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Control Building Structural Design Report

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REVISION CHART (CONT)

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RECORD OF REVISION

Rev #	Description
0	Initial issue
1	Incorporate comments on Rev.0
2	Incorporate comments on Rev.1

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1. SCOPE

The objective of this report is to document the North Anna Unit 3 (NA3) site-specific structural design evaluation of the Economic Simplified Boiling Water Reactor (ESBWR) Control Building (CB) for the site-specific seismic load demands that exceed the seismic loads used for the standard design of the CB structure in Reference 2.1.2-i. The scope of the evaluation is the analysis and stress checks of the structure for the site-specific seismic loads in combination with other design loads in critical seismic load combinations. The analysis is performed using the same NASTRAN model used for the standard design of the CB structure in Reference 2.1.2-i. The design loads applied to the model are the same as those considered in the standard design, except for the site-specific Safe Shutdown Earthquake (SSE) loads that are obtained from Reference 2.1.2-l. The NA3 site-specific SSE loads are combined with non-seismic standard plant loads following the same standard design analysis methodology and acceptance criteria.

2. APPLICABLE DOCUMENTS

2.1 Supporting and Supplemental Documents

The following documents form a part of this document:

2.1.1 Supporting Documents

Supporting documents are those documents that complete the requirements of this document and are referred to herein.

	Designation
a. Control Building Concrete Drawings, 105E4057	U73-2010

2.1.2 Supplemental Documents

Supplemental documents are those documents that are to be used in conjunction with this document.

	Designation
a. Standard Review Plans and Regulatory Guides Design Specification, SR3-1-A11-TRD-5201, Revision 0	A11-5201
b. Industry Codes and Standards Design Specification, SR3-1-A11-TRD-5202, Revision 0	A11-5202
c. Composite Design Specification, 26A6007, Revision 6	A11-5299
d. Seismic Design Input Design Specification, 26A6561	A25-4010
e. General Civil Design Criteria, 26A6558, Revision 4	A40-4010
f. Design Specification for Control Building, 26A6607, Revision 2	U73-4010
g. Stability Analysis of Control Building, 26A6654, Revision 4	U73-5020
h. Seismic Analysis of Control Building, 26A6648, Revision 4	U73-5030
i. Control Building Structural Design Report, 26A6653, Revision 5	U73-5010
j. North Anna 3 Control Building Stability Analysis Report, WG3-U73-ERD-S-0003, Revision 2	

k. North Anna 3 Control Building Seismic Analysis Report, WG3-U73-ERD-S-0001, Revision 2
l. North Anna 3 Bounding Seismic Demands CB and FWSC Site-Specific Evaluations, SER-DMN-032, Revision 3
m. North Anna 3 Control Building and Reactor/Fuel Building Complex Seismic Soil-Structure Interaction Analysis Report, WG3-U73-ERD-S-0005, Revision 3
n. North Anna 3 Control Building and Firewater Service Complex Seismic Structure-Soil-Structure Interaction Analysis Report, WG3-U73-ERD-S-0002, Revision 6
o. WG3-U71-ERD-S-0004, "Reactor Building Structural Design Report", Revision 1

2.2 Industry Codes and Standards

The following industry codes and standards shall form a part of this document to the extent specified herein. Unless otherwise specified, the applicable revision of the industry codes and standards as indicated in the Industry Codes and Standards Design Specification (Reference 2.1.2-b) shall be used.

a. ACI 349-01: "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-01) and Commentary (ACI 349R-01)"
b. ASME-2004: Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 2, Subsection CC, "Code for Concrete Reactor Vessels and Containments"
c. AISC N690-1994: "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities," with the Supplements No.1 (2002) and No.2 (2004)
d. ASCE 7-02: "Minimum Design Loads for Buildings and other Structures," 2002
e. ASCE 4-98: "Seismic Analysis of Safety-Related Nuclear Structures", 1998.
f. ASTM A615: "Specification for Deformed and Plain Billet-Steel Bar for Concrete Reinforcement Steel"

2.3 Regulation and Regulatory Requirements

The following regulations and regulatory requirements shall form a part of this document to the extent specified herein. Unless otherwise specified, the applicable revision of the Standard Review Plans (SRP) and Regulatory Guides (RG) as indicated in the Standard Review Plans and Regulatory Guides Design Specification (Reference 2.1.2-a) shall be used.

a. NUREG-0800, "USNRC Standard Review Plan for Review of Safety Analysis Reports for Nuclear Power Plants Light Water Reactor Edition"

2.4 References

a. BC-TOP-3A: "Tornado and Extreme Wind Design Criteria for Nuclear Power Plants", Rev.3, Aug. 1974

b. TM 5-855-1: "Fundamentals of Protective Design for Conventional Weapons", Department of the Army Technical Manual, Nov. 1986

c. BC-TOP-9A: "Design of Structures for Missile Impact", Rev.2, Sep. 1974

3. STRUCTURAL DESCRIPTION AND GEOMETRY

3.1 Structural Geometry and Dimensions

The CB houses the essential electrical, control and instrumentation equipment, the control room for the Reactor and Turbine Buildings, and the CB HVAC equipment. The CB is a Seismic Category I structure.

The CB has outside dimensions of 23.8 m x 30.3 m, 21.2 m high above the basemat. It consists of four floors, two of which are below-grade. It is embedded into the ground, such that the top of basemat is 11.9 m below the finished ground level grade.

3.2 Key Structural Elements and Descriptions

The CB is a reinforced concrete box type shear wall structure consisting of walls and slabs and is supported by a foundation mat. Steel framing is composite with concrete slab and used to support the slabs for vertical loads.

3.3 Floor Layout and Elevations

Floor layouts and sections of the CB are shown in Figures 3.3-1 through 3.3-6.

3.4 Conditions of Vicinity and Support

The site-specific evaluation presented in this report considers supporting subgrade conditions shown in Table 3.4-1 that correspond to the generic Soft Site described in Reference 2.1.2-h. The applied site properties are identical to those used for the standard design. The consideration of generic Soft Site conditions for the NA3 rock site is conservative because a softer subgrade results in larger structural deformations and stress demands on the CB basemat and structure.

Ground temperature is considered to be 15.5 °C.

4. STRUCTURAL MATERIAL REQUIREMENTS

4.1 Concrete

Concrete for the CB structures has the following compressive strength, f'_c:

- f'_c = 27.6 MPa = 4000 psi: basemat
- f'_c = 34.5 MPa = 5000 psi: other CB structures

4.2 Reinforcement

Reinforcement is Grade 60 deformed billet steel that conforms to ASTM A615 (Reference 2.2-f). Minimum yield strength, f_y is 414 MPa = 60000 psi.

4.3 Structural Steel

- ASTM A572, Grade 50 (for steel frame members such as Columns, Girders, Beams, etc.)
- ASTM A36 (for miscellaneous steel such as Embedded plate, etc.)

5. STRUCTURAL LOADS

5.1 Dead Loads

The following types of dead loads are considered in the structural evaluation and are identical to those used for the standard design of the CB structure in Reference 2.1.2-i.

5.1.1 Structural Weight

The weights of modeled structural members, i.e., concrete slabs, walls and steel columns, are included in the model by specifying the unit weight density for each material, so that they are automatically accounted for in the analysis calculation.

The following unit weights are used for modeled members:

- Reinforced concrete: 23.5 kN/m^3
- Steel: 77.0 kN/m^3

5.1.2 Other Weight

The following weights are considered in the analysis:

1. Deck and steel beam .... 3.0 kN/m^2
2. Finishing weight
   - Man-walking roof (cover concrete, waterproofing)........................ 1.8 kN/m^2
   - Floor slab.. 1.0 kN/m^2
   - Exterior wall below-grade (water proofing)................................ 0.2 kN/m^2
   - Exterior wall above-grade (architectural finishing concrete)........... 1.2 kN/m^2
3. Parapet weight
   - Parapet on roof... 9.0 kN/m
4. Reinforced-concrete-made partition walls
   - Weight of reinforced-concrete-made partition walls is calculated and applied as a uniform load to the specific area.
5. Piping load
   - Miscellaneous commodities and their supports.......................... 2.4 kN/m^2

5.1.3 Equipment Weight

Table 5.1-1 shows the weights of major equipment located on floors. 20% design margin is added to the equipment weight in accordance with U73-4010, "Design Specification for Control Building" (Reference 2.1.2-f).

Equipment weights, which are identical to those used for the standard design of the CB structure in Reference 2.1.2-i, are calculated and applied as uniform loads to the floor slab elements by their tributary area.

5.2 Live Loads

The following three live loads are considered in the structural evaluation and are identical to those used for the standard design of the CB structure in Reference 2.1.2-i.

5.2.1 Floor Live Loads

Floor live loads are also shown in Table 5.2-1. Floor live loads are reduced to 1/4 of their values when used in the evaluation of seismic loads.

5.2.2 Static Soil Pressure

The static lateral soil pressure loads, which are shown in Table 5.2-2 and Figure 5.2-1, are applied to the external walls below grade. These loads envelope the generic site conditions considered for the standard design in Reference 2.1.2-i and the NA3 site-specific static lateral pressures as shown in Section 7 of Reference 2.1.2-j. Evaluations of lateral soil pressures are described in Appendix B of Reference 2.1.2-i.

5.2.3 Snow Loads

Snow loads considered for the site-specific evaluation of the CB structure are identical to those used for the standard design of CB structure in Reference 2.1.2-i and are shown in Table 5.2-1. Snow loads are taken as 2.4 kN/m^2 (50 psf). The magnitude of the snow loads applied to the area by staircases on roof slab is greater than 2.4 kN/m^2 to account for the effects of snow drift. One hundred percent of the snow load is used in the evaluation of seismic loads. The NA3 site-specific snow loads (1.2 kN/m^2 (25 psf)) are bounded by the above standard design loads.

5.3 Thermal Loads

Figures 5.3-1 and 5.3-2 provide the temperatures during normal plant operation and Design Basis Accident (DBA), which are considered for both summer and winter seasons. These temperatures are identical to those used for the standard design of the CB structure in Reference 2.1.2-i.

The thermal loads for the CB are obtained by heat transfer analysis. Figure 5.3-3 shows the equations of heat transfer analysis. The room temperatures in winter and summer are provided in Tables 5.3-1 through 5.3-4 for both normal operation condition (To) and DBA condition (Ta). Average temperature (Td) and temperature difference (Tg) of walls and slabs are determined by equivalent linearization of the analysis results.

5.4 Wind Loads

Design conditions for calculating the basic wind load are as follows:

Basic wind speed (50 year recurrence interval), m/s (mph)	62.6 (140)
Importance Factors (Safety-Related structures)	1.15
Exposure Category	Exposure D

Wind load values at each floor level are shown in Table 5.4-1. The evaluation of these design wind loads, which are identical to those used for the standard design of the CB structure, is described in Appendix B of Reference 2.1.2-i. The NA3 site-specific wind loads (Basic wind speed is 40.2 m/s (90 mph)) are bounded by the above standard design loads.

5.5 Tornado Loads

Design conditions for calculating the tornado wind load are as follows:

Maximum Tornado wind speed, m/s (mph)	147.5 (330)
Maximum Rotational Speed, m/s (mph)	116.2 (260)
Maximum Translational Speed, m/s (mph)	31.3 (70)
Radius, m (ft)	45.7 (150)
Maximum Pressure Drop, kPa (psi)	16.6 (2.4)
Maximum Rate of Pressure Drop, kPa/s (psi/s)	11.7 (1.7)

Tornado load values at each floor level are shown in Table 5.5-1. The evaluation of design tornado loads, which are identical to those used for the standard design of the CB structure, is described in Appendix B in Reference 2.1.2-i. The NA3 site-specific tornado loads (for example, Maximum Tornado wind speed is 134.1 m/s (300 mph)) are bounded by the above standard design loads.

5.6 Seismic Loads

The seismic loads considered in the CB design are those generated by the site-specific SSE.

The design seismic loads are determined from the site-specific Soil-Structure Interaction (SSI) analysis results, described in the site-specific seismic analysis of the CB (Reference 2.1.2-k). Reference 2.1.2-l provides the site-specific seismic loads used for the evaluation presented in this report. These loads bound the effects of concrete cracking as described in Reference 2.1.2-k and the effects of Structure-Soil-Structure Interaction (SSSI) of the RB/FB and FWSC on the seismic response of CB as described in References 2.1.2-m and 2.1.2-n, respectively. The SSSI between the CB and FWSC, or the CB and RB/FB have a small effect on the site-specific seismic response of the CB at the NA3 site. The difference, which is only in vertical acceleration, is under 8%. Therefore, these effects are enveloped by design margin.

Four components - two horizontal, one vertical, and one torsional - of the seismic loads are evaluated following the methodology used for the standard design of the CB structure in Reference 2.1.2-i.

The site-specific seismic design loads applied to the CB structures are shown in the following tables and figures:

- Horizontal and torsional seismic loads: Table 5.6-1, Figure 5.6-2
- Vertical accelerations: Table 5.6-2

The node numbers in the tables are described in Figure 5.6-1. The following load is also regarded as a seismic load, and is considered in the CB design:

- Soil pressure due to an earthquake

The design soil pressure loads due to earthquakes are calculated from the envelope of SASSI (System for Analysis of Soil-Structure Interaction) results described in Reference 2.1.2-k. Reference 2.1.2-l provides the site-specific seismic lateral pressure loads used for the evaluation presented in this report and bound the effects of concrete cracking as described in Reference 2.1.2-k and the effects of SSSI of the RB/FB and FWSC on the seismic response of the CB as described in References 2.1.2-m and 2.1.2-n, respectively. The lateral pressure loads used for the site-specific evaluation are presented in Table 5.6-3 and Figure 5.6-3.

6. STRUCTURAL ANALYSIS AND DESIGN

6.1 General Description

The structural analysis and design of the CB are performed consistently with the procedure used for the standard design in Reference 2.1.2-i, as follows:

1. Perform stress analyses for the site-specific seismic loads, described in Section 5.6, using the same Finite Element (FE) model as the one used for the standard design to calculate section forces due to SSE.

2. Combine the SSE section forces with the section forces due to non-seismic design loads, calculated in Reference 2.1.2-i, according to the site-specific seismic design load combination described later in Section 6.3.

3. Perform structural design calculations using the section forces from the site-specific seismic design load combination and compare them with the corresponding results for the non-seismic load combinations selected in Reference 2.1.2-i.

The design / evaluation is essentially performed using ASME, Section III, Division 2 (Reference 2.2-b) to use the same procedure as that in Reference 2.1.2-i.

The design of steel members in the CB is performed in accordance with AISC N690-1994.

6.2 Stress Analysis

6.2.1 Analysis Program

The computer program used for the stress analysis calculation is MSC/NASTRAN version 2013. It is a general-purpose stress analysis program, which is technically based on the FE method. Analysis calculations are executed on Red Hat Enterprise Linux Server release 5.7 OS.

6.2.2 Analysis Model

6.2.2.1 Outline of the Analysis Model

The stress analysis model is a three-dimensional FE model. Figure 6.2-1 illustrates the global stress analysis model, which is identical to the model used for the standard design in Reference 2.1.2-i.

6.2.2.2 Modeling Principles

The global FE model was developed for the standard design according to the following modeling principles:

1. Primary structure members, including basemat, walls, and roof slab are modeled so that their design section forces are adequately evaluated.

2. The global coordinate system of the analysis model is determined as follows:

   - Origin: The origin is at EL 0.0 m at the corner of the North and West wall.
   - X-axis: Positive X is the southward direction from the origin.
   - Y-axis: Positive Y is the eastward direction from the origin.
   - Z-axis: Positive Z is the vertically upward direction.

3. Local coordinate system (for application of element forces) of vertical shell elements, such as exterior walls, and inner walls, is determined as follows:

   - For East and West walls:
     - Z-axis: Positive Z is the westward direction.
     - X-axis: Positive X is same as the global X-axis.
     - Y-axis: Positive Y is the vertically upward direction.
   - For North and South walls:
     - Z-axis: Positive Z is the southward direction.
     - X-axis: Positive X is same as the global Y-axis.
     - Y-axis: Positive Y is the vertically upward direction.

4. Local coordinate system of horizontal shell elements, such as the basemat and roof slab, is determined as follows:

   - Z-axis: Positive Z is the vertically upward direction.
   - X-axis: Positive X is same as the global X-axis.
   - Y-axis: Positive Y is same as the global Y-axis.

6.2.2.3 Modeling of the Basemat and Ground

6.2.2.3.1 Basemat

The basemat is modeled with thick shell elements that have equal thickness of 3.0 m. The elements are placed horizontally at the center of basemat, EL -8.90 m. The horizontal region of the basemat model is limited by the center of the exterior walls.

Figure 6.2-2 shows the FE model of the basemat.

6.2.2.3.2 Ground

The ground is modeled with spring elements. Three independent spring elements, one vertical and two horizontals, are attached to each of the basemat grid points.

Spring constants are calculated using the generic soil properties described in Section 3.4. Table 6.2-1 shows the vertical and horizontal spring constants of the unit area of the CB. These values are multiplied by the tributary area of each grid point to estimate the spring constants of spring elements.

The constants are calculated based on soil spring constants of the Sway-Rocking model for standard plant SSI analyses (Reference 2.1.2-h).

6.2.2.4 Modeling of Shear Walls

The seismic walls, which are considered in the seismic analysis model, are included in the global analysis model.

The walls are modeled with shell elements. They are divided horizontally at the same locations as those of the basemat grid points, and vertically into three elements in each story. FE models of the walls are shown in Figures 6.2-3 through 6.2-7.

Openings in the seismic walls are modeled by eliminating corresponding elements, if their areas are 3.0 m^2 or larger.

6.2.2.5 Modeling of Floor Slabs

Floor slabs are modeled with horizontal shell elements. Elements are positioned at the center of the slab thickness.

FE models of the slabs are shown in Figures 6.2-8 through 6.2-11.

6.2.2.6 Modeling of Frame Members

Frame members included in the global stress analysis model are steel columns and steel girders. They are modeled with bar elements.

Figures 6.2-12 through 6.2-20 show FE models of frame members.

6.2.2.7 Units and Material Constants

Stress analyses are executed with the following SI units:

- length: m
- force: MN
- moment: MN m
- pressure: MPa
- temperature: °C

Material constants shown in Table 6.2-2 are used for the stress analysis calculations.

Young's modulus used for concrete in the thermal load analysis is reduced, depending on the average temperature of each element as shown in Table 6.2-2.

6.2.3 Method of Applying Loads

Table 6.2-3 shows a list of the design basic load cases. A total of 22 load cases were considered in Reference 2.1.2-i for the standard design of the Reinforced Concrete (RC) shell elements, such as basemat, walls and slabs, and steel frame members, such as columns and girders. Table 6.2-4 shows a list of the analysis load cases considered for the standard design. In order to obtain the member stresses under site-specific seismic loads, the global FE model analyses are performed for the site-specific seismic load cases. A total of six site-specific seismic load cases are analyzed for the site-specific evaluation presented in this report.

6.2.3.1 Dead Loads

6.2.3.1.1 Structural Weight (GRAV)

The weights of reinforced concrete members included in the analysis model were evaluated in Reference 2.1.2-i using a GRAV feature that NASTRAN provides. It applies a downward gravity force to each element mass, which is calculated from the unit weight density and the volume of the element.

Evaluation of the structural weights using the GRAV feature has one drawback, which is double counting of weights at such regions as wall-to-wall and wall-to-slab corners and edges of girders and columns; however, this double counting is ignored in the analysis, for the following reasons: (1) duplicated weights of corners are negligibly small compared to the total weight of the analysis model and (2) the increased weights of girders lead to a design with larger margins.

6.2.3.1.2 Other Dead Weight (DL)

Dead weights, other than those included in the analysis model by using a GRAV feature, were evaluated in Reference 2.1.2-i as specified in Section 5.1.2 and applied to the analysis model as follows:

a. Decks and Steel Beams

The weights of decks and steel beams are applied to slabs as distributed surface loads.

b. Finishing

The weights of finishing for roof slabs, floor slabs, and exterior walls are applied as distributed loads.

c. Partition Walls

The weights of RC-made partition walls, which are not included in the model, are applied as uniformly distributed element loads.

d. Parapet

The uniform loads due to parapet weight are applied as concentrated forces at the intersection grids of parapets and roof slab. The applied force to each grid is calculated according to its tributary area.

e. Piping Loads

The weights of miscellaneous structures, piping and commodities are applied as distributed surface loads to the floor slab elements.

6.2.3.1.3 Equipment Loads (EL)

The unit loads due to equipment weight were calculated in Reference 2.1.2-i as specified in Section 5.1.3. They were applied to the slab elements as uniformly distributed surface loads.

6.2.3.2 Live Loads

In order to obtain the design live loads, the stress analyses were performed in Reference 2.1.2-i for the following load cases (LL1, LL2, SP).

6.2.3.2.1 Live Loads (LL1, LL2)

Floor live loads are applied to modeled slab elements as uniformly distributed surface loads.

The snow loads are applied to the roof slab. However, the snow loads on the roof by staircases at EL 13.80 m are larger than floor live loads, so the snow loads are applied instead of the floor live load.

The live load LL1 is the maximum value of floor live loads and snow loads for the condition of normal operation. And the live load LL2 is the maximum value of 25% floor live loads and 100% snow loads for calculating the vertical seismic forces.

6.2.3.2.2 Static Soil Pressure (SP)

The lateral soil pressure at rest is applied to the exterior walls below-grade. The average pressure for each element is calculated and applied as a uniformly distributed pressure load.

6.2.3.3 Thermal Loads

The average temperature Td, and the surface temperature difference, Tg, are obtained by heat transfer analyses as described in Section 5.3 and are applied to the corresponding shell elements.

6.2.3.4 Wind Loads

For the standard design analyses in Reference 2.1.2-i, the wind pressure loads acting on the walls and roof slab were applied to shell elements as uniform pressure loads. The average pressure for each element is calculated and applied to the element as a uniformly distributed pressure load.

Wind loads that act on exterior wall openings are applied to grid points around the openings as nodal forces. The nodal force applied to each grid point is determined according to its tributary area.

The description of the design wind loads (WON, WOS, WOE and WOW) are as follows. WON is a wind load from North to South. WOS is a wind load from South to North. WOE is a wind load from East to West. WOW is a wind load from West to East.

6.2.3.5 Tornado Loads

Analyses for the tornado wind loads were performed in Reference 2.1.2-i using the same method as the one used for design wind load.

A maximum pressure of 0.0165 MPa, shown in Table 5.5-1, is applied to roof slab and exterior walls above-grade as the tornado differential load.

The description of the design tornado wind loads (WTN, WTS, WTE and WTW), and tornado differential load (WTD) are as follows. WTN is a wind load from North to South. WTS is a wind load from South to North. WTE is a wind load from East to West. WTW is a wind load from West to East.

6.2.3.6 Site-Specific Seismic Loads

The site-specific seismic forces applied to the model for the site-specific stress analyses are determined from the design seismic loads presented in Section 5.6. Four components – two horizontal, one vertical, and one torsional – of the seismic loads are evaluated.

The methods of applying the site-specific seismic forces on the model are described below.

6.2.3.6.1 Shear Forces & Overturning Moment (XS, YS)

Calculation methods for the shear forces and the overturning moments are given in Figure 6.2-21. The horizontal force applied to each story is calculated by subtracting the design shear force for the story above from the design shear force for that story. The overturning moment applied to each story is determined in such a way that the sum of the applied moment and the one due to shear forces applied to the stories above is equal to or larger than the design moment of the story. The moment is adjusted considering the difference between the height where the design seismic loads are obtained and the height where the seismic forces are applied.

Tables 6.2-5 and 6.2-6 summarize the applied shear forces and overturning moments for the seismic walls for both earthquake directions. Columns "m+dMq" in these tables show the values of the applied moments.

Shear Forces

Shear forces are applied as horizontal nodal forces to grid points as illustrated in Figure 6.2-22. The nodal forces are applied to grid points that are on the walls and at floor slab levels.

In addition to the design shear forces, the inertia forces of the basemat due to the earthquake are applied to the basemat grid points. Inertia forces are applied as horizontal nodal forces. The nodal force applied to each node is calculated as the tributary weight of the node multiplied by the specified acceleration.

Overturning Moments

Overturning moments are applied as vertical nodal forces to grid points as illustrated in Figure 6.2-23. The magnitude of the vertical force is assumed to be proportional to the distance from the center of the building in each direction. The nodal force applied to each node is then calculated by multiplying it by the tributary wall area of the node. The nodal forces are applied to grid points that are on the walls at floor slab levels.

In addition to the design overturning moments mentioned above, an additional moment is applied to the basemat in order to adjust the total overturning moment imposed on the soil by the total shear force. The basemat is modeled at the center of its thickness, and the soil spring elements are directly attached to the basemat grid points. However, because the actual ground is underneath the basemat, an overturning moment, ΔM, which is calculated by the following equation, needs to be added. Table 6.2-7 shows the calculated additional overturning moments to be applied to the basemat.

$$\Delta M = (Q + W_{mat} \cdot A)h$$

where,

Q: Shear force at EL-7.4 m

W_{mat}: Weight of Basemat (GRAV+DL+EL+LL2)

A: Horizontal Acceleration of Basemat

h: Half of Basemat thickness (1.5 m)

The additional overturning moment is applied as vertical nodal forces to the basemat grid points. The magnitude of the vertical force per unit area is assumed to be proportional to the distance from the center of the basemat. The nodal force applied to each node is then calculated by multiplying it by the tributary area of the node.

6.2.3.6.2 Vertical Acceleration (VAS)

The site-specific seismic vertical accelerations calculated for the lumped mass locations of the dynamic models used for the site-specific seismic response analyses are applied directly

to the seismic walls. On the other hand, the out-of-plane accelerations applied to the CB slabs are determined using the method described in Appendix D of Reference 2.1.2-k.

The average accelerations, ${}_{S}A_{ave}$, provided in Table 6.2-8, are obtained from Reference 2.1.2-l and represent the out-of-plane site-specific seismic loads on the slabs. These loads bound effects of concrete cracking as described in Reference 2.1.2-k and the effects of SSSI of RB/FB and FWSC on the seismic response of the CB as described in References 2.1.2-m and 2.1.2-n, respectively. The site-specific out-of-plane acceleration loads in Table 6.2-8 are uniformly applied to all slab grid points following the methodology used for the standard design in Reference 2.1.2-i.

The vertical seismic forces are applied to all grid points as upward vertical nodal forces. Each nodal force is calculated by multiplying the tributary weight of the node by the vertical acceleration determined for the region containing the node. For the seismic walls, a design acceleration obtained at a given elevation is applied to a region that is limited by the centerlines of that elevation and the upper and lower elevations. The tributary weight of the node is obtained using the load combination for the vertical seismic loads, which consists of the dead load and a quarter of the floor live load.

6.2.3.6.3 Torsional Moment (TMS)

The torsional moment applied to each CB floor elevation is calculated by subtracting the design torsional moment for the story above from the design torsional moment for that story. The magnitudes of the site-specific torsional loads are summarized in Table 6.2-9. The torsional moments are applied to the seismic walls as in-plane shear forces following the methodology used for the standard design in Reference 2.1.2-i. The method of calculating the shear forces is described in Figure 6.2-24 and the results are summarized in Tables 6.2-10 through 6.2-13. Torsional moments in the clockwise (East to South) direction are considered to be positive.

The shear forces due to the torsional moments are applied as horizontal nodal forces to the grid points on floor slab levels. Their magnitudes are determined according to the tributary lengths of the nodes.

6.2.3.6.4 Soil Pressure due to an Earthquake (SPNS, SPEW)

The soil pressure loads described in Section 5.6 are applied to the CB exterior walls located below grade, as active soil pressures. The method of applying the site-specific seismic lateral pressures is the same as the method used for the standard design in Reference 2.1.2-i and the method used to apply the static soil pressure described in Subsection 6.2.3.2.2.

6.2.4 Analysis Results

Section deformations obtained from NASTRAN analyses for all the analysis cases are shown in Figures 6.2-25 through 6.2-48. Tables 6.2-14 through 6.2-18 tabulate section forces for the typical elements selected in Figures 6.2-2 through 6.2-11. The results presented in the tables for the non-seismic load cases are obtained from Reference 2.1.2-i.

Element forces and moments of shell elements are defined with relation to the element coordinate system shown in Figure 6.2-49.

6.3 Load Combinations

6.3.1 Code Requirements

Reinforced Concrete Structures

The load combinations, associated load factors, and acceptance criteria for reinforced concrete structures are summarized in Table 6.3-1, which is shown in Reference 2.1.2-f and in compliance with ACI 349-01 and SRP 3.8.4.

Steel Structures

The load combinations and associated load factors and acceptance criteria for steel structures are summarized in Table 6.3-2, which is in compliance with AISC N690-1994 Code and SRP 3.8.4.

6.3.2 Selection of Design Load Combinations

The CB structural evaluation considers the same critical site-specific seismic load combinations as those used for the standard design in Reference 2.1.2-i. These combinations include DBA loads and seismic loads as shown in Tables 6.3-3 and 6.3-4. The acceptance criteria for the considered load combinations are also included in the same table. Tables 6.3-5 and 6.3-6 show the details regarding the load combinations used for the site-specific evaluation.

6.3.3 Result of Load Combinations

Identical to the approach used for the standard design in Reference 2.1.2-i, the site-specific seismic load combinations are based on the SRSS method for the four directions of seismic loads as follows. The site-specific seismic loads include the dynamic increment of soil pressure.

$$SEISMIC_{SRSS} = \sqrt{(|\mathrm{EQNS}| + |\mathrm{SPNS}|)^2 + (|\mathrm{EQEW}| + |\mathrm{SPEW}|)^2 + (\mathrm{EQZ})^2 + (\mathrm{EQT})^2}$$

$E' = SEISMIC_{SRSS}$, which E' refers to Table 6.3 - 3

- EQEW: Horizontal seismic loads in the EW direction
- EQNS: Horizontal seismic loads in the NS direction
- EQZ: Vertical seismic loads
- EQT: Torsional seismic loads
- SPEW: Dynamic soil pressure during a horizontal earthquake (East to West)
- SPNS: Dynamic soil pressure during a horizontal earthquake (North to South)

The basic concept for SRSS is shown below:

1) Algebraic sum static component forces (dead, live, thermal, pressure, etc.): Retain sign for each force component. For example, N_x (+), N_y (-), and N_{xy} (+) for axial forces in X and Y direction and in-plane shear force, respectively.

2) Seismic component forces (SRSS results of force due to each of 3 direction input): regardless of sign
3) Assign signs to total dynamic component force to be same as static force: refer to Step-1 example, N_x (+), N_y (-), and N_{xy} (+)
4) Total component forces (add Step-1 and Step-3): refer to Step-1 example, N_x (+), N_y (-), and N_{xy} (+)
5) The case to reverse the signs of section forces is evaluated for total dynamic components which are described in Step-3 (the signs of static component forces in Step-1 are not reversed).

Tables 6.3-7 through 6.3-10 show the combined forces and moments for the load combinations listed in Table 6.3-3.

Section forces due to the following loads are shown independently in the tables:

- OTHR: Loads other than temperature and seismic loads
- TEMP: Thermal loads
- SEIS: Seismic loads

6.4 Section Design Principles

6.4.1 Section Design of Reinforced Concrete Structures

Structural design is performed according to ACI 349-01. The design flow chart is shown in Figure 6.4-1.

Section design calculations are carried out for the following section forces and it is confirmed that the results satisfy code requirements:

- Flexure and Membrane Forces
- Membrane Compressive Forces
- Transverse Shear

All elements are examined by the evaluation method described in the following subsections.

6.4.1.1 Section Design for Flexure and Membrane Forces

The design calculations are carried out for flexure and axial forces, and for in-plane shear forces, separately.

Design calculations for flexure and membrane force are performed by a computer program SSDP-2D. The program has the following characteristics:

- It calculates concrete and rebar stresses under two-dimensional equilibrium conditions for six components of the section forces in a shell element – two axial forces, two bending moments, in-plane shear, and torsional moment. Transverse shear is generated in an element but is not considered in the equilibrium conditions.

- It takes concrete cracks into account in the stress calculation. Cracked concrete is assumed not to bear tensile forces.
- It considers the reduction of thermal stresses due to the decreased stiffness of a cracked concrete section.
- It assumes concrete and rebars to be perfectly elastic.

In calculations with SSDP-2D, all section forces including axial forces, bending moments and in-plane shear are considered simultaneously. In SSDP-2D, the compressive stress distribution of concrete is based on the linear distribution which is proportional to the strain distribution at the section. Moment capacity based on this condition is more conservative than the moment capacity specified in ACI 349-01 which is based on the stress block for the compressive stress distribution of concrete. As shown in Figure 6.4.1-3 of Reference 2.1.2-o, the ASME capacity with linear concrete compressive stress distribution (used in the SSDP program) is more conservative than ACI 349-01 except in the high axial force (compression) region. This is addressed in Appendix C by performing additional compression check per ACI 349-01. Additionally, in-plane shear check per ACI 349-01 is performed in Appendix B.

As for the thermal effects, section forces due to thermal loads, which are evaluated by NASTRAN analyses using uncracked concrete stiffness, are reduced considering the depth and direction of cracking in calculations with SSDP-2D. The cracked section properties are used in the calculation only for the cracked sections. Furthermore, compatibility between strain distribution in a section and internal forces, including reduced thermal stress, is examined under an assumed cracked condition in calculation with SSDP-2D. The calculations are continued until the compatibility of strain and internal forces are satisfied. During the iterative calculations, redistribution of internal forces and strains are considered adequate. Therefore, SSDP calculation satisfies the requirements of Appendix A.3.3 (a) and (b) in ACI 349-01.

Table 6.4-1 shows the material constants used for the stress calculation. Allowable stresses specified in CC-3420 of ASME-2004 are used in the design, since they are not specifically defined in ACI 349-01. Tables 6.4-2 and 6.4-3 show the allowable stresses of concrete and rebars.

As specified in Section 6.1 of Reference 2.1.2-f, strengths of concrete and rebars are reduced taking effects of elevated temperatures into consideration.

Reduction of concrete strength due to high temperature is determined based upon the average value of the following upper bound and lower bound equations:

- Lower bound reduction factor
  - $\phi = 1.0 - 0.0030\ (T-21.1)$ 21.1°C (70°F) $\leq T \leq$ 121.1°C (250°F)
  - $\phi = 0.70 - 0.00083\ (T-121.1)$ 121.1°C (250°F) $\leq T$
- Upper bound reduction factor
  - $\phi = 1.0$ $T \leq$ 260.0°C (500°F)

- $\phi = 1.0 - 0.00081\,(T-260.0)$ 260.0°C (500°F) ≤ T

Reduction of reinforcing steel strength is based upon the following equation:

- Reduction Factor
  - $\phi = 1.0 - 0.000873\,(T-21.1)$ 21.1°C (70°F) ≤ T ≤ 204.4°C (400°F)

Average temperature "Td" in Section 5.3 is applied to the "T" of the above equation. Allowable stresses listed in Tables 6.4-2 and 6.4-3 are reduced using these factors in calculation for load combinations, including thermal loads.

6.4.1.2 Section Design for Membrane Compressive Forces

ASME-2004 specifies the allowable concrete stresses for membrane forces. It is necessary to confirm that the compressive stresses of the concrete due to membrane forces do not exceed the allowable stresses specified in CC-3420 of ASME-2004. Examinations for membrane compressive forces are also performed in the design in addition to examinations for flexure and membrane forces.

The principal membrane compressive stress σ_c, which is calculated by the following equation, is used for the evaluation.

$$\sigma_c = \frac{\sigma_x + \sigma_y}{2} + \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2{}_{xy}}$$

$$\sigma_x = \frac{N_x}{h}$$

$$\sigma_y = \frac{N_y}{h}$$

$$\tau_{xy} = \frac{N_{xy}}{h}$$

where,

N_x : x-direction axial force per unit length (Compression is positive.)

N_y : y-direction axial force per unit length (Compression is positive.)

N_{xy} : in-plane shear per unit length

h: element thickness

Reduction of thermal stresses is not considered in the calculation. Table 6.4-4 shows the allowable membrane compressive stresses of concrete. Reductions due to elevated temperature described in Subsection 6.4.1.1 are applicable to these allowables.

6.4.1.3 Section Design for Transverse Shear

Section design calculations for transverse shear are performed according to ACI 349-01, Chapter 11. It requires that the shear force at a section and section strength satisfy the following equation:

$$V_u \leq \phi(V_c + V_s)$$

where,

V_u: factored shear force at section per unit length

V_c: nominal shear strength provided by concrete per unit length

V_s: nominal shear strength provided by shear reinforcement per unit length

ϕ: strength reduction factor (=0.85)

The nominal shear strength provided by concrete, V_c, is calculated according to Figure 6.4-2. The nominal shear strength provided by shear reinforcement, V_s, is calculated by the following equation:

$$V_s = \rho_w f_y d, \quad V_s \leq 8\sqrt{f_c'}d \qquad \text{(lb - in)}$$

where,

ρ_w: shear reinforcement ratio

f_y: specified yield strength of rebar

d: distance from extreme compression fiber to centroid of tension reinforcement

f_c': specified compressive strength of concrete

The transverse shear stress is evaluated in the direction of the maximum shear force, and the section forces for evaluation are calculated by the following equations:

$$V_u = \sqrt{{Q_x}^2 + {Q_y}^2}$$

$$M_u = M_x \sin^2\theta + M_y \cos^2\theta + 2M_{xy} \sin\theta\cos\theta$$

$$N_u = N_x \sin^2\theta + N_y \cos^2\theta + 2N_{xy} \sin\theta\cos\theta$$

$$\theta = \tan^{-1}(Q_x/Q_y)$$

6.4.2 Section Design of Steel Structures

Section design of steel members is performed according to AISC N690-1994 (Reference 2.2-c). Steel members, i.e., columns and girders, are examined by the evaluation method described in the following subsections.

The design flow of steel structures is almost the same as the flow of reinforced concrete structures, which is shown in Figure 6.4-1. However, reductions of thermal stresses are not considered for the steel design.

6.4.2.1 Section Design for Axial Compression and Bending

Steel members subjected to both axial compression and bending stresses shall be proportioned to satisfy the following requirements:

$$\frac{f_a}{F_a}+\frac{C_{mx}f_{bx}}{\left(1-\frac{f_a}{F'_{ex}}\right)F_{bx}}+\frac{C_{my}f_{by}}{\left(1-\frac{f_a}{F'_{ey}}\right)F_{by}}\leq 1.0 \qquad (6.4.2\text{-}1)$$

$$\frac{f_a}{0.60F_y}+\frac{f_{bx}}{F_{bx}}+\frac{f_{by}}{F_{by}}\leq 1.0 \qquad (6.4.2\text{-}2)$$

When $f_a/F_a \leq 0.15$, Equation (6.4.2-3) is permitted in lieu of Equations (6.4.2-1) and (6.4.2-2):

$$\frac{f_a}{F_a}+\frac{f_{bx}}{F_{bx}}+\frac{f_{by}}{F_{by}}\leq 1.0 \qquad (6.4.2\text{-}3)$$

In Equations (6.4.2-1), (6.4.2-2) and (6.4.2-3), the subscripts x and y, combined with subscripts b, m and e, indicate the axis of bending about which a particular stress or design property applies, and

F_a = Axial compressive stress that would be permitted if axial force alone existed, ksi.

F_b = Compressive bending stress that would be permitted if bending moment alone existed, ksi.

$$F'_e=\frac{12\pi^2E}{23\left(Kl_b/r_b\right)^2}$$

= Euler stress divided by a factor of safety, ksi. (In the expression for F'_e, L_b is the actual unbraced length in the plane of bending and r_b is the corresponding radius of gyration. K is the effective length factor in the plane of bending.)

f_a = Computed axial stress, ksi.

f_b = Computed compressive bending stress at the point under consideration, ksi.

C_m = Coefficient whose value shall be taken as follows:

a. For compression members in frames subject to joint translation (sideways), $C_m = 0.85$.

b. For rotationally restrained compression members in frames braced against joint translation and not subject to transverse loading between their supports in the

plane of bending,
$C_m = 0.6 - 0.4\ (M_1/M_2)$.
where M_1/M_2 is the ratio of the smaller to larger moments at the ends of that portion of the member unbraced in the plane of bending under consideration. M_1/M_2 is positive when the member is bent in reverse curvature, negative when bent in single curvature.

c. For compression members in frames braced against joint translation in the plane of loading and subjected to transverse loading between their supports, the value of C_m may be determined by an analysis. However, in lieu of such analysis, the following values are permitted:

   i. For members whose ends are restrained against rotation in the plane of bending: $C_m = 0.85$.

   ii. For members whose ends are unrestrained against rotation in the plane of bending: $C_m = 1.0$.

6.4.2.2 Section Design for Axial Tension and Bending

Steel members subjected to both axial tension and bending stresses shall be proportioned at all points along their length to satisfy the following requirement:

$$\frac{f_a}{F_t} + \frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \leq 1.0 \qquad (6.4.2\text{-}4)$$

Where f_b is the computed bending tensile stress, f_a is the computed axial tensile stress, F_b is the allowable bending stress and F_t is the governing allowable tensile stress.

6.4.2.3 Section Design for Transverse Shear

Steel members subjected to transverse shear stress shall be proportioned to satisfy the following requirement:

$$\frac{f_v}{F_v} \leq 1.0 \qquad (6.4.2\text{-}5)$$

where f_v is the computed shear stress and F_v is the governing allowable shear stress.

6.4.2.4 Allowable Stresses

6.4.2.4.1 Allowable Axial Tensile Stress

On the gross section of axially loaded tension members, the allowable stress is:

$$F_t = 0.60 F_y \qquad (6.4.2\text{-}6)$$

where F_y is the specified minimum yield stress of the type of steel being used, ksi.

6.4.2.4.2 Allowable Axial Compressive Stress

On the gross section of axially loaded compression members, when Kl/r, the largest effective slenderness ratio of any unbraced segment is less than C_c, the allowable stress is:

$$F_a = \frac{\left[1 - \frac{(Kl/r)^2}{2C_c^2}\right] F_y}{\frac{5}{3} + \frac{3(Kl/r)}{8C_c} - \frac{(Kl/r)^3}{8C_c^3}} \qquad (6.4.2\text{-}7)$$

where,

$$C_c = \sqrt{\frac{2\pi^2 E}{F_y}}$$

E = Modulus of elasticity of steel, ksi

On the gross section of axially loaded compression members, when Kl/r exceeds C_c, the allowable stress is:

$$F_a = \frac{12\pi^2 E}{23(Kl/r)^2} \qquad (6.4.2\text{-}8)$$

6.4.2.4.3 Allowable Bending Stress of W-shaped Members (Strong Axis Bending)

The allowable stress for the strong axis bending of W-shaped members is given according to the procedure shown in Figure 6.4-3.

6.4.2.4.4 Allowable Bending Stress of W-shaped Members (Weak Axis bending)

The allowable stress for the weak axis bending of W-shaped members is given according to the procedure shown in Figure 6.4-4.

6.4.2.4.5 Allowable Bending Stress of Box Members

The allowable bending stress of box members is given according to the procedure shown in Figure 6.4-5.

6.4.2.4.6 Allowable Shear Stress

For $h/t_w \le 380/\sqrt{F_y}$, on the overall depth times the web thickness, the allowable shear stress is:

$$F_v = 0.40F_y \qquad (6.4.2\text{-}9)$$

For $h/t_w > 380/\sqrt{F_y}$, the allowable shear stress on the clear distance between flanges times the web thickness is:

$$F_v = \frac{F_y}{2.89}(C_v) \le 0.40F_y \qquad (6.4.2\text{-}10)$$

where,

$$C_v = \frac{45000k_v}{F_y\left(h/t_w\right)^2} \text{ when } C_v \text{ is less than 0.8.}$$

$$= \frac{190}{h/t_w}\sqrt{\frac{k_v}{F_y}} \text{ when } C_v \text{ is more than 0.8.}$$

$$k_v = 4.00 + \frac{5.34}{\left(a/h\right)^2} \text{ when } a/h \text{ is less than 1.0.}$$

$$= 5.34 + \frac{4.00}{\left(a/h\right)^2} \text{ when } a/h \text{ is more than 1.0.}$$

t_w = thickness of web, in.

a = clear distance between transverse stiffener, in.

h = clear distance between flanges at the section under investigation, in.

7. SUMMARY OF RESULTS

7.1 Required Sections

The basemat has a uniform thickness of 3.0 m. Figure 7.1-1 shows the typical sections of the basemat. #11 bars are used for the primary reinforcement. Bottom and top rebars are arranged orthogonally in NS- and EW- directions. Standard bar pitches are 200 mm.

Figure 7.1-2 shows the typical sections of the slabs. #11 bars are used for the primary reinforcement. Bottom and top rebars are arranged orthogonally in NS- and EW- directions. Standard bar pitches are 200 mm.

Figure 7.1-3 shows the typical sections of the wall. #11 bars are used for the primary reinforcement. Inside and outside rebars are arranged orthogonally in Horizontal- and Vertical- directions. Standard bar pitches are 200 mm.

The NA3 site-specific design rebar arrangement is the same as the standard design one.

The sections of the steel members are shown in Figures 7.1-4 and 7.1-5. Steel beam "SG23" at EL 4.65 m on Col-Row CB shown in Figure 7.1-4 is revised from the standard design.

7.2 Provided Sections

The sections of the CB which have been provided are identical to the required sections described in Section 7.1. Table 7.2-1 shows the sectional thickness and rebar ratios used in the evaluation.

7.3 Tabulation of Allowable Stresses versus Calculated Stresses

7.3.1 Reinforced Concrete Structures

7.3.1.1 Calculations for Flexure and Membrane Forces

The calculations are performed for all elements for the load combinations described in Section 6.3, and it is confirmed that all values are less than their allowable stresses.

Tables 7.3-1 through 7.3-8 show the rebar and concrete stresses at these sections for the typical elements selected in Figures 6.2-2 through 6.2-11. Tables 7.3-9 and 7.3-10 give a summary of the maximum stress ratios, which are ratios of the maximum stresses to the allowable stresses.

The maximum rebar stress in shear walls is found to be 254.8 MPa (36.96 ksi) against allowable stress 372.2 MPa (53.98 ksi) in the vertical rebar in the wall at EL 9.06 m due to the load combination CB-9 as shown in Table 7.3-8. The maximum horizontal rebar stress in shear walls is found to be 239.0 MPa (34.66 ksi) against allowable stress 372.2 MPa (53.98 ksi) in the vertical rebar in the wall at EL 9.06 m due to the load combination CB-9 as shown in Table 7.3-8.

The maximum rebar stress in floor slabs is found to be 198.3 MPa (28.76 ksi) against allowable stress 372.2 MPa (53.98 ksi) in the roof at EL 13.8 m slab due to the load combination CB-9 as shown in Table 7.3-7.

The maximum rebar stress in foundation mat is found to be 159.9 MPa (23.19 ksi) against allowable stress 372.2 MPa (53.98 ksi) due to the load combination CB-9 as shown in Table 7.3-7.

7.3.1.2 Calculations for Membrane Compressive Forces

The compressive stress of concrete is calculated for membrane forces. The calculations are performed for all elements for the selected design load combinations, and it is confirmed that all values are less than the allowable stress.

Table 7.3-11 gives a summary of the maximum compressive stresses for the typical elements selected in Figures 6.2-2 through 6.2-11.

The maximum concrete stress in shear walls is found to be 5.4 MPa (0.78 ksi) against allowable stress 20.7 MPa (3.0 ksi) in the wall at EL -2.0 m as shown in Table 7.3-11.

The maximum concrete stress in floor slabs is found to be 14.8 MPa (2.15 ksi) against allowable stress 20.7 MPa (3.0 ksi) at EL 9.06 m slab as shown in Table 7.3-11.

The maximum concrete stress in foundation mat is found to be 2.0 MPa (0.29 ksi) against allowable stress 16.6 MPa (2.41 ksi) as shown in Table 7.3-11.

7.3.1.3 Calculations for Transverse Shear

The transverse shear strength is calculated and compared with shear forces generated by design loads. All elements are examined, and it is confirmed section forces are less than the shear strength of sections.

Table 7.3-12 gives a summary of the examinations for the typical elements shown in Figures 6.2-2 through 6.2-11. Table 7.3-13 shows calculation results for transverse shear by the selected load combination listed in Table 6.3-3.

The maximum transverse shear force in shear walls is found to be 1.481 MN/m (8.46 kips/in) against the shear strength of 1.881 MN/m (10.74 kips/in) in the wall at EL -7.4 m as shown in Table 7.3-13.

The maximum transverse shear force in floor slabs is found to be 0.340 MN/m (1.94 kips/in) against the shear strength of 0.353 MN/m (2.02 kips/in) at EL 4.65 m slab as shown in Table 7.3-13.

The maximum transverse shear force in foundation mat is found to be 1.974 MN/m (11.27 kips/in) against the shear strength of 4.682 MN/m (26.73 kips/in) as shown in Table 7.3-13.

7.3.2 Steel Structure

The stresses of the steel members are combined in accordance with Table 6.3-6, and it is confirmed that all values are less than the allowable stresses in accordance with the procedure in Subsection 6.4.2.

Tables 7.3-14 through 7.3-17 list the calculation results of the selected sections included in Figures 7.3-1 and 7.3-2. The calculation results for "CBAR ID 21016", shown in Table 7.3-16 is revised from the standard design. "CBAR ID 21016" is included in the steel beam "SG23" at EL 4.65 m on Col-Row CB as shown in Figure 7.1-4. The stress ratios of the design stresses against their allowable stresses shown in the tables are the maximum ratios among all the load combinations.

Please note the columns are subject to two direction forces. The procedure for their stress check is shown in Figure 7.3-3.

Column members are subjected to forces in the NS (X) and EW (Y) directions and five kinds of forces (N, M_x, M_y, V_x, V_y) are induced. For the combination of axial force and bending moments, column stresses are checked by using the full section area of the column as follows. Calculation results are shown in Table 7.3-18.

$$R_{NS} + R_{EW} - R_a \leq 1.0 \qquad (6.4.2\text{-}11)$$

where, R_{NS}: maximum stress ratio of design stresses to allowable stresses for NS direction considering N and M_x

R_{EW}: maximum stress ratio of design stresses to allowable stresses for EW direction considering N and M_y

R_a: minimum ratio of axial stress ratios for NS and EW direction

7.4 External Wall Capacity Evaluation

Sliding of the CB during the SSE input is evaluated against the building stability requirement. As shown in Section 7 of Reference 2.1.2-j, the site-specific passive lateral pressure loads required for the sliding stability of the CB at the NA3 site are almost enveloped by the corresponding lateral pressure loads used for the standard design wall

capacity check. This check was performed for the standard design in Reference 2.1.2-i for the embedded exterior walls under SSE loading in combination with other applicable loads. Design load is shown in Table 7.4-1 based on the sliding analysis shown in Table 5-1 in Reference 2.1.2-j. The stress check results are shown in Tables 7.4-2 and 7.4-3.

7.5 Missile Impact Evaluations

Appendix A in Reference 2.1.2-i describes the design methodology and results of the evaluation for exterior walls and roof slab of the CB against the tornado missile impact.

Appendix C in Reference 2.1.2-i describes the design methodology and evaluation for the effect of the impact of an automobile tornado missile on the CB structures including exterior walls and roof slabs.

8. CONCLUSIONS

Site-specific stress check calculations for the CB are performed to evaluate the structural integrity of the CB at the NA3 site per specifications of ACI 349-01 and AISC N690-1994, following the same methodology as that used for the standard design in Reference 2.1.2-i. The stress checks are based on the results of the CB global model analyses for the site-specific seismic loads combined together with the non-seismic load results from Reference 2.1.2-i according to the site-specific seismic load combinations. The conclusions from the site-specific stress checks are summarized as follows:

- Reinforced concrete structures
  - The stresses of the concrete and rebar are less than the allowable stresses specified in the code.
  - The areas of the primary and shear reinforcement, which have been provided, satisfy the required values.
- Steel structures
  - The stresses of steel members are less than the allowable stresses specified in the code.

Therefore, it can be concluded that the standard design of the CB structures is adequate to resist the NA3 site-specific SSE loads in combination with non-seismic standard plant loads.

And, it is confirmed that the standard design of the CB is verified to be acceptable for NA3 site-specific loads, with minor design change for one structural steel beam as described in Section 7.1.

Table 3.4-1 Conditions of Applied Site Properties
(Reproduced from Reference 2.1.2-i)

Site Condition	Soft Site
Shear Wave Velocity (m/s)	300
Mass Density (kN/m^3)	19.6
Passion's Ratio	0.478
Material Damping (%)	5

Notes: The values are in accordance with the Seismic Analysis of Control Building. (Reference 2.1.2-h)
The maximum standard design ground water table is 0.61 m below the design plant grade.

Table 5.1-1 Equipment Load
(Reproduced from Reference 2.1.2-i)

EL (m)	Room ID No.	Room Description	Weight * (kN)
9.06	3401	HVAC Room A and B	Total 1489
	3402	HVAC Room C and D	
	3403	HVAC Chilled Water Storage Room A	
	3404	HVAC Chilled Water Storage Room B	
	3406	Control Room EFU Room A	
	3407	Control Room EFU Room B	
4.65	3301	Non 1E DCIS Room A	490
	3302	Non 1E DCIS Room B	490
-2.00	3275	Main Control Room	230
-7.4	3110	Division I DCIS Electrical Room	216
	3120	Division II DCIS Electrical Room	216
	3130	Division III DCIS Electrical Room	216
	3140	Division IV DCIS Electrical Room	216

Note: * Design margin (20 %) shall be added to this weight for future change.

Table 5.2-1 Floor Live Loads (Reproduced from Reference 2.1.2-i)

EL (m)	Live Load (MN/m^2)	Snow Load (MN/m^2)	LL1 (MN/m^2)	LL2 (MN/m^2)
13.80	0.00290	0.00240	0.00290	0.00240
		0.00576	0.00576	0.00576
9.06	0.00480		0.00480	0.00120
4.65	0.00480		0.00480	0.00120
-2.00	0.00480		0.00480	0.00120
-7.40	0.00480		0.00480	0.00120

Notes: LL1 = Max (Live Load, Snow Load) used for analysis and design
LL2 = Max (Live Load/4, Snow Load) used for evaluation of seismic loads
Snow loads distributing on EL 13.80 m are distinguished as follows:
0.00240 MN/m^2: snow load is distributed on roof without snow drift
0.00576 MN/m^2: snow load is distributed on roof by staircase with snow drift

Table 5.2-2 Calculation of At-Rest Pressure (Reproduced from Reference 2.1.2-i)

on CA, CD and C1 col-row

EL		Soil Pressure (t/m^2)				Total
(m)	$k_0\gamma_b$	$k_0\gamma_b H$	$\gamma_w H_w$	$k_0 q$	Total	(MN/m^2)
4.65		0.00	0.00	1.12	1.12	0.0110
4.04	1.831	1.12	0.00	1.12	2.23	0.0219
-2.00	1.140	8.00	6.04	1.12	15.16	0.1487
-7.40	1.140	14.16	11.44	1.12	26.72	0.2620
-10.40	1.140	17.58	14.44	1.12	33.14	0.3250

on C5 col-row

EL		Soil Pressure (t/m^2)				Total
(m)	$k_0\gamma_b$	$k_0\gamma_b H$	$\gamma_w H_w$	$k_0 q$	Total	(MN/m^2)
4.65		0.00	0.00	17.88	17.88	0.1754
4.04	1.831	1.12	0.00	17.88	19.00	0.1863
-2.00	1.140	8.00	6.04	17.88	31.93	0.3131
-7.40	1.140	14.16	11.44	17.88	43.49	0.4265
-10.40	1.140	17.58	14.44	17.88	49.91	0.4894

Notes: Ground water level is at EL 4.04 m.
Surcharge, q, is assumed to be 19.53 tf/m^2 on col-row C5 and 1.22 tf/m^2 on the others.

Table 5.3-1 Result of Heat Transfer Analysis, Normal Operation: Summer (Reproduced from Reference 2.1.2-i)

EL (m)	Location	ID	Thick. (m)	Atom. Temp (°C)		Thin Film Coef. (kcal/m^2 h °C)		Resistance of Heat Conduction (m^2 h °C /kcal)				Surface Temperature (°C)		Linearized Temperature (°C)		Tg/t
			t	T1	T2	h1	h2	rc	r1	r2	R	Ta	Tb	Td	Tg	(°C /m)
SLAB																
13.80	Roof	S_RF	0.70	T 46.1	B 30.0	30.0	6.0	0.50	0.03	0.17	0.70	45.3	33.8	39.6	11.5	16.4
9.06	Slab	S_2F	0.50	T 30.0	B 21.0	6.0	6.0	0.36	0.17	0.17	0.69	27.8	23.2	25.5	4.7	9.3
4.65	Slab	S_1F	0.50	T 21.0	B 21.0	6.0	6.0	0.36	0.17	0.17	0.69	21.0	21.0	21.0	0.0	0.0
-2.00	Slab	S_B1F	0.50	T 21.0	B 21.0	6.0	6.0	0.36	0.17	0.17	0.69	21.0	21.0	21.0	0.0	0.0
-7.40	Mat	S_MAT	3.00	T 21.0	B 15.5	6.0	1E+09	2.14	0.17	0.00	2.31	20.6	15.5	18.1	5.1	1.7
WALL																
13.80 - 9.06	C1	Wall-N	0.70	S 30.0	N 46.1	6.0	30.0	0.50	0.17	0.03	0.70	33.8	45.3	39.6	-11.5	-16.4
	C5	Wall-S	0.70	S 46.1	N 30.0	30.0	6.0	0.50	0.03	0.17	0.70	45.3	33.8	39.6	11.5	16.4
	CA	Wall-E	0.70	W 30.0	E 46.1	6.0	30.0	0.50	0.17	0.03	0.70	33.8	45.3	39.6	-11.5	-16.4
	CD	Wall-W	0.70	W 46.1	E 30.0	30.0	6.0	0.50	0.03	0.17	0.70	45.3	33.8	39.6	11.5	16.4
9.06 - 4.65	C1	Wall-N	0.90	S 21.0	N 46.1	6.0	30.0	0.64	0.17	0.03	0.84	26.0	45.1	35.5	-19.1	-21.3
	C5	Wall-S	0.90	S 46.1	N 21.0	30.0	6.0	0.64	0.03	0.17	0.84	45.1	26.0	35.5	19.1	21.3
	CA	Wall-E	0.90	W 21.0	E 46.1	6.0	30.0	0.64	0.17	0.03	0.84	26.0	45.1	35.5	-19.1	-21.3
	CD	Wall-W	0.90	W 46.1	E 21.0	30.0	6.0	0.64	0.03	0.17	0.84	45.1	26.0	35.5	19.1	21.3
4.65 - -2.00	C1	Wall-N	0.90	S 21.0	N 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	C5	Wall-S	0.90	S 15.5	N 21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9
	CA	Wall-E	0.90	W 21.0	E 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	CD	Wall-W	0.90	W 15.5	E 21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9
-2.00 - -7.40	C1	Wall-N	0.90	S 21.0	N 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	C3	Wall-NS	1.00	S 21.0	N 21.0	6.0	6.0	0.71	0.17	0.17	1.05	21.0	21.0	21.0	0.0	0.0
	C5	Wall-S	0.90	S 15.5	N 21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9
	CA	Wall-E	0.90	W 21.0	E 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	CD	Wall-W	0.90	W 15.5	E 21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9

Notes: T: Top of Roof, Slab or Mat, B: Bottom of Roof, Slab or Mat, N: North side of Wall, S: South side of Wall, E: East side of Wall, W: West side of Wall

As for the other walls and slabs which have the same temperature (T1=T2) at both sides, Td is set to T1 and Tg is set to zero.

Table 5.3-2 Result of Heat Transfer Analysis, Normal Operation: Winter
(Reproduced from Reference 2.1.2-i)

EL (m)	Location	ID	Thick. (m)	Atom. Temp (°C)				Thin Film Coef. (kcal/m^2 h °C)		Resistance of Heat Conduction (m^2 h °C /kcal)				Surface Temperature (°C)		Linearized Temperature (°C)		Tg/t
			t	T1		T2		h1	h2	rc	r1	r2	R	Ta	Tb	Td	Tg	(°C /m)
SLAB																		
13.80	Roof	S_RF	0.70	T	-40.0	B	10.0	35.0	6.0	0.50	0.03	0.17	0.70	-37.9	-2.0	-20.0	-36.0	-51.4
9.06	Slab	S_2F	0.50	T	10.0	B	21.0	6.0	6.0	0.36	0.17	0.17	0.69	12.7	18.3	15.5	-5.7	-11.4
4.65	Slab	S_1F	0.50	T	21.0	B	21.0	6.0	6.0	0.36	0.17	0.17	0.69	21.0	21.0	21.0	0.0	0.0
-2.00	Slab	S_B1F	0.50	T	21.0	B	21.0	6.0	6.0	0.36	0.17	0.17	0.69	21.0	21.0	21.0	0.0	0.0
-7.40	Mat	S_MAT	3.00	T	21.0	B	15.5	6.0	1E+09	2.14	0.17	0.00	2.31	20.6	15.5	18.1	5.1	1.7
WALL																		
13.80 - 9.06	C1	Wall-N	0.70	S	10.0	N	-40.0	6.0	35.0	0.50	0.17	0.03	0.70	-2.0	-37.9	-20.0	36.0	51.4
	C5	Wall-S	0.70	S	-40.0	N	10.0	35.0	6.0	0.50	0.03	0.17	0.70	-37.9	-2.0	-20.0	-36.0	-51.4
	CA	Wall-E	0.70	W	10.0	E	-40.0	6.0	35.0	0.50	0.17	0.03	0.70	-2.0	-37.9	-20.0	36.0	51.4
	CD	Wall-W	0.70	W	-40.0	E	10.0	35.0	6.0	0.50	0.03	0.17	0.70	-37.9	-2.0	-20.0	-36.0	-51.4
9.06 - 4.65	C1	Wall-N	0.90	S	21.0	N	-40.0	6.0	35.0	0.64	0.17	0.03	0.84	8.9	-37.9	-14.5	46.8	52.0
	C5	Wall-S	0.90	S	-40.0	N	21.0	35.0	6.0	0.64	0.03	0.17	0.84	-37.9	8.9	-14.5	-46.8	-52.0
	CA	Wall-E	0.90	W	21.0	E	-40.0	6.0	35.0	0.64	0.17	0.03	0.84	8.9	-37.9	-14.5	46.8	52.0
	CD	Wall-W	0.90	W	-40.0	E	21.0	35.0	6.0	0.64	0.03	0.17	0.84	-37.9	8.9	-14.5	-46.8	-52.0
4.65 - -2.00	C1	Wall-N	0.90	S	21.0	N	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	C5	Wall-S	0.90	S	15.5	N	21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9
	CA	Wall-E	0.90	W	21.0	E	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	CD	Wall-W	0.90	W	15.5	E	21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9
-2.00 - -7.40	C1	Wall-N	0.90	S	21.0	N	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	C3	Wall-NS	1.00	S	21.0	N	21.0	6.0	6.0	0.71	0.17	0.17	1.05	21.0	21.0	21.0	0.0	0.0
	C5	Wall-S	0.90	S	15.5	N	21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9
	CA	Wall-E	0.90	W	21.0	E	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	19.9	15.5	17.7	4.4	4.9
	CD	Wall-W	0.90	W	15.5	E	21.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	19.9	17.7	-4.4	-4.9

Notes: T: Top of Roof, Slab or Mat, B: Bottom of Roof, Slab or Mat, N: North side of Wall, S: South side of Wall, E: East side of Wall, W: West side of Wall

As for the other walls and slabs which have the same temperature (T1=T2) at both sides, Td is set to T1 and Tg is set to zero.

Table 5.3-3 Result of Heat Transfer Analysis, DBA: Summer (Reproduced from Reference 2.1.2-i)

EL (m)	Location	ID	Thick. (m)	Atom. Temp (°C)		Thin Film Coef. (kcal/m^2 h °C)		Resistance of Heat Conduction (m^2 h °C /kcal)				Surface Temperature (°C)		Linearized Temperature (°C)		Tg/t
			t	T1	T2	h1	h2	rc	r1	r2	R	Ta	Tb	Td	Tg	(°C /m)
SLAB																
13.80	Roof	S_RF	0.70	T 46.1	B 50.0	30.0	6.0	0.50	0.03	0.17	0.70	46.3	49.1	47.7	-2.8	-4.0
9.06	Slab	S_2F	0.50	T 50.0	B 50.0	6.0	6.0	0.36	0.17	0.17	0.69	50.0	50.0	50.0	0.0	0.0
4.65	Slab	S_1F	0.50	T 50.0	B 30.0	6.0	6.0	0.36	0.17	0.17	0.69	45.2	34.8	40.0	10.3	20.7
-2.00	Slab	S_B1F	0.50	T 30.0	B 50.0	6.0	6.0	0.36	0.17	0.17	0.69	34.8	45.2	40.0	-10.3	-20.7
-7.40	Mat	S_MAT	3.00	T 50.0	B 15.5	6.0	1E+09	2.14	0.17	0.00	2.31	47.5	15.5	31.5	32.0	10.7
WALL																
13.80 - 9.06	C1	Wall-N	0.70	S 50.0	N 46.1	6.0	30.0	0.50	0.17	0.03	0.70	49.1	46.3	47.7	2.8	4.0
	C5	Wall-S	0.70	S 46.1	N 50.0	30.0	6.0	0.50	0.03	0.17	0.70	46.3	49.1	47.7	-2.8	-4.0
	CA	Wall-E	0.70	W 50.0	E 46.1	6.0	30.0	0.50	0.17	0.03	0.70	49.1	46.3	47.7	2.8	4.0
	CD	Wall-W	0.70	W 46.1	E 50.0	30.0	6.0	0.50	0.03	0.17	0.70	46.3	49.1	47.7	-2.8	-4.0
9.06 - 4.65	C1	Wall-N	0.90	S 50.0	N 46.1	6.0	30.0	0.64	0.17	0.03	0.84	49.2	46.3	47.7	3.0	3.3
	C5	Wall-S	0.90	S 46.1	N 50.0	30.0	6.0	0.64	0.03	0.17	0.84	46.3	49.2	47.7	-3.0	-3.3
	CA	Wall-E	0.90	W 50.0	E 46.1	6.0	30.0	0.64	0.17	0.03	0.84	49.2	46.3	47.7	3.0	3.3
	CD	Wall-W	0.90	W 46.1	E 50.0	30.0	6.0	0.64	0.03	0.17	0.84	46.3	49.2	47.7	-3.0	-3.3
4.65 - -2.00	C1	Wall-N	0.90	S 30.0	N 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	27.0	15.5	21.3	11.5	12.8
	C5	Wall-S	0.90	S 15.5	N 30.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	27.0	21.3	-11.5	-12.8
	CA	Wall-E	0.90	W 30.0	E 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	27.0	15.5	21.3	11.5	12.8
	CD	Wall-W	0.90	W 15.5	E 30.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	27.0	21.3	-11.5	-12.8
-2.00 - -7.40	C1	Wall-N	0.90	S 50.0	N 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	42.9	15.5	29.2	27.4	30.4
	C3	Wall-NS	1.00	S 50.0	N 50.0	6.0	6.0	0.71	0.17	0.17	1.05	50.0	50.0	50.0	0.0	0.0
	C5	Wall-S	0.90	S 15.5	N 50.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	42.9	29.2	-27.4	-30.4
	CA	Wall-E	0.90	W 50.0	E 15.5	6.0	1E+09	0.64	0.17	0.00	0.81	42.9	15.5	29.2	27.4	30.4
	CD	Wall-W	0.90	W 15.5	E 50.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	42.9	29.2	-27.4	-30.4

Notes: T: Top of Roof, Slab or Mat, B: Bottom of Roof, Slab or Mat, N: North side of Wall, S: South side of Wall, E: East side of Wall, W: West side of Wall

As for the other walls and slabs which have the same temperature (T1=T2) at both sides, Td is set to T1 and Tg is set to zero.

Table 5.3-4 Result of Heat Transfer Analysis, DBA: Winter (Reproduced from Reference 2.1.2-i)

EL (m)	Location	ID	Thick. (m)	Atom. Temp (°C)				Thin Film Coef. (kcal/m^2 h °C)		Resistance of Heat Conduction (m^2 h °C /kcal)				Surface Temperature (°C)		Linearized Temperature (°C)		Tg/t
			t	T1		T2		h1	h2	rc	r1	r2	R	Ta	Tb	Td	Tg	(°C /m)
SLAB																		
13.80	Roof	S_RF	0.70	T	-40.0	B	40.0	35.0	6.0	0.50	0.03	0.17	0.70	-36.7	20.8	-7.9	-57.5	-82.2
9.06	Slab	S_2F	0.50	T	40.0	B	50.0	6.0	6.0	0.36	0.17	0.17	0.69	42.4	47.6	45.0	-5.2	-10.3
4.65	Slab	S_1F	0.50	T	50.0	B	30.0	6.0	6.0	0.36	0.17	0.17	0.69	45.2	34.8	40.0	10.3	20.7
-2.00	Slab	S_B1F	0.50	T	30.0	B	50.0	6.0	6.0	0.36	0.17	0.17	0.69	34.8	45.2	40.0	-10.3	-20.7
-7.40	Mat	S_MAT	3.00	T	50.0	B	15.5	6.0	1E+09	2.14	0.17	0.00	2.31	47.5	15.5	31.5	32.0	10.7
WALL																		
13.80 - 9.06	C1	Wall-N	0.70	S	40.0	N	-40.0	6.0	35.0	0.50	0.17	0.03	0.70	20.8	-36.7	-7.9	57.5	82.2
	C5	Wall-S	0.70	S	-40.0	N	40.0	35.0	6.0	0.50	0.03	0.17	0.70	-36.7	20.8	-7.9	-57.5	-82.2
	CA	Wall-E	0.70	W	40.0	E	-40.0	6.0	35.0	0.50	0.17	0.03	0.70	20.8	-36.7	-7.9	57.5	82.2
	CD	Wall-W	0.70	W	-40.0	E	40.0	35.0	6.0	0.50	0.03	0.17	0.70	-36.7	20.8	-7.9	-57.5	-82.2
9.06 - 4.65	C1	Wall-N	0.90	S	50.0	N	-40.0	6.0	35.0	0.64	0.17	0.03	0.84	32.1	-36.9	-2.4	69.0	76.7
	C5	Wall-S	0.90	S	-40.0	N	50.0	35.0	6.0	0.64	0.03	0.17	0.84	-36.9	32.1	-2.4	-69.0	-76.7
	CA	Wall-E	0.90	W	50.0	E	-40.0	6.0	35.0	0.64	0.17	0.03	0.84	32.1	-36.9	-2.4	69.0	76.7
	CD	Wall-W	0.90	W	-40.0	E	50.0	35.0	6.0	0.64	0.03	0.17	0.84	-36.9	32.1	-2.4	-69.0	-76.7
4.65 - -2.00	C1	Wall-N	0.90	S	30.0	N	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	27.0	15.5	21.3	11.5	12.8
	C5	Wall-S	0.90	S	15.5	N	30.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	27.0	21.3	-11.5	-12.8
	CA	Wall-E	0.90	W	30.0	E	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	27.0	15.5	21.3	11.5	12.8
	CD	Wall-W	0.90	W	15.5	E	30.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	27.0	21.3	-11.5	-12.8
-2.00 - -7.40	C1	Wall-N	0.90	S	50.0	N	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	42.9	15.5	29.2	27.4	30.4
	C3	Wall-NS	1.00	S	50.0	N	50.0	6.0	6.0	0.71	0.17	0.17	1.05	50.0	50.0	50.0	0.0	0.0
	C5	Wall-S	0.90	S	15.5	N	50.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	42.9	29.2	-27.4	-30.4
	CA	Wall-E	0.90	W	50.0	E	15.5	6.0	1E+09	0.64	0.17	0.00	0.81	42.9	15.5	29.2	27.4	30.4
	CD	Wall-W	0.90	W	15.5	E	50.0	1E+09	6.0	0.64	0.00	0.17	0.81	15.5	42.9	29.2	-27.4	-30.4

Notes: T: Top of Roof, Slab or Mat, B: Bottom of Roof, Slab or Mat, N: North side of Wall, S: South side of Wall, E: East side of Wall, W: West side of Wall

As for the other walls and slabs which have the same temperature (T1=T2) at both sides, Td is set to T1 and Tg is set to zero.

Table 5.4-1 Design Wind Pressure Loads by Floor Level (Reproduced from Reference 2.1.2-i)

Height (m)		Design Wind Load (kN/m^2)			
EL	Z	Windward Wall	Leeward Wall	Side Wall	Roof
13.80	9.15	2.35	-1.65	-2.11	-2.90
9.22	4.57	2.14	-1.65	-2.11	-2.90
9.06	4.41	2.14	-1.65	-2.11	-2.90
4.65	0.00	2.14	-1.65	-2.11	-2.90

	zg	700	ft
	α	11.5	
Importance factor	I	1.15	
Basic wind speed	V	62.59	m/s
Wind directionality factor	Kd	0.85	

Coef.	Wall			Roof
	Windward	Leeward	Side	
G	0.85			
Cp	0.8	-0.5	-0.7	-1.04
GCpi	-0.18	0.18	0.18	0.18

Table 5.5-1 Design Pressure of Tornado Wind Load (Reproduced from Reference 2.1.2-i)

Wind Direction	p (kN/m^2)			
	Wall			Roof
	Windward	Leeward	Side	
All	7.1	-4.4	-6.2	-9.2
Differential	16.5	16.5	16.5	16.5

Table 5.6-1 Design Seismic Loads for Horizontal

EL (m)	Node No.	NS-direction*)		EW-direction*)		Calculated Torsion (MN-m)	Accidental Torsion (MN-m)	Design Torsion (MN-m)
		Shear (MN)	Moment (MN-m)	Shear (MN)	Moment (MN-m)			
13.80	6	42.68	109.76	40.16	86.07	27.53	64.67	92.20
9.06	5	42.68	276.32	40.16	226.02	27.53	64.67	92.20
9.06	5	77.90	359.79	70.07	292.54	57.73	118.02	175.75
4.65	4	77.90	684.74	70.07	561.86	57.73	118.02	175.75
4.65	4	101.02	381.88	91.19	204.46	51.22	153.04	204.26
-2.00	3	101.02	1053.35	91.19	736.10	51.22	153.04	204.26
-2.00	3	40.98	566.89	44.77	510.74	26.91	67.83	94.74
-7.40	2	40.98	770.80	44.77	693.16	26.91	67.83	94.74
-7.40	2	26.86	338.05	20.86	198.89	0.00	40.70	40.70
-10.40	1	26.86	257.43	20.86	136.22	0.00	40.70	40.70

Note: Obtained from Reference 2.1.2-l based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k
The node numbers in this table are described in Figure 5.6-1.
*) NS and EW represent moments for bending in the NS and EW direction, respectively.

Table 5.6-2 Vertical Acceleration

EL (m)	Node No.	V (g)
13.80	6	1.05
9.06	5	0.95
4.65	4	0.82
-2.00	3	0.60
-7.40	2	0.64
-10.40	1	0.63
13.80	9001	2.20
	9002	2.09
	9003	2.00
	9004	2.08
9.06	9101	2.08
	9102	1.62
	9103	2.00
	9104	1.93
4.65	9201	1.53
	9202	1.73
	9203	1.75
-2.00	9301	1.32
	9302	1.28

Note: Obtained from Reference 2.1.2-l based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

The node numbers in this table are described in Figure 5.6-1.

Table 5.6-3 Dynamic Soil Pressures

EL (m)	H (m)	C1 and C5 Walls σ (MN/m²)	CA and CD Walls σ (MN/m²)
4.650			
	0.350		
4.300			
	0.350		
3.950			
	1.830		
2.120		0.12	0.12
	2.190		
-0.070			
	1.930		
-2.000			
	0.250		
-2.250			
	0.250		
-2.500			
	1.465		
-3.965		0.28	0.23
	1.720		
-5.685			
	1.715		
-7.400			
	2.500		
-9.900		0.31	0.28
	0.500		
-10.400			

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

Table 6.2-1 Soil Spring Constants
(Reproduced from Reference 2.1.2-i)

Loads		Soil Spring Constants (MN/m/m^2) Horizontal NS-direction	Horizontal EW-direction	Vertical
for All Loads except for Seismic Loads		19.650	20.378	29.177
for Seismic Loads	Horizontal, NS motion *	19.650	20.378	79.174
	Horizontal, EW motion *	19.650	20.378	79.174
	Vertical	19.650	20.378	29.177
	Torsional	19.650	20.378	79.174

Note: * Vertical springs for horizontal seismic loads are calculated based on the rotational spring constants.

Table 6.2-2 Properties of Structural Material
(Reproduced from Reference 2.1.2-i)

		Temperature (°C) (*)	Reinforced Concrete: Basemat f'$_c$=4000psi 27.6MPa	Reinforced Concrete: Others f'$_c$=5000psi 34.5MPa	Steel: Structural Steel
Young's Modulus (MPa)	Temperature Loads	< 21	2.49×10^4	2.78×10^4	2.00x10^5
		93	1.81×10^4	2.03×10^4	
		204	1.62×10^4	1.81×10^4	
	Other Loads		2.49×10^4	2.78×10^4	2.00×10^5
Poisson's Ratio			0.17		0.3
Thermal Expansion (m/m°C)			9.90×10^{-6}		1.17×10^{-5}
Unit Weight (MN/m^3)			0.0235		0.0770

Note:(*) Linear interpolation of material properties should be used for temperatures between the specified values.

Table 6.2-3 Design Basic Load Case List

Design Basic Load Case			Label	Combination of Analysis Cases
Dead Loads			DLO	=GRAV+DL+EL
Live Loads	Floor Live Loads		LLO	=LL1
	Static Soil Pressure		SPO	=SP
Thermal Loads	Normal Summer		TLS0	=TLS0
	Normal Winter		TLW0	=TLW0
	DBA Summer		TLS1	=TLS1
	DBA Winter		TLW1	=TLW1
Wind Loads	Wind Loads	North to South	WON	=WON
		South to North	WOS	=WOS
		East to West	WOE	=WOE
		West to East	WOW	=WOW
	Tornado Loads	North to South	WTN	=WTN
		South to North	WTS	=WTS
		East to West	WTE	=WTE
		West to East	WTW	=WTW
	Tornado Differential Pressure Loads	Outward	WTD	=WTD
NA3 Seismic Loads (SSE)	X (NS) direction V & M	North to South	KXS	=XS
	Y (EW) direction V & M	West to East	KYS	=YS
	Vertical Acceleration	Upward	KZS	=VAS
	Torsional Moment	Clockwise	KTS	=TMS
	Dynamic Soil Pressure	North and South (with KXS and/or -KXS)	SKNS	=SPNS
		East and West (with -KYS and/or KYS)	SKEW	=SPEW

Note: Non-Seismic load combinations, shown in the red case, are from the standard design in Reference 2.1.2-i.

Table 6.2-4 Analysis Load Case List

Analysis Load Cases	Applied load	Direction	Load ID No.	Case Label
Dead Loads	Structural Weight		1000	GRAV
	Other Weight		1100	DL
	Equipment Loads		1200	EL
Live Loads	Floor Live Loads		2000	LL1
	Floor Live Loads (25% Live Load)		2100	LL2
	Static Soil Pressure		2200	SP
Thermal Loads	Normal Summer		3101	TLS0
	Normal Winter		3102	TLW0
	DBA Summer		3201	TLS1
	DBA Winter		3202	TLW1
Wind Loads	Severe Environmental	North to South	4101	WON
		South to North	4102	WOS
		East to West	4103	WOE
		West to East	4104	WOW
	Extreme Environmental	North to South	4201	WTN
		South to North	4202	WTS
		East to West	4203	WTE
		West to East	4204	WTW
	Tornado Differential Pressure Loads	Outward	4205	WTD
NA3 Seismic Loads (SSE)	X (NS) direction Shear & Moment	North to South	5110	XS
	Y (EW) direction Shear & Moment	West to East	5120	YS
	Vertical Acceleration	Upward	5130	VAS
	Torsional Moment	Clockwise	5140	TMS
	Dynamic Soil Pressure	North and South (with XS and/or -XS)	5150	SPNS
		East and West (with-YS and/or YS)	5160	SPEW

Note: Non-Seismic load combinations, shown in the red case, are from the standard design in Reference 2.1.2-i.

Table 6.2-5 Applied Shear and Moment for Walls, NS Input

Elevation	Height	Shear		Moment									
EL (m)	DH (m)	Q (MN)	q (MN)	M (MNm)	Mq (MNm)	M-Mq (MNm)	dM (MNm)	m (MNm)	Mq+dM (MNm)	Input Level (m)	Difference (m)	dMq (MNn)	Total m + dMq (MNm)
13.80		42.68	42.68	109.76	0.00	109.76	109.76	109.76	109.76	13.45	0.35	14.94	124.70
9.06	4.74			276.32	202.32	74.00			312.08				
9.06		77.90	35.22	359.79	202.32	157.47	157.47	47.71	359.79	8.81	0.25	8.80	56.51
4.65	4.41			684.74	545.85	138.89			703.32				
4.65		101.02	23.12	381.88	545.85	-163.98	-163.98	-321.45	381.88	4.40	0.25	5.78	-315.67
-2.00	6.65			1053.35	1217.61	-164.26			1053.63				
-2.00		40.98	-60.03	566.89	1217.61	-650.72	-650.72	-486.74	566.89	-2.25	0.25	-15.01	-501.75
-7.40	5.40			770.80	1438.93	-668.13			788.21				

Notes :
Q : Design Shear Force
q : Input Shear Force
M : Design Moment
Mq : Moment due to Shear
dM : Additional Moment
m : Input Moment
dMq : Moment Modification Considering the Difference of Input Level

Table 6.2-6 Applied Shear and Moment for Walls, EW Input

Elevation	Height	Shear		Moment									
EL (m)	DH (m)	Q (MN)	q (MN)	M (MNm)	Mq (MNm)	M-Mq (MNm)	dM (MNm)	m (MNm)	Mq+dM (MNm)	Input Level (m)	Difference (m)	dMq (MNn)	Total m + dMq (MNm)
13.80		40.16	40.16	86.07	0.00	86.07	86.07	86.07	86.07	13.45	0.35	14.06	100.13
9.06	4.74			226.02	190.36	35.66			276.43				
9.06		70.07	29.90	292.54	190.36	102.18	102.18	16.11	292.54	8.81	0.25	7.48	23.58
4.65	4.41			561.86	499.35	62.51			601.53				
4.65		91.19	21.13	204.46	499.35	-294.90	-294.90	-397.07	204.46	4.40	0.25	5.28	-391.79
-2.00	6.65			736.10	1105.79	-369.69			810.90				
-2.00		44.77	-46.42	510.74	1105.79	-595.06	-595.06	-300.16	510.74	-2.25	0.25	-11.60	-311.77
-7.40	5.40			693.16	1347.58	-654.42			752.52				

Notes :
Q : Design Shear Force
q : Input Shear Force
M : Design Moment
Mq : Moment due to Shear
dM : Additional Moment
m : Input Moment
dMq : Moment Modification Considering the Difference of Input Level

Table 6.2-7 Additional Overturning Moments for Basemat

NS direction			EW direction		
Q (MN)	A (g)	ΔM (MN-m)	Q (MN)	A (g)	ΔM (MN-m)
40.98	0.48	102.57	44.77	0.43	104.33

Note: Additional moment for basemat is calculated by the following equation:

$\Delta M = (Q + W_{mat} A)\, h$

where,

Q: Shear force at EL -7.40 m

W_{mat}: Weight of Basemat (GRAV+DL +EL+ LL2) =57.55MN

A: Horizontal Acceleration of Basemat

h: Half of Basemat thickness (1.50 m)

Table 6.2-8 Slab Vertical Acceleration

EL (m)	Slab Equivalent Out-of-Plane Acceleration Load ($_sA_{ave}$) (g)
13.80	1.53
9.06	1.21
4.65	1.03
-2.00	0.69

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

Table 6.2-9 Applied Torsional Moment

EL (m)	Torsion Mt (MN-m)	Applied Torsion dMt (MN-m)
13.80 9.06	92.20 92.20	92.20
9.06 4.65	175.75 175.75	83.55
4.65 -2.00	204.26 204.26	28.52
-2.00 -7.40	94.74 94.74	-109.52

Table 6.2-10 Applied Force due to Torsional Moment, EL 9.06 to 13.80

Wall ID	Xi,Yi (m)	Thick-ness (m)	Height (m)	Length (m)	A (m^2)	I (m^4)	K (MN/m)	Lxi,Lyi (m)	Kt (MNm)	dMt (MNm)	Q (MN)	Input Load (MN)	Applied dir.	Applied grid No.
X 1	-0.10	0.70	4.74	29.60	20.72	1513	51370	-11.55	3.11E+07	92.20	1.756	0.13510	-X	6501~6513, Interval=1
X 2	23.00	0.70	4.74	29.60	20.72	1513	51370	11.55			1.756	0.13510	+X	6631~6643, Interval=1
Y 1	-0.10	0.70	4.74	23.10	16.17	719	39812	-14.80			1.744	0.15856	+Y	6501~6631, Interval=13
Y 2	29.50	0.70	4.74	23.10	16.17	719	39812	14.80			1.744	0.15856	-Y	6513~6643, Interval=13

Ec = 27800 MN/m^2

n = 0.17

G = 11880 MN/m^2

Xcr = 14.70 m

Ycr = 11.45 m

dMt = Mt (EL 9.06 ~ EL 13.80)

{ }

Table 6.2-11 Applied Force due to Torsional Moment, EL 4.65 to 9.06

Wall ID	Xi,Yi (m)	Thick-ness (m)	Height (m)	Length (m)	A (m^2)	I (m^4)	K (MN/m)	Lxi,Lyi (m)	Kt (MNm)	dMt (MNm)	Q (MN)	Input Load (MN)	Applied dir.	Applied grid No.
X1a	0.00	0.90	4.41	12.20	10.98	136	28015	-11.45	3.83E+07	83.55	0.699	0.11658	-X	5001~5006, Interval=1
X1b	0.00	0.90	4.41	12.20	10.98	136	28015	-11.45			0.699	0.11658	-X	5008~5013, Interval=1
X2a	22.90	0.90	4.41	12.20	10.98	136	28015	11.45			0.699	0.11658	+X	5131~5136, Interval=1
X2b	22.90	0.90	4.41	12.20	10.98	136	28015	11.45			0.699	0.11658	+X	5138~5143, Interval=1
Y1	0.00	0.90	4.41	22.90	20.61	901	54656	-14.70			1.752	0.15928	+Y	5001~5131, Interval=13
Y2	29.40	0.90	4.41	22.90	20.61	901	54656	14.70			1.752	0.15928	-Y	5013~5143, Interval=13

Ec = 27800 MN/m^2
n = 0.17
G = 11880 MN/m^2

Xcr = 14.70 m
Ycr = 11.45 m

dMt = Mt (EL 4.65 ~ EL 9.06)

{ }

Table 6.2-12 Applied Force due to Torsional Moment, EL -2.00 to 4.65

Wall ID	Xi,Yi (m)	Thick-ness (m)	Height (m)	Length (m)	A (m^2)	I (m^4)	K (MN/m)	Lxi,Lyi (m)	Kt (MNm)	dMt (MNm)	Q (MN)	Input Load (MN)	Applied dir.	Applied grid No.
X1	0.00	0.90	6.65	29.40	26.46	1906	46260	-11.45	2.75E+07	28.52	0.549	0.04227	-X	3501~3513, Interval=1
X2	22.90	0.90	6.65	29.40	26.46	1906	46260	11.45			0.549	0.04227	+X	3631~3643, Interval=1
Y1	0.00	0.90	6.65	22.90	20.61	901	35539	-14.70			0.542	0.04927	+Y	3501~3631, Interval=13
Y2	29.40	0.90	6.65	22.90	20.61	901	35539	14.70			0.542	0.04927	-Y	3513~3643, Interval=13

Ec = 27800 MN/m^2

n = 0.17

G = 11880 MN/m^2

Xcr = 14.70 m

Ycr = 11.45 m

{ }

dMt = Mt (EL -2.00 ~ EL 4.65)

Table 6.2-13 Applied Force due to Torsional Moment, EL -7.40 to -2.00

Wall ID	Xi,Yi (m)	Thick-ness (m)	Height (m)	Length (m)	A (m^2)	I (m^4)	K (MN/m)	Lxi,Lyi (m)	Kt (MNm)	dMt (MNm)	Q (MN)	Input Load (MN)	Applied dir.	Applied grid No.
X1	0.00	0.90	5.40	29.40	26.46	1906	57386	-11.45	3.42E+07	-109.52	2.105	0.16191	+X	2001~2013, Interval=1
X2	22.90	0.90	5.40	29.40	26.46	1906	57386	11.45			2.105	0.16191	-X	2131~2143, Interval=1
Y1	0.00	0.90	5.40	22.90	20.61	901	44291	-14.70			2.086	0.18960	-Y	2001~2131, Interval=13
Y2a	14.70	1.00	5.40	9.95	9.95	82	19443	0.00			0.000	0.00000	-Y	2007~2059, Interval=13
Y2b	14.70	1.00	5.40	9.95	9.95	82	19443	0.00			0.000	0.00000	-Y	2085~2137, Interval=13
Y3	29.40	0.90	5.40	22.90	20.61	901	44291	14.70			2.086	0.18960	+Y	2013~2143, Interval=13

Ec = 27800 MN/m^2
n = 0.17
G = 11880 MN/m^2

{ }

Xcr = 14.70 m
Ycr = 11.45 m

dMt = Mt (EL -7.40 ~ EL -2.00)

Table 6.2-14 Results of NASTRAN Analysis: Dead Load (Reproduced from Reference 2.1.2-i)

Location	Element ID	N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	0.026	-0.709	0.027	-0.987	-1.078	0.088	0.195	-0.160
	72	-0.050	0.071	0.010	-0.469	-0.218	-0.025	-0.623	0.037
	115	-0.729	-0.274	0.309	-0.219	-0.213	-0.371	-0.027	-0.660
	120	-0.058	-0.027	-0.157	-0.110	-0.173	0.675	-0.033	-0.021
Slab B1F EL-2.0m	567	-0.004	0.729	-0.044	-0.049	-0.023	-0.009	-0.077	0.022
	572	0.080	0.122	-0.012	-0.021	-0.017	0.008	0.100	-0.006
	615	0.167	0.128	-0.255	-0.034	-0.006	0.026	-0.042	0.004
	620	0.040	0.042	0.056	-0.024	-0.024	-0.029	0.034	0.039
Slab 1F EL4.65m	1067	0.071	0.031	-0.002	0.168	0.058	-0.011	0.030	0.025
	1072	-0.013	0.032	0.002	-0.028	-0.009	0.000	0.073	0.005
	1115	0.110	0.008	0.010	-0.016	-0.152	-0.009	-0.001	0.144
	1120	0.020	0.015	0.055	-0.016	-0.015	-0.015	0.019	0.025
Slab 2F EL9.06m	1567	0.012	0.061	-0.002	0.081	0.002	-0.004	0.016	0.010
	1572	0.018	-0.006	0.001	-0.030	-0.012	0.000	0.061	0.001
	1615	0.136	0.114	-0.025	-0.007	-0.117	-0.007	0.007	0.128
	1620	0.015	0.009	0.018	-0.015	-0.015	-0.014	0.017	0.022
Slab RF EL13.8m	1867	-0.081	-0.055	0.003	0.152	0.050	-0.007	0.023	0.004
	1872	-0.033	-0.104	0.003	-0.029	-0.015	0.006	0.057	0.001
	1915	-0.074	-0.105	-0.001	-0.004	-0.122	-0.008	-0.004	0.136
	1920	-0.010	-0.043	0.012	-0.017	-0.015	-0.037	0.016	0.021
Wall EL-7.4m ~EL-2.0m	6007	-0.263	-0.753	-0.224	-0.014	0.097	-0.006	-0.059	0.070
	4006	0.028	-0.925	0.015	-0.035	-0.188	0.001	-0.002	-0.045
	4010	0.070	-0.211	-0.113	0.016	-0.073	-0.007	-0.034	-0.042
Wall EL-2.0m ~EL4.65m	6043	0.172	-1.275	-0.295	0.041	0.025	0.008	0.044	0.002
	4036	0.070	-0.620	-0.007	0.021	0.116	-0.002	-0.002	0.036
	4040	-0.018	-0.362	0.045	-0.005	0.028	0.014	0.019	0.021
Wall EL4.65m ~EL9.06m	6081	0.006	-0.592	-0.031	-0.014	-0.116	-0.007	0.000	-0.062
	4066	-0.012	-0.338	0.004	0.005	0.022	-0.002	-0.002	0.018
	4070	-0.016	-0.263	0.095	-0.003	0.007	0.001	0.006	0.007
Wall EL9.06m ~EL13.8m	6117	-0.003	-0.330	-0.053	-0.009	-0.060	0.005	0.005	-0.077
	4096	-0.067	-0.164	0.001	0.006	0.033	0.000	-0.002	0.038
	4100	-0.009	-0.113	0.083	0.003	0.009	-0.001	-0.001	0.010

Table 6.2-15 Results of NASTRAN Analysis: Temperature Load (DBA: Winter) (Reproduced from Reference 2.1.2-i)

Location	Element ID	N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	-0.409	-1.291	0.169	6.783	6.419	-0.132	0.291	-0.113
	72	-0.189	-0.279	0.059	1.916	5.868	-0.007	0.290	0.127
	115	-0.198	-0.082	0.185	6.662	2.336	-0.255	0.533	0.941
	120	-0.949	-1.034	-0.271	3.316	3.332	1.777	1.350	1.269
Slab B1F EL-2.0m	567	-0.720	0.380	0.045	-0.078	-0.091	0.002	-0.003	0.006
	572	0.331	-0.756	-0.056	-0.030	-0.063	0.003	-0.023	0.000
	615	-0.858	0.641	-0.723	-0.078	-0.033	0.006	-0.032	-0.073
	620	-0.970	-0.965	-1.402	-0.066	-0.065	0.009	0.007	0.005
Slab 1F EL4.65m	1067	-1.315	-0.447	-0.012	0.062	0.026	0.001	0.003	-0.003
	1072	-0.170	-1.780	-0.097	0.184	0.081	0.007	-0.061	-0.001
	1115	-1.419	0.046	0.018	0.065	0.113	0.002	-0.008	-0.017
	1120	-1.987	-1.963	-2.417	0.130	0.129	-0.007	-0.033	-0.031
Slab 2F EL9.06m	1567	-2.552	-1.076	0.015	-0.027	-0.087	0.002	0.004	0.000
	1572	-0.679	-3.420	-0.099	0.070	-0.022	0.008	-0.099	0.006
	1615	-2.425	0.082	-0.110	0.043	0.193	-0.031	0.036	-0.087
	1620	-3.153	-3.133	-4.149	-0.051	-0.057	0.025	0.020	0.029
Roof EL13.8m	1867	1.500	1.282	-0.012	-0.783	-1.023	0.001	0.015	-0.006
	1872	1.774	1.355	0.412	-0.232	-0.745	0.032	-0.330	0.023
	1915	1.949	1.114	0.485	-0.695	-0.400	0.008	0.017	-0.146
	1920	-0.003	-0.164	0.493	-0.634	-0.644	-0.022	-0.011	0.005
Wall EL-7.4m ~EL-2.0m	6007	0.521	1.371	-0.057	0.642	0.904	0.004	-0.032	0.165
	4006	0.756	-0.069	0.091	-0.688	-1.068	-0.002	-0.001	-0.194
	4010	1.043	1.253	-0.324	-0.531	-0.881	-0.042	-0.156	-0.334
Wall EL-2.0m ~EL4.65m	6043	2.535	-1.168	-0.671	0.378	0.483	-0.026	0.127	0.061
	4036	2.463	-0.411	-0.013	-0.289	-0.300	0.001	0.031	0.070
	4040	1.381	1.392	-0.606	-0.080	-0.300	-0.047	-0.217	-0.181
Wall EL4.65m ~EL9.06m	6081	5.519	-0.786	0.338	1.391	1.000	0.007	-0.048	-0.161
	4066	6.358	-0.464	-0.042	-1.488	-1.021	0.000	-0.021	0.188
	4070	3.596	1.323	-1.489	-1.232	-1.167	-0.021	-0.332	-0.163
Wall EL9.06m ~EL13.8m	6117	3.560	-0.619	-1.500	0.908	1.500	-0.022	-0.038	0.385
	4096	3.980	-0.285	-0.182	-0.936	-1.566	-0.001	0.034	-0.463
	4100	2.844	1.752	-1.526	-0.681	-1.227	-0.002	-0.347	-0.594

Table 6.2-16 Results of NASTRAN Analysis: Site-Specific Seismic Load (Horizontal: North to South Direction)

Location	Element ID	N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	-0.075	-0.060	0.054	-0.245	-0.160	-0.095	0.339	-0.008
	72	-0.201	-1.943	-0.047	-0.427	-0.587	0.040	-0.663	-0.042
	115	-0.095	-0.041	0.946	0.024	0.021	-1.012	0.510	-0.071
	120	0.093	-0.370	-0.057	-0.249	-0.110	0.320	0.028	-0.458
Slab B1F EL-2.0m	567	0.063	0.068	-0.052	0.019	-0.001	-0.005	0.008	-0.005
	572	-0.299	-0.162	0.093	-0.007	-0.004	-0.001	0.002	0.001
	615	0.091	0.006	0.442	0.013	0.001	0.002	0.013	0.002
	620	-0.144	0.014	0.409	-0.010	0.010	-0.001	0.011	-0.013
Slab 1F EL4.65m	1067	0.020	-0.007	0.010	-0.003	-0.004	-0.002	0.006	-0.002
	1072	0.157	0.138	-0.042	-0.036	-0.008	-0.002	0.016	0.001
	1115	0.007	-0.010	-0.234	-0.009	-0.001	0.000	0.005	0.001
	1120	0.148	0.049	-0.072	-0.019	0.010	0.002	0.019	-0.018
Slab 2F EL9.06m	1567	0.042	-0.048	0.007	-0.003	-0.003	-0.002	0.006	-0.001
	1572	0.280	0.336	-0.061	-0.015	-0.005	-0.001	0.009	0.000
	1615	-0.481	-0.090	0.003	-0.017	-0.003	0.002	0.010	0.003
	1620	0.166	0.082	-0.235	-0.014	0.009	0.000	0.014	-0.015
Roof EL13.8m	1867	0.052	0.026	-0.014	-0.006	-0.005	-0.003	0.009	-0.001
	1872	0.412	0.848	0.014	0.003	-0.010	0.001	-0.008	0.001
	1915	0.152	0.025	-0.481	-0.012	-0.001	-0.004	0.007	0.002
	1920	0.182	0.189	-0.003	-0.011	0.008	-0.002	0.012	-0.014
Wall EL-7.4m ~EL-2.0m	6007	0.026	-0.070	1.074	-0.033	0.019	-0.003	-0.040	0.019
	4006	-0.616	-0.860	-0.079	-0.016	-0.133	0.001	-0.001	-0.083
	4010	-0.111	-0.495	-0.534	0.008	-0.035	0.011	-0.006	-0.022
Wall EL-2.0m ~EL4.65m	6043	-0.030	0.060	2.181	-0.013	-0.009	-0.001	-0.003	-0.004
	4036	-0.360	-0.871	-0.029	0.039	0.168	-0.002	0.006	0.050
	4040	-0.184	-1.318	-0.723	-0.005	0.090	-0.012	0.056	0.062
Wall EL4.65m ~EL9.06m	6081	0.551	-0.330	1.576	0.005	0.022	-0.004	0.001	0.015
	4066	0.197	-0.677	-0.054	-0.013	-0.044	-0.003	-0.005	0.008
	4070	0.029	-0.697	-0.891	0.002	-0.006	-0.025	-0.019	-0.016
Wall EL9.06m ~EL13.8m	6117	-0.358	0.126	0.778	-0.002	-0.003	0.000	-0.002	0.004
	4096	0.551	-0.298	-0.069	-0.011	-0.039	0.001	-0.006	-0.014
	4100	0.132	-0.208	-0.674	-0.001	-0.019	-0.004	-0.021	-0.020

Table 6.2-17 Results of NASTRAN Analysis: Site-Specific Seismic Load (Horizontal: East to West Direction)

Location	Element ID	N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	-0.134	0.064	-0.105	-0.265	-0.782	-0.049	-0.253	1.034
	72	-0.020	0.046	1.236	-0.037	-0.090	-1.297	-0.076	0.457
	115	-3.134	-0.280	-0.025	-0.343	-0.272	-0.109	0.017	-0.412
	120	-0.548	0.263	0.001	-0.132	-0.344	0.111	-0.759	0.117
Slab B1F EL-2.0m	567	-0.012	-0.087	0.374	-0.011	-0.032	-0.008	-0.007	0.050
	572	0.004	-0.005	0.600	0.001	0.000	0.000	-0.001	-0.001
	615	-0.354	-0.068	0.227	-0.007	-0.025	-0.002	0.002	0.017
	620	0.019	-0.091	0.511	0.013	-0.017	-0.002	-0.019	0.018
Slab 1F EL4.65m	1067	0.001	0.015	-0.016	-0.003	0.000	-0.003	-0.001	-0.001
	1072	0.001	0.004	-0.193	0.000	0.000	-0.001	-0.001	-0.002
	1115	0.244	0.109	0.003	-0.016	-0.051	0.001	-0.001	0.019
	1120	0.051	0.104	-0.108	0.012	-0.024	0.000	-0.022	0.023
Slab 2F EL9.06m	1567	0.017	0.043	-0.044	-0.001	0.001	-0.001	0.000	-0.001
	1572	0.005	0.005	-0.424	0.000	0.000	-0.001	0.000	-0.001
	1615	0.737	0.254	0.032	-0.004	-0.023	0.001	0.004	0.009
	1620	0.092	0.147	-0.207	0.010	-0.018	-0.001	-0.017	0.018
Roof EL13.8m	1867	0.063	0.036	-0.070	-0.003	0.000	-0.003	0.000	0.001
	1872	0.006	0.004	-0.635	0.000	0.000	-0.005	0.000	-0.003
	1915	1.315	0.362	-0.015	-0.013	-0.042	0.002	0.001	0.013
	1920	0.251	0.141	-0.099	0.006	-0.022	-0.007	-0.020	0.015
Wall EL-7.4m ~EL-2.0m	6007	-1.101	-0.560	-0.141	-0.012	0.034	0.002	-0.003	0.043
	4006	0.038	-0.087	1.175	-0.005	-0.015	0.011	0.005	-0.006
	4010	0.155	-0.683	0.526	-0.039	-0.086	-0.001	-0.026	-0.038
Wall EL-2.0m ~EL4.65m	6043	-0.612	-0.583	-0.136	-0.074	-0.250	0.000	-0.014	-0.087
	4036	0.001	-0.058	2.069	-0.001	0.000	-0.003	-0.004	0.000
	4040	-0.156	-1.151	1.627	-0.042	0.006	0.019	0.027	0.021
Wall EL4.65m ~EL9.06m	6081	0.189	-0.741	-0.330	0.015	0.075	0.018	0.007	0.005
	4066	-0.002	-0.051	1.692	0.000	-0.001	0.005	0.000	-0.001
	4070	0.016	-0.601	1.263	0.016	-0.007	0.015	-0.004	-0.010
Wall EL9.06m ~EL13.8m	6117	0.707	-0.375	-0.393	0.006	0.002	0.002	0.004	-0.016
	4096	-0.004	-0.027	0.980	0.001	0.001	0.002	0.000	0.000
	4100	0.012	-0.254	0.691	0.014	-0.004	0.007	-0.002	-0.016

Table 6.2-18 Results of NASTRAN Analysis: Site-Specific Seismic Load (Vertical: Upward Direction)

Location	Element ID	N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	-0.027	0.640	-0.022	1.152	0.943	-0.093	-0.111	0.130
	72	0.041	-0.092	-0.013	0.432	0.127	0.044	0.535	-0.031
	115	0.676	0.259	-0.284	0.242	0.214	0.325	0.029	0.639
	120	0.053	0.027	0.137	0.099	0.174	-0.587	0.043	0.044
Slab B1F EL-2.0m	567	-0.005	-0.662	0.039	0.048	0.018	0.006	0.060	-0.017
	572	-0.073	-0.114	0.011	0.023	0.012	-0.006	-0.077	0.004
	615	-0.164	-0.128	0.231	0.027	0.003	-0.020	0.033	0.003
	620	-0.041	-0.041	-0.056	0.017	0.017	0.021	-0.024	-0.028
Slab 1F EL4.65m	1067	-0.086	-0.047	0.004	-0.178	-0.066	0.011	-0.032	-0.026
	1072	0.001	-0.044	-0.001	0.041	0.011	0.001	-0.085	-0.005
	1115	-0.123	-0.034	-0.014	0.019	0.171	0.009	0.000	-0.158
	1120	-0.024	-0.019	-0.056	0.019	0.017	0.017	-0.020	-0.026
Slab 2F EL9.06m	1567	-0.039	-0.079	0.004	-0.103	-0.008	0.005	-0.020	-0.013
	1572	-0.028	-0.008	0.000	0.050	0.016	0.001	-0.088	0.000
	1615	-0.156	-0.137	0.022	0.011	0.159	0.008	-0.008	-0.167
	1620	-0.021	-0.017	-0.008	0.021	0.020	0.017	-0.022	-0.028
Roof EL13.8m	1867	0.125	0.099	-0.004	-0.254	-0.083	0.012	-0.038	-0.007
	1872	0.051	0.125	-0.005	0.047	0.026	-0.009	-0.097	-0.001
	1915	0.135	0.166	0.002	0.008	0.200	0.013	0.007	-0.226
	1920	0.026	0.059	-0.017	0.029	0.025	0.062	-0.027	-0.032
Wall EL-7.4m ~EL-2.0m	6007	0.236	0.736	0.210	0.012	-0.088	0.004	0.054	-0.066
	4006	-0.014	0.829	-0.019	0.029	0.158	-0.001	0.002	0.039
	4010	-0.062	0.221	0.102	-0.013	0.066	0.005	0.029	0.038
Wall EL-2.0m ~EL4.65m	6043	-0.160	1.287	0.274	-0.037	-0.024	-0.006	-0.039	0.002
	4036	-0.059	0.636	0.002	-0.018	-0.097	0.001	0.002	-0.033
	4040	0.017	0.390	-0.046	0.004	-0.023	-0.010	-0.016	-0.018
Wall EL4.65m ~EL9.06m	6081	-0.004	0.713	-0.006	0.021	0.133	0.005	0.001	0.073
	4066	0.007	0.408	-0.007	-0.008	-0.041	0.003	0.003	-0.029
	4070	0.017	0.297	-0.096	0.003	-0.009	-0.002	-0.007	-0.010
Wall EL9.06m ~EL13.8m	6117	0.018	0.434	0.043	0.013	0.089	-0.006	-0.006	0.125
	4096	0.069	0.222	0.000	-0.009	-0.048	0.001	0.003	-0.062
	4100	0.002	0.125	-0.090	-0.005	-0.012	0.003	0.003	-0.016

Table 6.3-1 Load Combinations and Acceptance Criteria for Safety-Related Reinforced Concrete Structures

Category	Combination No.	Load*									Acceptance Criteria**
		D	F	L	H	To	Ta	E'	W	Wt	
Normal	CB-1	1.4	1.4	1.7	1.7						U
	CB-2	1.05	1.05	1.3	1.3	1.3					U
Severe Environmental	CB-3	1.4	1.4	1.7	1.7				1.7		U
	CB-4	1.05	1.05	1.3	1.3	1.3			1.3		U
	CB-5	1.2	1.2						1.7		U
Extreme Environmental	CB-6	1.0	1.0	1.0	1.0	1.0		1.0			U
	CB-7	1.0	1.0	1.0	1.0	1.0				1.0	U
Abnormal	CB-8	1.0	1.0	1.0	1.0		1.0				U
Abnormal/Extreme Environmental	CB-9	1.0	1.0	1.0	1.0		1.0	1.0			U

Note *: D = Dead loads
F = Hydrostatic pressure loads
L = Live loads (For the roof, Roof Live loads or Snow loads or Rain loads each act independently.)
H = Lateral soil pressure loads
To = Thermal loads during the normal operation
Ta = Thermal loads during design basis accident
E' = Seismic loads (SSE)
W = Wind loads (basic wind)
Wt = Wind loads (tornado wind)

Note **: U = Required section strength based on the strength design method per ACI 349-01.

Note: Non-Seismic load combinations, shown in the red combination No., are analyzed as part of the standard design in Reference 2.1.2-i.

Table 6.3-2 Load Combinations and Acceptance Criteria for Safety-Related Steel Structures

Category	Combination No.	Load*							Acceptance Criteria**
		D	L	To	Ta	E'	W	Wt	
Normal	CB-S1	1.0	1.0						S
	CB-S2	1.0	1.0	1.0					S(a)
Severe Environmental	CB-S3	1.0	1.0				1.0		S
	CB-S4	1.0	1.0	1.0			1.0		S(a)
Extreme Environmental	CB-S5	1.0	1.0	1.0		1.0			1.6S(b)(c)
	CB-S6	1.0	1.0	1.0				1.0	1.6S(b)(c)
Abnormal	CB-S7	1.0	1.0		1.0				1.6S(b)(c)
Abnormal/Extreme Environmental	CB-S8	1.0	1.0		1.0	1.0			1.7S(b)(c)

Note *: D = Dead loads
L = Live loads (For the roof, Roof Live loads or Snow loads or Rain loads each act independently.)
To = Thermal loads during the normal operation
Ta = Thermal loads during design basis accident
E' = Seismic loads (SSE)
W = Wind loads (basic wind)
Wt = Wind loads (tornado wind)

Note **: Allowable elastic working stress (S) is the allowable stress limit specified in Part 1 of AISC N690-1994-s2 (2004).
(a) For primary plus secondary stress, the allowable limits are increased by a factor of 1.5.
(b) Stress limit coefficient in shear shall not exceed 1.4 in members and bolts.
(c) Stress limit coefficient where axial compression exceeds 20% of nominal allowable, shall be 1.5 for load combination 5, 6, 7, and 1.6 for load combination 8.

Note: Non-Seismic load combinations, shown in the red combination No., are analyzed as part of the standard design in Reference 2.1.2-i.

Table 6.3-3 Selected Load Combinations for Reinforced Concrete Structures

Category	Load Combination								Acceptance Criteria*
	No.	D	L	To	Ta	E'	W	Wt	
Severe Environmental	CB-3	1.4	1.7				1.7		U
	CB-4	1.05	1.3	1.3			1.3		U
Tornado	CB-7	1.0	1.0	1.0				1.0	U
DBA + SSE	CB-9	1.0	1.0		1.0	1.0			U

Note *: U = Required section strength based on the strength design method per ACI 349-01

Note: Non-Seismic load combinations, shown in the red combination No., are analyzed as part of the standard design in Reference 2.1.2-i.

Table 6.3-4 Selected Load Combination for Steel Structures

Category	Load Combination								Acceptance Criteria*
	No.	D	L	To	Ta	E'	W	Wt	
Severe Environmental	CB-S3	1.0	1.0				1.0		S
	CB-S4	1.0	1.0	1.0			1.0		S (a)
SSE	CB-S5	1.0	1.0	1.0		1.0			1.6S (b)(c)
Tornado	CB-S6	1.0	1.0	1.0				1.0	1.6S (b)(c)
DBA	CB-S7	1.0	1.0		1.0				1.6S (b)(c)
DBA + SSE	CB-S8	1.0	1.0		1.0	1.0			1.7S (b)(c)

Note *: See note in Table 6.3-2.

Note: Non-Seismic load combinations, shown in the red combination No., are analyzed as part of the standard design in Reference 2.1.2-i.

Table 6.3-5 Detailed Load Combinations for Reinforced Concrete Structures

				Dead Load	Live Load: Normal Operation	Live Load: Soil Pressure (Static)	Thermal Load: Normal Operation: Summer	Thermal Load: Normal Operation: Winter	Thermal Load: DBA: Summer	Thermal Load: DBA: Winter	Seismic Load	Wind Load: N to S	Wind Load: S to N	Wind Load: E to W	Wind Load: W to E	Tornado Load: N to S	Tornado Load: S to N	Tornado Load: E to W	Tornado Load: W to E	Tornado Differential Load	Acceptance Criteria	Selected Load Combination for Tables of Combined Forces and Moments
				DLO	LLO	SPO	TLS0	TLW0	TLS1	TLW1	KSO	WON	WOS	WOE	WOW	WTN	WTS	WTE	WTW	WTD		
CB-3	**1.4D+1.7L+1.7W (Normal Operation)**																					
		N to S Wind	3001	1.40	1.70	1.70						1.70									U	√
		S to N Wind	3002	1.40	1.70	1.70							1.70								U	
		E to W Wind	3003	1.40	1.70	1.70								1.70							U	
		W to E Wind	3004	1.40	1.70	1.70									1.70						U	
CB-4	**1.05D+1.3L+1.3To+1.3W (Normal Operation)**																					
	Summer	N to S Wind	4011	1.05	1.30	1.30	1.30					1.30									U	
		S to N Wind	4012	1.05	1.30	1.30	1.30						1.30								U	
		E to W Wind	4013	1.05	1.30	1.30	1.30							1.30							U	
		W to E Wind	4014	1.05	1.30	1.30	1.30								1.30						U	
	Winter	N to S Wind	4021	1.05	1.30	1.30		1.30				1.30									U	√
		S to N Wind	4022	1.05	1.30	1.30		1.30					1.30								U	
		E to W Wind	4023	1.05	1.30	1.30		1.30						1.30							U	
		W to E Wind	4024	1.05	1.30	1.30		1.30							1.30						U	
CB-7	**Tornado (Normal Operation)**																					
	w/o Temp	N to S Wind	5001	1.00	1.00	1.00										1.00					U	
		S to N Wind	5002	1.00	1.00	1.00											1.00				U	
		E to W Wind	5003	1.00	1.00	1.00												1.00			U	
		W to E Wind	5004	1.00	1.00	1.00													1.00		U	
		N to S Wind+DP/2	5005	1.00	1.00	1.00										1.00				0.50	U	
		S to N Wind+DP/2	5006	1.00	1.00	1.00											1.00			0.50	U	
		E to W Wind+DP/2	5007	1.00	1.00	1.00												1.00		0.50	U	
		W to E Wind+DP/2	5008	1.00	1.00	1.00													1.00	0.50	U	
		Differential	5009	1.00	1.00	1.00														1.00	U	
	Summer	N to S Wind	5011	1.00	1.00	1.00	1.00									1.00					U	
		S to N Wind	5012	1.00	1.00	1.00	1.00										1.00				U	
		E to W Wind	5013	1.00	1.00	1.00	1.00											1.00			U	
		W to E Wind	5014	1.00	1.00	1.00	1.00												1.00		U	
		N to S Wind+DP/2	5015	1.00	1.00	1.00	1.00									1.00				0.50	U	
		S to N Wind+DP/2	5016	1.00	1.00	1.00	1.00										1.00			0.50	U	
		E to W Wind+DP/2	5017	1.00	1.00	1.00	1.00											1.00		0.50	U	
		W to E Wind+DP/2	5018	1.00	1.00	1.00	1.00												1.00	0.50	U	
		Differential	5019	1.00	1.00	1.00	1.00													1.00	U	
	Winter	N to S Wind	5021	1.00	1.00	1.00		1.00								1.00					U	√
		S to N Wind	5022	1.00	1.00	1.00		1.00									1.00				U	
		E to W Wind	5023	1.00	1.00	1.00		1.00										1.00			U	
		W to E Wind	5024	1.00	1.00	1.00		1.00											1.00		U	
		N to S Wind+DP/2	5025	1.00	1.00	1.00		1.00								1.00				0.50	U	
		S to N Wind+DP/2	5026	1.00	1.00	1.00		1.00									1.00			0.50	U	
		E to W Wind+DP/2	5027	1.00	1.00	1.00		1.00										1.00		0.50	U	
		W to E Wind+DP/2	5028	1.00	1.00	1.00		1.00											1.00	0.50	U	
		Differential	5029	1.00	1.00	1.00		1.00												1.00	U	
CB-9	**LOCA (DBA+SSE)**																					
	Max.*)	w/o Temp	7001	1.00	1.00	1.00					1.00										U	
		Summer	7011	1.00	1.00	1.00			1.00		1.00										U	
		Winter	7021	1.00	1.00	1.00				1.00	1.00										U	√
	Min.**)	w/o Temp	7501	1.00	1.00	1.00					-1.00										U	
		Summer	7511	1.00	1.00	1.00			1.00		-1.00										U	
		Winter	7521	1.00	1.00	1.00				1.00	-1.00										U	√

Notes: Non-Seismic load combinations, shown in the red box, are analyzed as part of the standard design in Reference 2.1.2-i.

*) Max. = Seismic Load is applied to positive direction.

**) Min. = Seismic Load is applied to negative direction.

Table 6.3-6 Detailed Load Combinations for Steel Structures

	No.		Live Load		Thermal Load					Wind Load				Tornado Load					Acceptance Criteria		
		Dead Load	Normal Operation	Soil Pressure (Static)	Normal Operation Summer	Normal Operation Winter	DBA Summer	DBA Winter	Seismic Load	N to S	S to N	E to W	W to E	N to S	S to N	E to W	W to E	Tornado Differential Load			
		DLO	LLO	SPO	TLS0	TLW0	TLS1	TLW1	KSO	WON	WOS	WOE	WOW	WTN	WTS	WTE	WTW	WTD	tens.	comp.	shear
CB-S3 1.0D+1.0L+1.0W (Normal Operation)																					
N to S Wind	3001	1.00	1.00	1.00						1.00									S	S	S
S to N Wind	3002	1.00	1.00	1.00							1.00										
E to W Wind	3003	1.00	1.00	1.00								1.00									
W to E Wind	3004	1.00	1.00	1.00									1.00								
CB-S4 1.0D+1.0L+1.0To+1.0W (Normal Operation)																					
Summer N to S Wind	4011	1.00	1.00	1.00	1.00					1.00									1.5S	1.3S	1.4S
S to N Wind	4012	1.00	1.00	1.00	1.00						1.00										
E to W Wind	4013	1.00	1.00	1.00	1.00							1.00									
W to E Wind	4014	1.00	1.00	1.00	1.00								1.00								
Winter N to S Wind	4021	1.00	1.00	1.00		1.00				1.00											
S to N Wind	4022	1.00	1.00	1.00		1.00					1.00										
E to W Wind	4023	1.00	1.00	1.00		1.00						1.00									
W to E Wind	4024	1.00	1.00	1.00		1.00							1.00								
CB-S5 (Normal Operation+SSE)																					
Max. *) w/o Temp	5001	1.00	1.00	1.00					1.00										1.6S	1.4S	1.4S
Summer	5101	1.00	1.00	1.00	1.00				1.00												
Winter	5201	1.00	1.00	1.00		1.00			1.00												
Min. **) w/o Temp	5501	1.00	1.00	1.00	1.00				-1.00												
Summer	5601	1.00	1.00	1.00		1.00			-1.00												
Winter	5701	1.00	1.00	1.00					-1.00												
CB-S6 Tornado (Normal Operation)																					
w/o Temp N to S Wind	6001	1.00	1.00	1.00										1.00					1.6S	1.4S	1.4S
S to N Wind	6002	1.00	1.00	1.00											1.00						
E to W Wind	6003	1.00	1.00	1.00												1.00					
W to E Wind	6004	1.00	1.00	1.00													1.00				
N to S Wind+DP/2	6005	1.00	1.00	1.00										1.00				0.50			
S to N Wind+DP/2	6006	1.00	1.00	1.00											1.00			0.50			
E to W Wind+DP/2	6007	1.00	1.00	1.00												1.00		0.50			
W to E Wind+DP/2	6008	1.00	1.00	1.00													1.00	0.50			
Differential	6009	1.00	1.00	1.00														1.00			
Summer N to S Wind	6011	1.00	1.00	1.00	1.00									1.00							
S to N Wind	6012	1.00	1.00	1.00	1.00										1.00						
E to W Wind	6013	1.00	1.00	1.00	1.00											1.00					
W to E Wind	6014	1.00	1.00	1.00	1.00												1.00				
N to S Wind+DP/2	6015	1.00	1.00	1.00	1.00									1.00				0.50			
S to N Wind+DP/2	6016	1.00	1.00	1.00	1.00										1.00			0.50			
E to W Wind+DP/2	6017	1.00	1.00	1.00	1.00											1.00		0.50			
W to E Wind+DP/2	6018	1.00	1.00	1.00	1.00												1.00	0.50			
Differential	6019	1.00	1.00	1.00	1.00													1.00			
Winter N to S Wind	6021	1.00	1.00	1.00		1.00								1.00							
S to N Wind	6022	1.00	1.00	1.00		1.00									1.00						
E to W Wind	6023	1.00	1.00	1.00		1.00										1.00					
W to E Wind	6024	1.00	1.00	1.00		1.00											1.00				
N to S Wind+DP/2	6025	1.00	1.00	1.00		1.00								1.00				0.50			
S to N Wind+DP/2	6026	1.00	1.00	1.00		1.00									1.00			0.50			
E to W Wind+DP/2	6027	1.00	1.00	1.00		1.00										1.00		0.50			
W to E Wind+DP/2	6028	1.00	1.00	1.00		1.00											1.00	0.50			
Differential	6029	1.00	1.00	1.00		1.00												1.00			
CB-S7 LOCA (DBA)																					
Summer	7011	1.00	1.00	1.00			1.00												1.6S	1.4S	1.4S
Winter	7021	1.00	1.00	1.00				1.00													
CB-S8 LOCA (DBA+SSE)																					
Max. *) Summer	8101	1.00	1.00	1.00			1.00		1.00										1.7S	1.6S	1.4S
Winter	8201	1.00	1.00	1.00				1.00	1.00												
Min. **) Summer	8601	1.00	1.00	1.00			1.00		-1.00												
Winter	8701	1.00	1.00	1.00				1.00	-1.00												

Notes: Non-Seismic load combinations, shown in the red box, are analyzed as part of the standard design in Reference 2.1.2-i.

*) Max. = Seismic Load is applied to positive direction.

**) Min. = Seismic Load is applied to negative direction.

Table 6.3-7 Combined Forces and Moments: Selected Load Combination CB-3 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	OTHR	-3.076	-3.299	-0.064	-1.214	-0.445	0.171	-0.029	-0.209
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	72	OTHR	-3.988	-0.998	-0.061	3.228	1.110	-0.064	-0.756	-0.033
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	115	OTHR	-3.867	-2.269	-0.933	-0.231	0.426	0.867	-0.626	-0.886
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	120	OTHR	-3.044	-1.664	-0.173	1.430	0.607	-0.028	-0.555	-0.039
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Slab B1F EL-2.0m	567	OTHR	-1.677	-0.332	0.009	-0.116	-0.035	-0.006	-0.138	0.041
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	572	OTHR	-2.586	-1.024	0.182	-0.014	-0.020	0.013	0.156	-0.010
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	615	OTHR	-0.867	-0.783	0.118	-0.069	-0.014	0.032	-0.078	0.010
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	620	OTHR	-1.208	-0.600	1.568	-0.031	-0.054	-0.048	0.041	0.077
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Slab 1F EL4.65m	1067	OTHR	-0.567	-0.133	-0.024	0.271	0.103	-0.017	0.045	0.035
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1072	OTHR	-1.227	-0.485	0.096	-0.190	-0.034	-0.004	0.189	0.007
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1115	OTHR	-0.354	-0.296	0.327	-0.034	-0.298	-0.010	0.001	0.261
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1120	OTHR	-0.445	-0.114	0.614	-0.059	-0.029	-0.010	0.054	0.031
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Slab 2F EL9.06m	1567	OTHR	0.017	0.092	-0.028	0.140	0.010	-0.006	0.026	0.016
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1572	OTHR	0.140	-0.070	-0.022	-0.085	-0.023	-0.002	0.134	0.000
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1615	OTHR	0.022	0.199	-0.056	-0.016	-0.208	-0.010	0.011	0.224
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1620	OTHR	0.054	0.027	-0.135	-0.030	-0.028	-0.027	0.030	0.037
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Roof EL13.8m	1867	OTHR	-0.111	-0.087	-0.006	0.220	0.103	-0.009	0.024	0.006
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1872	OTHR	-0.062	-0.136	-0.009	-0.084	-0.020	0.003	0.120	-0.002
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1915	OTHR	-0.110	-0.168	-0.028	-0.014	-0.205	-0.005	-0.004	0.207
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1920	OTHR	-0.010	-0.059	0.038	-0.028	-0.028	-0.062	0.019	0.026
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes:
OTHR: Loads other than thermal loads
TEMP: Thermal loads
Load Combination ID in Table 6.3-5 = 3001

Table 6.3-7 Combined Forces and Moments: Selected Load Combination CB-3 (Continued)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Wall	6007	OTHR	-1.370	-1.029	-1.442	0.093	0.134	0.050	0.104	0.321
EL-7.4m		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
~EL-2.0m	4006	OTHR	-0.630	-0.851	-0.047	-0.103	-0.605	0.002	-0.007	-1.197
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4010	OTHR	-0.498	-0.704	-0.037	-0.112	-0.242	0.133	0.136	-0.504
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wall	6043	OTHR	-0.954	-1.472	-0.807	0.061	0.054	-0.019	0.064	0.359
EL-2.0m		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
~EL4.65m	4036	OTHR	-1.175	-0.429	0.058	0.043	0.103	-0.007	0.037	-0.967
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4040	OTHR	-0.680	-1.387	0.649	-0.180	-0.008	0.168	0.356	-0.283
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wall	6081	OTHR	-0.538	-0.813	0.197	0.005	0.007	0.001	-0.001	-0.057
EL4.65m		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
~EL9.06m	4066	OTHR	-0.674	-0.365	0.092	-0.073	-0.509	-0.013	0.015	-0.096
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4070	OTHR	-0.153	-0.624	0.418	-0.041	-0.153	-0.125	0.005	-0.081
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wall	6117	OTHR	-0.097	-0.482	0.023	-0.020	-0.128	0.004	0.007	-0.141
EL9.06m		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
~EL13.8m	4096	OTHR	-0.220	-0.261	0.031	0.009	0.057	-0.002	-0.009	0.082
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4100	OTHR	0.000	-0.080	0.083	0.008	0.006	-0.001	-0.011	0.011
		TEMP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes:
OTHR: Loads other than thermal loads
TEMP: Thermal loads
Load Combination ID in Table 6.3-5 = 3001

Table 6.3-8 Combined Forces and Moments: Selected Load Combination CB-4 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	OTHR	-2.353	-2.508	-0.049	-0.908	-0.318	0.129	-0.026	-0.156
		TEMP	0.245	0.128	0.024	1.598	1.437	-0.003	-0.013	0.008
	72	OTHR	-3.049	-0.765	-0.047	2.478	0.853	-0.048	-0.565	-0.026
		TEMP	0.067	0.300	0.066	0.289	1.406	-0.040	0.110	0.095
	115	OTHR	-2.942	-1.729	-0.720	-0.172	0.330	0.671	-0.478	-0.664
		TEMP	1.046	0.058	0.132	1.780	0.464	-0.083	0.263	0.175
	120	OTHR	-2.327	-1.272	-0.129	1.096	0.468	-0.035	-0.424	-0.029
		TEMP	-0.179	-0.321	0.371	0.667	0.679	-0.063	0.490	0.334
Slab B1F EL-2.0m	567	OTHR	-1.282	-0.269	0.008	-0.087	-0.027	-0.004	-0.104	0.031
		TEMP	-0.230	0.032	0.005	-0.007	-0.004	0.000	-0.004	0.002
	572	OTHR	-1.980	-0.786	0.139	-0.010	-0.015	0.009	0.117	-0.008
		TEMP	0.093	-0.254	-0.026	-0.017	0.001	0.000	0.007	0.000
	615	OTHR	-0.666	-0.601	0.095	-0.052	-0.010	0.024	-0.059	0.007
		TEMP	-0.428	0.121	-0.119	-0.001	0.000	0.001	-0.007	-0.012
	620	OTHR	-0.924	-0.460	1.198	-0.023	-0.041	-0.036	0.031	0.058
		TEMP	-0.347	-0.334	-0.506	-0.010	-0.007	0.006	0.006	0.001
Slab 1F EL4.65m	1067	OTHR	-0.435	-0.102	-0.018	0.204	0.077	-0.013	0.034	0.026
		TEMP	-1.179	-0.492	-0.005	0.003	-0.015	0.000	0.002	-0.001
	1072	OTHR	-0.938	-0.372	0.073	-0.145	-0.026	-0.003	0.143	0.005
		TEMP	-0.153	-1.626	-0.081	0.100	0.016	0.005	-0.045	-0.002
	1115	OTHR	-0.273	-0.226	0.250	-0.026	-0.225	-0.008	0.001	0.197
		TEMP	-1.366	0.033	-0.042	-0.004	0.028	0.003	-0.010	-0.005
	1120	OTHR	-0.340	-0.087	0.468	-0.045	-0.022	-0.008	0.041	0.023
		TEMP	-1.745	-1.712	-2.181	0.088	0.086	-0.008	-0.041	-0.038
Slab 2F EL9.06m	1567	OTHR	0.013	0.069	-0.021	0.105	0.008	-0.005	0.019	0.012
		TEMP	-2.057	-0.795	0.007	-0.039	-0.083	0.001	0.003	0.000
	1572	OTHR	0.107	-0.054	-0.017	-0.064	-0.017	-0.002	0.101	0.000
		TEMP	-0.490	-2.745	-0.073	0.027	-0.039	0.005	-0.070	0.005
	1615	OTHR	0.014	0.150	-0.042	-0.012	-0.157	-0.008	0.008	0.169
		TEMP	-1.573	0.168	-0.018	0.019	0.137	-0.025	0.031	-0.069
	1620	OTHR	0.041	0.021	-0.104	-0.023	-0.021	-0.020	0.023	0.028
		TEMP	-2.781	-2.761	-3.520	-0.067	-0.073	0.022	0.020	0.029
Roof EL13.8m	1867	OTHR	-0.084	-0.065	-0.005	0.165	0.078	-0.006	0.018	0.004
		TEMP	1.083	0.974	-0.007	-0.620	-0.784	0.001	0.011	-0.004
	1872	OTHR	-0.047	-0.102	-0.007	-0.064	-0.015	0.002	0.090	-0.001
		TEMP	1.288	0.870	0.299	-0.226	-0.592	0.022	-0.235	0.017
	1915	OTHR	-0.083	-0.126	-0.021	-0.010	-0.154	-0.004	-0.003	0.156
		TEMP	1.560	0.814	0.362	-0.557	-0.354	0.007	0.014	-0.103
	1920	OTHR	-0.007	-0.045	0.029	-0.021	-0.021	-0.047	0.014	0.020
		TEMP	-0.018	-0.182	0.316	-0.520	-0.530	-0.022	-0.009	0.007

Notes:
OTHR: Loads other than thermal loads
TEMP: Thermal loads
Load Combination ID in Table 6.3-5 = 4021

Table 6.3-8 Combined Forces and Moments: Selected Load Combination CB-4 (Continued)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Wall EL-7.4m ~EL-2.0m	6007	OTHR	-1.042	-0.772	-1.098	0.071	0.100	0.038	0.081	0.244
		TEMP	0.343	0.087	0.124	0.139	0.187	0.000	-0.006	0.045
	4006	OTHR	-0.482	-0.632	-0.036	-0.078	-0.459	0.001	-0.005	-0.914
		TEMP	0.359	-0.212	0.108	-0.134	-0.142	0.000	-0.001	-0.023
	4010	OTHR	-0.382	-0.534	-0.026	-0.086	-0.183	0.102	0.105	-0.384
		TEMP	0.173	0.673	0.175	-0.115	-0.131	-0.010	-0.005	-0.031
Wall EL-2.0m ~EL4.65m	6043	OTHR	-0.733	-1.099	-0.611	0.046	0.040	-0.015	0.048	0.275
		TEMP	-0.258	-0.852	-0.163	0.134	0.145	-0.008	0.011	-0.063
	4036	OTHR	-0.900	-0.315	0.045	0.033	0.076	-0.005	0.028	-0.740
		TEMP	0.077	-0.838	0.043	-0.138	-0.138	0.000	0.002	0.114
	4040	OTHR	-0.519	-1.053	0.496	-0.137	-0.007	0.128	0.272	-0.217
		TEMP	0.340	2.135	0.158	-0.047	-0.159	-0.042	-0.097	-0.035
Wall EL4.65m ~EL9.06m	6081	OTHR	-0.412	-0.610	0.151	0.004	0.008	0.001	-0.001	-0.042
		TEMP	6.548	-1.010	0.131	1.243	0.955	0.018	-0.056	-0.077
	4066	OTHR	-0.515	-0.272	0.070	-0.056	-0.389	-0.010	0.011	-0.074
		TEMP	7.531	-0.836	-0.102	-1.322	-0.952	-0.001	0.000	0.110
	4070	OTHR	-0.116	-0.471	0.317	-0.031	-0.117	-0.096	0.004	-0.062
		TEMP	4.742	1.668	-2.190	-1.087	-0.988	-0.027	-0.303	-0.234
Wall EL9.06m ~EL13.8m	6117	OTHR	-0.074	-0.362	0.019	-0.015	-0.097	0.003	0.005	-0.106
		TEMP	3.689	-0.604	-1.506	0.729	1.178	-0.018	-0.029	0.288
	4096	OTHR	-0.167	-0.196	0.024	0.007	0.043	-0.002	-0.007	0.062
		TEMP	4.099	-0.340	-0.173	-0.751	-1.226	0.000	0.023	-0.344
	4100	OTHR	0.000	-0.059	0.062	0.006	0.005	-0.001	-0.008	0.008
		TEMP	2.630	1.287	-1.234	-0.554	-0.993	-0.004	-0.282	-0.506

Notes:
OTHR: Loads other than thermal loads
TEMP: Thermal loads
Load Combination ID in Table 6.3-5 = 4021

Table 6.3-9 Combined Forces and Moments: Selected Load Combination CB-7
(Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	OTHR	-1.808	-2.051	-0.030	-0.844	-0.436	0.109	0.033	-0.149
		TEMP	0.189	0.099	0.018	1.230	1.105	-0.002	-0.010	0.006
	72	OTHR	-2.357	-0.633	-0.035	1.804	0.589	-0.038	-0.565	-0.014
		TEMP	0.052	0.231	0.051	0.223	1.082	-0.031	0.085	0.073
	115	OTHR	-2.387	-1.376	-0.471	-0.164	0.221	0.417	-0.356	-0.619
		TEMP	0.804	0.045	0.101	1.369	0.357	-0.064	0.202	0.135
	120	OTHR	-1.798	-0.994	-0.125	0.815	0.329	0.097	-0.328	-0.035
		TEMP	-0.138	-0.247	0.285	0.513	0.522	-0.049	0.377	0.257
Slab B1F EL-2.0m	567	OTHR	-0.986	-0.084	-0.001	-0.074	-0.025	-0.005	-0.094	0.028
		TEMP	-0.177	0.025	0.004	-0.005	-0.003	0.000	-0.003	0.002
	572	OTHR	-1.509	-0.582	0.106	-0.011	-0.015	0.009	0.109	-0.007
		TEMP	0.071	-0.195	-0.020	-0.013	0.001	0.000	0.005	0.000
	615	OTHR	-0.485	-0.442	0.032	-0.046	-0.010	0.024	-0.053	0.007
		TEMP	-0.329	0.093	-0.091	-0.001	0.000	0.001	-0.005	-0.009
	620	OTHR	-0.704	-0.346	0.932	-0.022	-0.036	-0.033	0.031	0.052
		TEMP	-0.267	-0.257	-0.389	-0.008	-0.005	0.004	0.005	0.001
Slab 1F EL4.65m	1067	OTHR	-0.325	-0.066	-0.014	0.189	0.070	-0.012	0.032	0.025
		TEMP	-0.907	-0.378	-0.004	0.003	-0.012	0.000	0.002	-0.001
	1072	OTHR	-0.720	-0.271	0.055	-0.115	-0.022	-0.002	0.123	0.005
		TEMP	-0.118	-1.251	-0.062	0.077	0.013	0.004	-0.035	-0.001
	1115	OTHR	-0.193	-0.164	0.188	-0.023	-0.202	-0.008	0.001	0.179
		TEMP	-1.051	0.025	-0.032	-0.003	0.021	0.002	-0.008	-0.004
	1120	OTHR	-0.256	-0.060	0.361	-0.038	-0.019	-0.008	0.035	0.023
		TEMP	-1.342	-1.317	-1.678	0.068	0.066	-0.006	-0.032	-0.030
Slab 2F EL9.06m	1567	OTHR	-0.001	0.069	-0.016	0.097	0.005	-0.004	0.018	0.011
		TEMP	-1.582	-0.611	0.005	-0.030	-0.064	0.001	0.002	0.000
	1572	OTHR	0.092	-0.030	-0.015	-0.051	-0.016	-0.001	0.086	0.000
		TEMP	-0.377	-2.111	-0.056	0.021	-0.030	0.004	-0.054	0.003
	1615	OTHR	0.020	0.138	-0.044	-0.011	-0.139	-0.008	0.007	0.153
		TEMP	-1.210	0.130	-0.014	0.015	0.105	-0.019	0.024	-0.053
	1620	OTHR	0.037	0.025	-0.088	-0.020	-0.019	-0.018	0.021	0.025
		TEMP	-2.139	-2.124	-2.708	-0.051	-0.056	0.017	0.015	0.022
Roof EL13.8m	1867	OTHR	-0.071	-0.041	-0.003	0.120	0.060	-0.005	0.013	0.003
		TEMP	0.833	0.750	-0.005	-0.477	-0.603	0.001	0.008	-0.003
	1872	OTHR	-0.032	-0.070	-0.004	-0.050	-0.010	0.001	0.070	-0.001
		TEMP	0.990	0.669	0.230	-0.174	-0.455	0.017	-0.181	0.013
	1915	OTHR	-0.063	-0.094	-0.024	-0.008	-0.117	-0.002	-0.002	0.115
		TEMP	1.200	0.626	0.278	-0.429	-0.272	0.005	0.011	-0.079
	1920	OTHR	-0.002	-0.030	0.022	-0.015	-0.016	-0.036	0.011	0.015
		TEMP	-0.014	-0.140	0.243	-0.400	-0.408	-0.017	-0.007	0.005

Notes:
OTHR: Loads other than thermal loads
TEMP: Thermal loads
Load Combination ID in Table 6.3-5 = 5021

Table 6.3-9 Combined Forces and Moments: Selected Load Combination CB-7 (Continued)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Wall EL-7.4m ~EL-2.0m	6007	OTHR	-0.845	-0.717	-0.846	0.051	0.094	0.028	0.051	0.200
		TEMP	0.264	0.067	0.095	0.107	0.144	0.000	-0.005	0.034
	4006	OTHR	-0.378	-0.673	-0.027	-0.067	-0.387	0.001	-0.004	-0.711
		TEMP	0.276	-0.163	0.083	-0.103	-0.109	0.000	-0.001	-0.018
	4010	OTHR	-0.285	-0.453	-0.052	-0.062	-0.153	0.077	0.075	-0.303
		TEMP	0.133	0.518	0.135	-0.088	-0.101	-0.007	-0.004	-0.024
Wall EL-2.0m ~EL4.65m	6043	OTHR	-0.536	-1.046	-0.483	0.042	0.034	-0.010	0.044	0.212
		TEMP	-0.199	-0.655	-0.125	0.103	0.111	-0.006	0.009	-0.048
	4036	OTHR	-0.677	-0.360	0.032	0.029	0.080	-0.004	0.021	-0.563
		TEMP	0.059	-0.645	0.033	-0.106	-0.106	0.000	0.001	0.088
	4040	OTHR	-0.403	-0.877	0.373	-0.107	0.000	0.101	0.212	-0.163
		TEMP	0.262	1.642	0.122	-0.036	-0.123	-0.033	-0.075	-0.027
Wall EL4.65m ~EL9.06m	6081	OTHR	-0.305	-0.544	0.126	0.001	-0.013	0.000	0.000	-0.052
		TEMP	5.037	-0.777	0.101	0.957	0.735	0.014	-0.043	-0.060
	4066	OTHR	-0.381	-0.262	0.053	-0.043	-0.298	-0.008	0.008	-0.050
		TEMP	5.793	-0.643	-0.079	-1.017	-0.732	-0.001	0.000	0.085
	4070	OTHR	-0.085	-0.401	0.246	-0.023	-0.089	-0.074	0.002	-0.045
		TEMP	3.647	1.283	-1.685	-0.836	-0.760	-0.021	-0.233	-0.180
Wall EL9.06m ~EL13.8m	6117	OTHR	-0.058	-0.297	0.011	-0.013	-0.083	0.002	0.005	-0.089
		TEMP	2.838	-0.465	-1.159	0.560	0.906	-0.014	-0.022	0.222
	4096	OTHR	-0.118	-0.166	0.017	0.006	0.037	-0.001	-0.005	0.053
		TEMP	3.153	-0.262	-0.133	-0.578	-0.943	0.000	0.018	-0.265
	4100	OTHR	0.005	-0.056	0.047	0.005	0.005	0.000	-0.007	0.008
		TEMP	2.023	0.990	-0.949	-0.426	-0.764	-0.003	-0.217	-0.390

Notes:
OTHR: Loads other than thermal loads
TEMP: Thermal loads
Load Combination ID in Table 6.3-5 = 5021

Table 6.3-10 Combined Forces and Moments: Site-Specific Seismic Load Combination CB-9

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Basemat EL-7.4m	67	OTHR	-1.803	-2.073	-0.034	-0.908	-0.459	0.120	0.010	-0.152
		TEMP	-0.409	-1.291	0.169	6.783	6.419	-0.132	0.291	-0.113
		SEIS	0.156	0.646	0.129	1.363	1.690	0.181	0.565	1.102
	72	OTHR	-2.353	-0.545	-0.033	1.822	0.627	-0.044	-0.549	-0.012
		TEMP	-0.189	-0.279	0.059	1.916	5.868	-0.007	0.290	0.127
		SEIS	0.206	1.945	1.239	1.936	0.924	1.306	1.012	0.479
	115	OTHR	-2.411	-1.386	-0.507	-0.180	0.209	0.459	-0.382	-0.646
		TEMP	-0.198	-0.082	0.185	6.662	2.336	-0.255	0.533	0.941
		SEIS	3.207	0.383	0.992	0.532	0.814	1.151	0.527	0.774
	120	OTHR	-1.802	-0.979	-0.132	0.826	0.326	0.105	-0.334	-0.022
		TEMP	-0.949	-1.034	-0.271	3.316	3.332	1.777	1.350	1.269
		SEIS	0.559	0.455	0.148	0.839	0.819	0.916	0.852	0.576
Slab B1F EL-2.0m	567	OTHR	-0.988	-0.058	-0.003	-0.078	-0.025	-0.005	-0.095	0.028
		TEMP	-0.720	0.380	0.045	-0.078	-0.091	0.002	-0.003	0.006
		SEIS	0.065	0.671	0.379	0.054	0.036	0.012	0.061	0.057
	572	OTHR	-1.507	-0.581	0.105	-0.012	-0.015	0.009	0.110	-0.007
		TEMP	0.331	-0.756	-0.056	-0.030	-0.063	0.003	-0.023	0.000
		SEIS	0.308	0.199	0.607	0.028	0.013	0.006	0.077	0.005
	615	OTHR	-0.478	-0.436	0.021	-0.047	-0.009	0.024	-0.054	0.006
		TEMP	-0.858	0.641	-0.723	-0.078	-0.033	0.006	-0.032	-0.073
		SEIS	0.400	0.145	0.548	0.031	0.034	0.020	0.037	0.029
	620	OTHR	-0.703	-0.345	0.932	-0.022	-0.036	-0.034	0.030	0.052
		TEMP	-0.970	-0.965	-1.402	-0.066	-0.065	0.009	0.007	0.005
		SEIS	0.151	0.101	0.657	0.027	0.028	0.021	0.035	0.038
Slab 1F EL4.65m	1067	OTHR	-0.319	-0.076	-0.015	0.189	0.071	-0.012	0.032	0.025
		TEMP	-1.315	-0.447	-0.012	0.062	0.026	0.001	0.003	-0.003
		SEIS	0.088	0.050	0.020	0.178	0.067	0.012	0.032	0.026
	1072	OTHR	-0.727	-0.284	0.058	-0.117	-0.022	-0.002	0.124	0.005
		TEMP	-0.170	-1.780	-0.097	0.184	0.081	0.007	-0.061	-0.001
		SEIS	0.157	0.145	0.198	0.084	0.017	0.003	0.091	0.005
	1115	OTHR	-0.187	-0.177	0.197	-0.023	-0.202	-0.008	0.001	0.179
		TEMP	-1.419	0.046	0.018	0.065	0.113	0.002	-0.008	-0.017
		SEIS	0.274	0.115	0.235	0.031	0.190	0.009	0.006	0.161
	1120	OTHR	-0.260	-0.067	0.376	-0.038	-0.020	-0.009	0.035	0.023
		TEMP	-1.987	-1.963	-2.417	0.130	0.129	-0.007	-0.033	-0.031
		SEIS	0.159	0.116	0.141	0.038	0.040	0.018	0.045	0.049

Notes:

OTHR: Loads other than thermal and seismic loads.
TEMP: Thermal loads.
SEIS: Seismic loads.
Load Combination IDs in Table 6.3-5 = 7021 and 7521

Table 6.3-10 Combined Forces and Moments: Site-Specific Seismic Load Combination CB-9 (Continued)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Slab 2F EL9.06m	1567	OTHR	0.018	0.062	-0.017	0.097	0.007	-0.004	0.018	0.011
		TEMP	-2.552	-1.076	0.015	-0.027	-0.087	0.002	0.004	0.000
		SEIS	0.059	0.102	0.046	0.104	0.009	0.006	0.021	0.013
	1572	OTHR	0.081	-0.049	-0.011	-0.057	-0.016	-0.001	0.091	0.000
		TEMP	-0.679	-3.420	-0.099	0.070	-0.022	0.008	-0.099	0.006
		SEIS	0.281	0.336	0.429	0.054	0.017	0.002	0.089	0.001
	1615	OTHR	0.045	0.136	-0.034	-0.011	-0.145	-0.007	0.008	0.155
		TEMP	-2.425	0.082	-0.110	0.043	0.193	-0.031	0.036	-0.087
		SEIS	0.895	0.302	0.041	0.022	0.161	0.009	0.014	0.167
	1620	OTHR	0.033	0.014	-0.070	-0.021	-0.020	-0.018	0.021	0.026
		TEMP	-3.153	-3.133	-4.149	-0.051	-0.057	0.025	0.020	0.029
		SEIS	0.191	0.169	0.314	0.028	0.029	0.018	0.032	0.037
Roof EL13.8m	1867	OTHR	-0.084	-0.071	-0.003	0.173	0.074	-0.007	0.021	0.005
		TEMP	1.500	1.282	-0.012	-0.783	-1.023	0.001	0.015	-0.006
		SEIS	0.149	0.109	0.072	0.255	0.084	0.013	0.039	0.007
	1872	OTHR	-0.047	-0.113	-0.005	-0.057	-0.016	0.003	0.086	-0.001
		TEMP	1.774	1.355	0.412	-0.232	-0.745	0.032	-0.330	0.023
		SEIS	0.415	0.857	0.635	0.048	0.028	0.010	0.097	0.004
	1915	OTHR	-0.085	-0.129	-0.012	-0.009	-0.154	-0.005	-0.004	0.160
		TEMP	1.949	1.114	0.485	-0.695	-0.400	0.008	0.017	-0.146
		SEIS	1.331	0.399	0.482	0.022	0.206	0.014	0.010	0.227
	1920	OTHR	-0.011	-0.049	0.026	-0.022	-0.021	-0.046	0.015	0.021
		TEMP	-0.003	-0.164	0.493	-0.634	-0.644	-0.022	-0.011	0.005
		SEIS	0.312	0.243	0.101	0.032	0.034	0.063	0.035	0.039

Notes:
OTHR: Loads other than thermal and seismic loads.
TEMP: Thermal loads.
SEIS: Seismic loads.
Load Combination IDs in Table 6.3-5 = 7021 and 7521

Table 6.3-10 Combined Forces and Moments: Site-Specific Seismic Load Combination CB-9 (Continued)

Location	Element ID		N_x (MN/m)	N_y (MN/m)	N_{xy} (MN/m)	M_x (MNm/m)	M_y (MNm/m)	M_{xy} (MNm/m)	Q_x (MN/m)	Q_y (MN/m)
Wall EL-7.4m ~EL-2.0m	6007	OTHR	-0.856	-0.748	-0.908	0.052	0.097	0.029	0.051	0.202
		TEMP	0.521	1.371	-0.057	0.642	0.904	0.004	-0.032	0.165
		SEIS	1.228	0.934	1.128	0.076	0.119	0.037	0.115	0.208
	4006	OTHR	-0.359	-0.658	-0.024	-0.067	-0.390	0.001	-0.004	-0.712
		TEMP	0.756	-0.069	0.091	-0.688	-1.068	-0.002	-0.001	-0.194
		SEIS	0.855	1.301	1.186	0.051	0.327	0.012	0.006	0.592
	4010	OTHR	-0.278	-0.450	-0.037	-0.063	-0.156	0.077	0.074	-0.304
		TEMP	1.043	1.253	-0.324	-0.531	-0.881	-0.042	-0.156	-0.334
		SEIS	0.496	0.999	0.888	0.096	0.144	0.079	0.101	0.237
Wall EL-2.0m ~EL4.65m	6043	OTHR	-0.529	-1.111	-0.549	0.044	0.037	-0.010	0.046	0.212
		TEMP	2.535	-1.168	-0.671	0.378	0.483	-0.026	0.127	0.061
		SEIS	0.877	1.448	2.282	0.101	0.277	0.023	0.058	0.362
	4036	OTHR	-0.679	-0.361	0.034	0.029	0.082	-0.004	0.021	-0.562
		TEMP	2.463	-0.411	-0.013	-0.289	-0.300	0.001	0.031	0.070
		SEIS	0.662	1.151	2.087	0.053	0.273	0.006	0.022	0.345
	4040	OTHR	-0.403	-0.880	0.399	-0.107	0.000	0.101	0.213	-0.163
		TEMP	1.381	1.392	-0.606	-0.080	-0.300	-0.047	-0.217	-0.181
		SEIS	0.465	1.967	1.906	0.112	0.133	0.046	0.144	0.171
Wall EL4.65m ~EL9.06m	6081	OTHR	-0.321	-0.600	0.102	0.000	-0.018	-0.001	-0.001	-0.041
		TEMP	5.519	-0.786	0.338	1.391	1.000	0.007	-0.048	-0.161
		SEIS	0.795	1.112	1.694	0.046	0.276	0.029	0.013	0.089
	4066	OTHR	-0.407	-0.280	0.056	-0.042	-0.294	-0.008	0.008	-0.055
		TEMP	6.358	-0.464	-0.042	-1.488	-1.021	0.000	-0.021	0.188
		SEIS	0.308	0.832	1.708	0.042	0.214	0.009	0.011	0.058
	4070	OTHR	-0.097	-0.419	0.271	-0.025	-0.089	-0.073	0.005	-0.047
		TEMP	3.596	1.323	-1.489	-1.232	-1.167	-0.021	-0.332	-0.163
		SEIS	0.065	0.976	1.663	0.026	0.060	0.072	0.026	0.049
Wall EL9.06m ~EL13.8m	6117	OTHR	-0.057	-0.362	0.001	-0.013	-0.087	0.004	0.005	-0.100
		TEMP	3.560	-0.619	-1.500	0.908	1.500	-0.022	-0.038	0.385
		SEIS	0.829	0.599	0.911	0.015	0.090	0.006	0.007	0.127
	4096	OTHR	-0.154	-0.190	0.020	0.007	0.041	-0.001	-0.005	0.055
		TEMP	3.980	-0.285	-0.182	-0.936	-1.566	-0.001	0.034	-0.463
		SEIS	0.591	0.391	0.986	0.016	0.065	0.002	0.008	0.064
	4100	OTHR	-0.005	-0.072	0.071	0.005	0.006	-0.001	-0.006	0.008
		TEMP	2.844	1.752	-1.526	-0.681	-1.227	-0.002	-0.347	-0.594
		SEIS	0.146	0.391	1.010	0.016	0.025	0.009	0.024	0.031

Notes:
OTHR: Loads other than thermal and seismic loads.
TEMP: Thermal loads.
SEIS: Seismic loads.
Load Combination IDs in Table 6.3-5 = 7021 and 7521

Table 6.4-1 Material Constants for Stress Calculations

Material	Property	Value	
Concrete	Compressive strength, f_c'	Basemat	27.6 MPa
		Others	34.5 MPa
	Young's modulus	Basemat	2.49×10^4 MPa
		Others	2.78×10^4 MPa
	Poisson's ratio	0.17	
Reinforcement	Yield stress, f_y	413.6 MPa	
	Young's modulus	2.00×10^5 MPa	

Table 6.4-2 Allowable Stress of Concrete for Membrane Plus Bending

Load Condition	Allowable Compressive Stress (MPa)		
Primary	Basemat	20.7	(0.75 f_c')
	Others	25.9	
Primary plus secondary	Basemat	23.5	(0.85 f_c')
	Others	29.3	

Note: Concrete allowable stress for load condition of "Primary plus secondary" is applied to the load combinations that include thermal loads.

Table 6.4-3 Allowable Stress of Reinforcement for Membrane Plus Bending

	Allowable Stress (MPa)
Tension	372.2 (0.90 f_y)
Compression	372.2 (0.90 f_y)

Table 6.4-4 Allowable Stress of Concrete for Membrane Compression

Load Condition	Allowable Compressive Stress (MPa)		
Primary	Basemat	16.6	(0.60 f_c')
	Others	20.7	
Primary plus secondary	Basemat	20.7	(0.75 f_c')
	Others	25.9	

Table 7.2-1 Sectional Thicknesses and Rebar Ratios Used in the Evaluation

Location	Element ID	Thickness (m)	Primary Reinforcement					Shear Tie	
			Position	Direction 1[*1]		Direction 2[*1]			
				Arrangement	Ratio (%)	Arrangement	Ratio (%)	Arrangement	Ratio (%)
Basemat EL-7.4m	67 72	3.0	Top	2-#11@200	0.335	2-#11@200	0.335	#6@400 × 400	0.177
			Bottom	2-#11@200	0.335	2-#11@200	0.335		
	115 120		Top	2-#11@200	0.335	2-#11@200	0.335	#6@400 × 400	0.177
			Bottom	2-#11@200	0.335	2-#11@200	0.335		
SlabB1F EL-2.0m	567	0.5	Top	1-#11@200	1.006	1-#11@200	1.006	-	-
			Bottom	1-#11@200	1.006	1-#11@200	1.006		
	572 615 620		Top	1-#11@200	1.006	1-#11@200	1.006	-	-
			Bottom	1-#11@200	1.006	1-#11@200	1.006		
Slab 1F EL4.65m	1067 1072 1115 1120	0.5	Top	1-#11@200	1.006	1-#11@200	1.006	-	-
			Bottom	1-#11@200	1.006	1-#11@200	1.006		
Slab 2F EL9.06m	1567 1572 1620	0.5	Top	1-#11@200	1.006	1-#11@200	1.006	-	-
			Bottom	1-#11@200	1.006	1-#11@200	1.006		
	1615		Top	1-#11@200	1.006	1-#11@200	1.006	#4@400 × 400	0.081
			Bottom	1-#11@200	1.006	1-#11@200	1.006		
Slab RF EL13.8m	1867 1872 1920	0.7	Top	1-#11@200 + 1-#11@400	1.078	1-#11@200 + 1-#11@400	1.078	-	-
			Bottom	1-#11@200 + 1-#11@400	1.078	1-#11@200 + 1-#11@400	1.078		
	1915		Top	1-#11@200 + 1-#11@400	1.078	1-#11@200 + 1-#11@400	1.078	#4@400 × 400	0.081
			Bottom	1-#11@200 + 1-#11@400	1.078	1-#11@200 + 1-#11@400	1.078		

Note *1: Wall — Direction 1: Horizontal, Direction 2: Vertical
Basemat, Slab, Roof — Direction 1: N-S, Direction 2: E-W

Table 7.2-1 Sectional Thicknesses and Rebar Ratios Used in the Evaluation (Continued)

Location	Element ID	Thickness (m)	Primary Reinforcement					Shear Tie	
			Position	Direction 1[*1]		Direction 2[*1]			
				Arrangement	Ratio (%)	Arrangement	Ratio (%)	Arrangement	Ratio (%)
Wall EL-7.4m ~EL-2.0m	6007	0.9	Inside	2-#11@200	1.118	2-#11@200	1.118	#6@200×400	0.355
			Outside	2-#11@200	1.118	2-#11@200	1.118		
	4006 4010		Inside	2-#11@200	1.118	2-#11@200	1.118	#6@200×400	0.355
			Outside	2-#11@200	1.118	2-#11@200	1.118		
Wall EL-2.0m ~EL4.65m	6043 4040	0.9	Inside	2-#11@200	1.118	2-#11@200	1.118	#6@200×400	0.355
			Outside	2-#11@200	1.118	2-#11@200	1.118		
	4036		Inside	2-#11@200	1.118	2-#11@200	1.118	#6@200×200	0.710
			Outside	2-#11@200	1.118	2-#11@200	1.118		
Wall EL4.65m ~EL9.06m	6081 4066 4070	0.9	Inside	2-#11@200	1.118	2-#11@200	1.118	-	-
			Outside	2-#11@200	1.118	2-#11@200	1.118		
Wall EL9.06m ~EL13.8m	6117	0.7	Inside	1-#11@200	0.719	1-#11@200	0.719	-	-
			Outside	1-#11@200 + 1-#11@400	1.078	1-#11@200 + 1-#11@400	1.078		
	4096 4100		Inside	1-#11@200	0.719	1-#11@200	0.719	-	-
			Outside	1-#11@200 + 1-#11@400	1.078	1-#11@200 + 1-#11@400	1.078		

Note *1: Wall — Direction 1: Horizontal, Direction 2: Vertical
Basemat, Slab, Roof — Direction 1: N-S, Direction 2: E-W

Table 7.3-1 Rebar and Concrete Stresses (Basemat and Slabs): Selected Load Combination CB-3 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				NS direction		EW direction		
				Top	Bottom	Top	Bottom	
Basemat EL-7.4m	67	-1.7	-20.7	-1.7	-10.9	-6.0	-8.2	372.2
	72	-3.4		-23.3	5.2	-4.7	6.2	
	115	-1.9		-7.6	-10.1	-6.1	-2.3	
	120	-1.8		-12.5	-1.9	-4.6	-1.4	
Slab B1F EL-2.0m	567	-5.5	-25.9	-12.7	-28.1	0.8	-2.7	372.2
	572	-5.0		-29.7	-31.3	-6.3	-9.7	
	615	-3.6		-4.7	-14.1	-7.9	-8.5	
	620	-8.4		110.2	19.1	141.0	20.1	
Slab 1F EL4.65m	1067	-13.9	-25.9	-10.8	112.6	-2.4	46.4	372.2
	1072	-7.6		10.8	-27.5	-1.4	-4.3	
	1115	-11.9		37.1	8.4	155.5	-28.0	
	1120	-4.4		64.2	6.2	70.1	14.6	
Slab 2F EL9.06m	1567	-7.4	-25.9	4.1	90.5	7.2	24.8	372.2
	1572	-4.4		67.9	8.1	7.4	-0.7	
	1615	-7.5		14.0	6.0	133.3	-11.6	
	1620	-3.3		22.9	14.1	17.7	16.2	
Roof EL13.8m	1867	-5.6	-25.9	0.2	56.3	-2.2	20.9	372.2
	1872	-2.1		20.8	-0.9	-0.2	-1.3	
	1915	-4.1		-0.5	0.0	45.0	-9.8	
	1920	-2.9		25.2	5.9	23.5	1.1	

Notes: Negative value means compression.
* For denominations of table columns, see the definition of local coordinate in Figure 6.2-49.
Load Combination ID in Table 6.3-5 = 3001

Table 7.3-2 Rebar and Concrete Stresses (Walls): Selected Load Combination CB-3 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				Horizontal direction		Vertical direction		
				Inside	Outside	Inside	Outside	
Wall EL-7.4m ~EL-2.0m	6007	-4.0	-25.9	0.7	19.6	-2.9	31.6	372.2
	4006	-7.9		-3.6	-1.7	-16.1	58.8	
	4010	-5.0		-3.8	17.0	-8.3	23.0	
Wall EL-2.0m ~EL4.65m	6043	-2.4	-25.9	-6.6	-2.5	-10.2	-7.2	372.2
	4036	-1.5		-6.9	-8.4	1.3	-4.1	
	4040	-3.7		-8.1	1.7	-5.1	-9.5	
Wall EL4.65m ~EL9.06m	6081	-1.0	-25.9	-3.0	-2.8	-5.2	-4.9	372.2
	4066	-6.9		-3.7	-1.1	-8.2	67.7	
	4070	-4.3		5.0	35.6	-2.8	36.0	
Wall EL9.06m ~EL13.8m	6117	-2.7	-25.9	-0.1	-0.2	10.0	-7.7	372.2
	4096	-1.2		-1.6	-1.6	2.5	-3.8	
	4100	-0.3		9.1	2.0	4.8	1.0	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 3001

Table 7.3-3 Rebar and Concrete Stresses (Basemat and Slabs): Selected Load Combination CB-4 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				NS direction		EW direction		
				Top	Bottom	Top	Bottom	
Basemat EL-7.4m	67	-1.5	-23.5	-6.5	-2.4	-9.4	-1.1	372.2
	72	-2.7		-17.9	4.5	-5.4	14.1	
	115	-1.8		-8.6	0.0	-6.0	-1.0	
	120	-1.8		-11.8	0.2	-6.4	0.4	
Slab B1F EL-2.0m	567	-4.8	-29.3	-12.2	-24.8	1.5	-1.5	372.2
	572	-4.1		-19.9	-23.4	-8.6	-10.4	
	615	-3.3		-9.2	-16.4	-3.7	-4.2	
	620	-5.4		67.1	7.1	88.9	7.0	
Slab 1F EL4.65m	1067	-8.4	-29.3	-28.9	13.8	-8.9	4.5	372.2
	1072	-3.8		-6.7	-12.8	-22.8	-23.3	
	1115	-8.0		-13.9	-18.9	102.7	-18.2	
	1120	-6.9		-21.2	-23.0	-22.2	-14.5	
Slab 2F EL9.06m	1567	-5.1	-29.3	-29.6	-18.9	2.8	-13.3	372.2
	1572	-6.3		33.7	4.2	-30.0	-39.1	
	1615	-4.2		-18.9	-19.6	82.2	1.3	
	1620	-14.2		74.8	38.5	75.9	37.3	
Roof EL13.8m	1867	-0.6	-29.3	-8.6	39.6	47.9	-15.9	372.2
	1872	-4.4		65.8	15.4	79.2	-0.3	
	1915	-4.4		53.0	15.0	66.7	-4.6	
	1920	-10.6		104.4	13.3	111.8	-6.9	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 4021

Table 7.3-4 Rebar and Concrete Stresses (Walls): Selected Load Combination CB-4 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				Horizontal direction		Vertical direction		
				Inside	Outside	Inside	Outside	
Wall EL-7.4m ~EL-2.0m	6007	-3.8	-29.3	-0.8	32.8	-0.7	40.4	372.2
	4006	-6.8		-1.2	1.8	-14.3	49.2	
	4010	-4.4		-4.6	19.7	-1.9	29.0	
Wall EL-2.0m ~EL4.65m	6043	-3.5	-29.3	-7.4	0.3	-15.9	-6.2	372.2
	4036	-1.6		-7.1	-1.9	-8.2	-6.0	
	4040	-2.7		9.3	16.8	24.8	-2.7	
Wall EL4.65m ~EL9.06m	6081	-6.9	-29.3	20.4	76.6	-21.7	24.4	372.2
	4066	-11.6		34.6	99.3	-27.1	72.0	
	4070	-7.8		32.3	112.8	-4.5	91.6	
Wall EL9.06m ~EL13.8m	6117	-11.5	-29.3	33.6	97.5	-21.4	86.8	372.2
	4096	-7.6		15.7	57.8	-16.3	57.0	
	4100	-6.9		27.2	78.7	-0.3	95.5	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 4021

Table 7.3-5 Rebar and Concrete Stresses (Basemat and Slabs): Selected Load Combination CB-7 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				NS direction		EW direction		
				Top	Bottom	Top	Bottom	
Basemat EL-7.4m	67	-1.0	-23.5	-4.5	-2.2	-6.9	-1.9	372.2
	72	-2.0		-13.2	2.4	-3.7	7.6	
	115	-1.3		-7.1	-0.1	-4.5	-1.1	
	120	-1.4		-9.1	0.3	-5.0	0.4	
Slab B1F EL-2.0m	567	-3.9	-29.3	-9.0	-19.7	7.6	-0.1	372.2
	572	-3.2		-15.0	-18.1	-6.1	-8.0	
	615	-2.6		-6.4	-12.7	-2.6	-3.1	
	620	-4.4		58.6	6.6	75.8	6.0	
Slab 1F EL4.65m	1067	-8.4	-29.3	-21.2	32.8	-6.8	8.9	372.2
	1072	-2.9		-4.9	-10.1	-17.2	-17.8	
	1115	-7.3		-9.7	-14.1	95.9	-16.0	
	1120	-5.4		-16.0	-17.8	-16.8	-11.3	
Slab 2F EL9.06m	1567	-4.3	-29.3	-24.0	-13.6	2.8	-10.4	372.2
	1572	-4.9		28.6	3.7	-22.7	-30.1	
	1615	-3.8		-14.4	-14.9	75.8	0.1	
	1620	-11.1		58.9	31.0	59.7	30.4	
Roof EL13.8m	1867	-0.2	-29.3	-6.5	27.2	37.9	-13.7	372.2
	1872	-3.4		43.1	10.5	49.6	-1.1	
	1915	-3.4		42.2	11.5	53.3	-3.3	
	1920	-8.2		80.3	10.3	86.1	-5.3	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 5021

Table 7.3-6 Rebar and Concrete Stresses (Walls): Selected Load Combination CB-7 (Standard design analysis results reproduced from Reference 2.1.2-i)

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				Horizontal direction		Vertical direction		
				Inside	Outside	Inside	Outside	
Wall EL-7.4m ~EL-2.0m	6007	-3.1	-29.3	-1.5	21.7	-3.0	27.8	372.2
	4006	-5.5		-0.8	1.8	-13.8	34.5	
	4010	-3.6		-2.9	17.8	-1.7	25.9	
Wall EL-2.0m ~EL4.65m	6043	-2.9	-29.3	-5.6	1.0	-13.9	-6.5	372.2
	4036	-1.2		-5.2	-1.3	-6.6	-5.9	
	4040	-2.0		5.3	13.3	18.0	-3.9	
Wall EL4.65m ~EL9.06m	6081	-5.2	-29.3	16.0	59.4	-17.2	16.4	372.2
	4066	-8.6		24.7	76.4	-20.6	53.0	
	4070	-7.2		15.4	88.2	24.9	60.7	
Wall EL9.06m ~EL13.8m	6117	-8.8	-29.3	25.8	74.9	-16.7	65.1	372.2
	4096	-5.8		12.2	45.2	-12.8	42.1	
	4100	-5.3		20.3	61.3	-0.2	72.8	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-3 = 5021

Table 7.3-7 Rebar and Concrete Stresses (Basemat and Slabs): Site-Specific Seismic Load Combination CB-9

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				NS direction		EW direction		
				Top	Bottom	Top	Bottom	
Basemat EL-7.4m	67	-5.0	-23.5	-20.3	35.1	-30.7	28.8	372.2
	72	-8.4		-30.9	136.4	24.9	159.9	
	115	-4.9		-25.2	107.8	-11.3	12.8	
	120	-5.7		-22.8	28.9	-17.8	35.5	
Slab B1F EL-2.0m	567	-9.7	-29.3	14.9	-33.1	136.8	35.7	372.2
	572	-6.2		-11.7	-19.7	-9.0	-23.9	
	615	-9.8		61.5	-15.9	76.4	6.7	
	620	-9.0		-13.2	-26.4	-6.4	-25.6	
Slab 1F EL4.65m	1067	-21.0	-29.3	-27.7	143.4	-8.2	57.0	372.2
	1072	-6.4		-18.9	8.0	-30.7	-20.5	
	1115	-13.2		-16.5	-17.0	180.1	-31.0	
	1120	-9.5		-19.1	24.1	-26.4	38.3	
Slab 2F EL9.06m	1567	-8.4	-29.3	-43.4	-31.0	1.8	-20.0	372.2
	1572	-7.9		-9.1	1.3	-39.9	-52.2	
	1615	-8.8		-43.2	-37.3	183.9	38.9	
	1620	-18.2		98.4	61.9	100.4	61.0	
Roof EL13.8m	1867	-13.6	-29.3	80.0	137.3	79.3	-33.9	372.2
	1872	-4.1		159.4	64.6	196.7	54.9	
	1915	-8.6		198.3	86.2	196.6	6.8	
	1920	-15.3		138.8	20.7	153.7	-8.6	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 7021 or 7521, whichever is greater.

Table 7.3-8 Rebar and Concrete Stresses (Walls): Site-Specific Seismic Load Combination CB-9

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				Horizontal direction		Vertical direction		
				Inside	Outside	Inside	Outside	
Wall EL-7.4m ~EL-2.0m	6007	-9.8	-29.3	13.2	116.5	21.0	136.7	372.2
	4006	-14.3		68.6	121.3	-27.7	168.0	
	4010	-10.7		29.2	176.7	36.6	224.9	
Wall EL-2.0m ~EL4.65m	6043	-9.2	-29.3	97.1	210.5	-25.4	150.6	372.2
	4036	-5.8		103.5	113.2	130.0	102.4	
	4040	-6.5		77.0	123.9	189.7	148.4	
Wall EL4.65m ~EL9.06m	6081	-7.8	-29.3	76.6	198.1	32.8	101.9	372.2
	4066	-15.8		87.4	200.8	-12.5	189.2	
	4070	-7.6		119.2	188.0	77.8	227.3	
Wall EL9.06m ~EL13.8m	6117	-17.6	-29.3	89.1	239.0	-33.2	147.1	372.2
	4096	-15.2		73.6	182.1	-11.5	181.0	
	4100	-12.8		99.8	180.4	17.4	254.8	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 7021 or 7521, whichever is greater.

Table 7.3-9 Maximum Stress Ratios (Basemat and Slabs) for Flexure and Membrane Forces

Location	Element	Concrete		Primary Reinforcement							
				NS direction				EW direction			
				Top		Bottom		Top		Bottom	
	ID	σ/σ_a	Load ID	σ/σ_a	Load ID	σ/σ_a	Load ID	σ/σ_a	Load ID	σ/σ_a	Load ID
Basemat EL-7.4m	67	0.228	7011	0.058	7011	0.095	7021	0.087	7011	0.078	7021
	72	0.367	7011	0.084	7011	0.370	7021	0.207	7501	0.434	7521
	115	0.234	7011	0.129	7501	0.292	7521	0.063	7501	0.041	7501
	120	0.254	7011	0.062	7021	0.078	7021	0.048	7021	0.096	7021
SlabB1F EL-2.0m	567	0.340	7021	0.041	7021	0.091	7011	0.374	7011	0.221	7501
	572	0.217	7021	0.080	3004	0.084	3002	0.025	7021	0.067	7011
	615	0.345	7021	0.185	7011	0.075	7501	0.216	7011	0.100	7501
	620	0.337	7001	0.418	7001	0.089	7001	0.480	7001	0.082	7001
Slab 1F EL4.65m	1067	0.751	7001	0.078	4022	0.527	7011	0.024	4024	0.185	7011
	1072	0.361	7001	0.131	7001	0.074	3002	0.084	7021	0.063	4022
	1115	0.606	7001	0.155	4014	0.052	4014	0.581	7001	0.092	7011
	1120	0.335	7021	0.211	4013	0.071	7501	0.224	4012	0.113	7501
Slab 2F EL9.06m	1567	0.417	7001	0.119	7021	0.368	7001	0.037	4012	0.130	4014
	1572	0.278	7021	0.371	7001	0.083	7501	0.160	7501	0.166	7501
	1615	0.413	7001	0.325	7001	0.179	7001	0.572	7001	0.107	7521
	1620	0.643	7021	0.270	7021	0.170	7021	0.276	7021	0.167	7021
Slab RF EL13.8m	1867	0.465	7021	0.215	7521	0.369	7021	0.213	7021	0.091	7021
	1872	0.154	4023	0.428	7021	0.174	7021	0.529	7021	0.238	7011
	1915	0.336	7011	0.533	7021	0.311	7501	0.528	7021	0.188	7501
	1920	0.523	7021	0.373	7021	0.087	7511	0.413	7021	0.076	7511

Table 7.3-10 Maximum Stress Ratios (Walls) for Flexure and Membrane Forces

Location	Element	Concrete		Primary Reinforcement							
				Horizontal direction				Vertical direction			
				Inside		Outside		Inside		Outside	
	ID	σ/σ_a	Load ID	σ/σ_a	Load ID	σ/σ_a	Load ID	σ/σ_a	Load ID	σ/σ_a	Load ID
Wall EL-7.4m ~EL-2.0m	6007	0.339	7021	0.092	7501	0.315	7521	0.075	7501	0.370	7021
	4006	0.506	7011	0.213	7501	0.348	7511	0.189	7501	0.457	7511
	4010	0.402	7011	0.170	7501	0.478	7021	0.166	7501	0.609	7021
Wall EL-2.0m ~EL4.65m	6043	0.315	7021	0.290	7501	0.590	7011	0.421	7501	0.445	7011
	4036	0.282	7001	0.286	7501	0.408	7011	0.484	7511	0.462	7501
	4040	0.317	7011	0.239	7511	0.380	7011	0.510	7521	0.399	7521
Wall EL4.65m ~EL9.06m	6081	0.267	7021	0.295	7501	0.532	7021	0.385	7511	0.421	7501
	4066	0.538	7021	0.235	7521	0.540	7021	0.221	7501	0.508	7521
	4070	0.320	4023	0.320	7021	0.505	7021	0.233	7501	0.611	7021
Wall EL9.06m ~EL13.8m	6117	0.600	7021	0.366	7501	0.642	7021	0.345	7511	0.395	7021
	4096	0.517	7021	0.322	7501	0.489	7021	0.331	7511	0.486	7021
	4100	0.436	7021	0.281	7011	0.485	7021	0.278	7011	0.685	7021

Table 7.3-11 Maximum Stress Ratios for Membrane Compressive Forces

Location	Element ID	Load ID	Section Forces (MN/m)			Thickness	Calculated Concrete Stress (MPa)				Allowable Stress	σ_c/σ_a
			N_x	N_y	N_{xy}	h (m)	σ_x	σ_y	τ_{xy}	σ_c	σ_a (MPa)	
Basemat EL-7.4m	67	3004	3.077	3.293	-0.076	3.0	1.0	1.1	0.0	1.1	16.6	0.07
	72	3001	3.988	0.998	-0.061	3.0	1.3	0.3	0.0	1.3	16.6	0.08
	115	7001	5.618	1.769	-1.498	3.0	1.9	0.6	-0.5	2.0	16.6	0.12
	120	3004	3.061	1.649	-0.173	3.0	1.0	0.5	-0.1	1.0	16.6	0.06
SlabB1F EL-2.0m	567	3002	1.679	0.333	0.009	0.5	3.4	0.7	0.0	3.4	20.7	0.16
	572	3004	2.587	1.026	0.190	0.5	5.2	2.1	0.4	5.2	20.7	0.25
	615	7021	1.737	0.565	-1.108	0.5	3.5	1.1	-2.2	4.8	25.9	0.19
	620	3004	1.207	0.599	1.574	0.5	2.4	1.2	3.1	5.0	20.7	0.24
Slab 1F EL4.65m	1067	4022	1.292	0.550	-0.025	0.5	2.6	1.1	0.0	2.6	25.9	0.10
	1072	7021	1.035	2.210	-0.237	0.5	2.1	4.4	-0.5	4.5	25.9	0.17
	1115	7021	1.880	0.251	0.450	0.5	3.8	0.5	0.9	4.0	25.9	0.15
	1120	7021	2.406	2.146	-2.027	0.5	4.8	4.3	-4.1	8.6	25.9	0.33
Slab 2F EL9.06m	1567	7021	2.594	1.116	-0.048	0.5	5.2	2.2	-0.1	5.2	25.9	0.20
	1572	7021	0.879	3.805	-0.539	0.5	1.8	7.6	-1.1	7.8	25.9	0.30
	1615	7021	3.276	-0.520	-0.184	0.5	6.6	-1.0	-0.4	6.6	25.9	0.25
	1620	7021	3.311	3.288	-4.116	0.5	6.6	6.6	-8.2	14.8	25.9	0.57
Slab RF EL13.8m	1867	7001	0.234	0.179	-0.075	0.7	0.3	0.3	-0.1	0.4	20.7	0.02
	1872	7001	0.462	0.970	-0.640	0.7	0.7	1.4	-0.9	2.0	20.7	0.10
	1915	7001	1.415	0.528	-0.494	0.7	2.0	0.8	-0.7	2.3	20.7	0.11
	1920	7021	0.325	0.456	0.480	0.7	0.5	0.7	0.7	1.3	25.9	0.05
Wall EL-7.4m ~EL-2.0m	6007	7001	2.084	1.682	-2.036	0.9	2.3	1.9	-2.3	4.4	20.7	0.21
	4006	7001	1.215	1.960	-1.209	0.9	1.3	2.2	-1.3	3.2	20.7	0.15
	4010	7001	0.775	1.448	-0.924	0.9	0.9	1.6	-1.0	2.3	20.7	0.11
Wall EL-2.0m ~EL4.65m	6043	7001	1.406	2.559	-2.831	0.9	1.6	2.8	-3.1	5.4	20.7	0.26
	4036	7001	1.341	1.512	2.120	0.9	1.5	1.7	2.4	3.9	20.7	0.19
	4040	7001	0.868	2.847	2.305	0.9	1.0	3.2	2.6	4.9	20.7	0.23
Wall EL4.65m ~EL9.06m	6081	7011	2.814	1.478	1.918	0.9	3.1	1.6	2.1	4.6	25.9	0.18
	4066	7011	2.626	0.910	1.828	0.9	2.9	1.0	2.0	4.2	25.9	0.16
	4070	7011	1.719	1.605	2.851	0.9	1.9	1.8	3.2	5.0	25.9	0.19
Wall EL9.06m ~EL13.8m	6117	7001	0.886	0.961	0.912	0.7	1.3	1.4	1.3	2.6	20.7	0.13
	4096	7001	0.745	0.581	1.005	0.7	1.1	0.8	1.4	2.4	20.7	0.12
	4100	7001	0.151	0.464	1.081	0.7	0.2	0.7	1.5	2.0	20.7	0.10

Note: Compressive forces are positive.

Table 7.3-12 Calculation Results for Maximum Transverse Shear

Location	Element ID	Load ID	Section Forces and Moments (MN/m, MN-m/m)								d	ρ_w	ρ_v	Shear Forces (MN/m)				$V_u/\phi V_n$
			N_x	N_y	N_{xy}	M_x	M_y	M_{xy}	Q_x	Q_y	(m)	(%)	(%)	V_u	V_c	V_s	ϕV_n	
Basemat EL-7.4m	67	7011	-2.501	-4.050	0.232	3.503	4.701	-0.214	0.820	-1.366	2.744	0.366	0.177	1.594	4.868	2.011	5.847	0.273
	72	7011	-2.714	-2.735	-1.278	4.321	2.874	-1.327	-1.441	0.481	2.719	0.370	0.177	1.520	2.499	1.992	3.818	0.398
	115	7521	0.666	-1.057	0.606	1.963	0.423	-0.818	0.495	0.757	2.743	0.366	0.177	0.905	2.370	2.010	3.723	0.243
	120	7021	-3.010	-2.082	-0.367	3.097	2.502	1.335	1.440	1.350	2.734	0.368	0.177	1.974	3.505	2.003	4.682	0.422
Slab B1F EL-2.0m	567	7001	-1.052	-0.730	-0.382	-0.131	-0.061	-0.017	-0.156	0.086	0.372	1.359	0.000	0.179	0.746	0.000	0.634	0.282
	572	7001	-1.815	-0.779	0.712	-0.040	-0.028	0.015	0.187	-0.012	0.360	1.402	0.000	0.187	0.891	0.000	0.757	0.247
	615	7011	-1.600	-0.576	-1.102	-0.123	-0.043	0.044	-0.124	0.034	0.363	1.390	0.000	0.128	0.764	0.000	0.649	0.197
	620	7001	-0.854	-0.446	1.589	-0.049	-0.065	-0.055	0.065	0.090	0.393	1.286	0.000	0.111	0.178	0.000	0.151	0.735
Slab 1F EL4.65m	1067	7011	-0.521	-0.130	-0.039	0.396	0.151	-0.024	0.065	0.051	0.379	1.332	0.000	0.082	0.360	0.000	0.306	0.269
	1072	7001	-0.884	-0.429	0.256	-0.202	-0.039	-0.005	0.215	0.010	0.360	1.402	0.000	0.216	0.593	0.000	0.504	0.428
	1115	7011	-0.683	-0.292	0.470	0.062	-0.355	-0.017	0.007	0.340	0.410	1.232	0.000	0.340	0.415	0.000	0.353	0.965
	1120	7001	-0.418	-0.183	0.517	-0.076	-0.060	-0.027	0.080	0.071	0.382	1.322	0.000	0.107	0.330	0.000	0.280	0.383
Slab 2F EL9.06m	1567	7011	-0.160	-0.119	-0.062	0.200	-0.023	-0.010	0.040	0.024	0.373	1.352	0.000	0.046	0.355	0.000	0.302	0.153
	1572	7001	0.363	-0.385	-0.440	-0.111	-0.033	-0.003	0.180	-0.002	0.360	1.403	0.000	0.180	0.276	0.000	0.234	0.769
	1615	7011	-1.546	0.433	-0.122	-0.033	-0.292	-0.016	0.025	0.320	0.410	1.233	0.081	0.321	0.300	0.137	0.372	0.865
	1620	7001	0.224	0.183	-0.384	-0.048	-0.049	-0.036	0.053	0.063	0.389	1.298	0.000	0.082	0.418	0.000	0.355	0.231
Slab RF EL13.8m	1867	7021	0.460	0.406	-0.085	0.284	-0.262	-0.020	0.064	0.010	0.511	1.479	0.000	0.064	0.409	0.000	0.347	0.185
	1872	7021	0.975	1.255	0.688	-0.130	-0.235	0.025	-0.125	0.012	0.500	1.511	0.000	0.125	0.318	0.000	0.270	0.463
	1915	7021	1.802	0.632	0.506	-0.116	-0.406	0.017	0.011	0.339	0.550	1.375	0.081	0.339	0.388	0.184	0.486	0.698
	1920	7011	-0.323	-0.292	0.250	-0.056	-0.057	-0.101	0.051	0.060	0.529	1.428	0.000	0.078	0.519	0.000	0.441	0.177
Wall EL-7.4m ~EL-2.0m	6007	7021	-1.680	-1.003	-2.036	0.559	0.622	0.069	0.141	0.492	0.676	1.491	0.355	0.512	1.489	0.994	2.110	0.242
	4006	7021	-0.895	-2.022	1.186	-0.242	-1.019	0.013	-0.011	-1.481	0.672	1.500	0.355	1.481	1.225	0.988	1.881	0.787
	4010	7021	0.768	1.120	-0.924	-0.406	-0.591	0.115	-0.110	-0.693	0.673	1.498	0.355	0.702	0.479	0.989	1.247	0.563
Wall EL-2.0m ~EL4.65m	6043	7011	1.146	-3.056	-3.113	0.180	0.719	-0.032	0.135	0.733	0.674	1.495	0.355	0.745	1.744	0.991	2.324	0.321
	4036	4013	-0.241	0.009	-0.006	-0.045	-0.003	-0.005	0.031	-0.790	0.672	1.500	0.710	0.791	0.654	1.975	2.235	0.354
	4040	7011	0.555	-3.663	-1.971	-0.218	-0.365	0.147	0.296	-0.514	0.682	1.478	0.355	0.593	1.202	1.002	1.874	0.317
Wall EL4.65m ~EL9.06m	6081	7021	1.735	-2.499	1.907	0.263	0.754	-0.030	-0.025	-0.290	0.673	1.497	0.000	0.291	1.494	0.000	1.270	0.229
	4066	7021	1.600	-1.575	1.763	-0.248	-0.858	-0.017	0.014	0.190	0.672	1.500	0.000	0.191	0.681	0.000	0.579	0.330
	4070	7521	1.112	-0.741	1.456	-0.283	-0.386	-0.019	-0.087	-0.078	0.694	1.452	0.000	0.117	0.300	0.000	0.255	0.458
Wall EL9.06m ~EL13.8m	6117	7021	1.448	-1.580	-1.426	0.162	0.690	0.010	-0.009	0.412	0.493	1.533	0.000	0.412	0.562	0.000	0.478	0.863
	4096	7021	1.206	-0.865	1.004	-0.120	-0.443	-0.004	0.009	-0.472	0.493	1.533	0.000	0.472	0.623	0.000	0.530	0.892
	4100	7521	0.600	-0.043	0.898	-0.081	-0.267	0.006	-0.074	-0.103	0.507	1.492	0.000	0.127	0.284	0.000	0.242	0.526

Table 7.3-13 Calculation Results for Transverse Shear by Selected Load Combination

Location	Element ID	Load ID	d (m)	ρ_w (%)	ρ_v (%)	Shear Forces (MN/m)				$V_u/\phi V_n$
						V_u	V_c	V_s	ϕV_n	
Basemat EL-7.4m	67	CB-9	2.745	0.366	0.177	1.537	4.798	2.011	5.788	0.266
	72	CB-9	2.720	0.370	0.177	1.477	2.483	1.993	3.805	0.388
	115	CB-9	2.743	0.366	0.177	0.905	2.370	2.010	3.723	0.243
	120	CB-9	2.734	0.368	0.177	1.974	3.505	2.003	4.682	0.422
Slab B1F EL-2.0m	567	CB-9	0.372	1.359	0.000	0.183	0.859	0.000	0.730	0.250
	572	CB-9	0.360	1.402	0.000	0.165	0.838	0.000	0.713	0.231
	615	CB-9	0.363	1.390	0.000	0.127	0.783	0.000	0.665	0.190
	620	CB-3	0.399	1.266	0.000	0.087	0.260	0.000	0.221	0.395
Slab 1F EL4.65m	1067	CB-9	0.378	1.336	0.000	0.082	0.370	0.000	0.314	0.262
	1072	CB-3	0.360	1.403	0.000	0.189	0.803	0.000	0.682	0.276
	1115	CB-9	0.410	1.232	0.000	0.325	0.415	0.000	0.352	0.923
	1120	CB-3	0.372	1.356	0.000	0.062	0.327	0.000	0.278	0.225
Slab 2F EL9.06m	1567	CB-3	0.374	1.350	0.000	0.030	0.362	0.000	0.308	0.098
	1572	CB-3	0.360	1.403	0.000	0.134	0.323	0.000	0.274	0.490
	1615	CB-9	0.407	1.240	0.081	0.243	0.339	0.136	0.404	0.600
	1620	CB-3	0.390	1.295	0.000	0.048	0.406	0.000	0.345	0.139
Slab RF EL13.8m	1867	CB-9	0.511	1.479	0.000	0.064	0.409	0.000	0.347	0.185
	1872	CB-9	0.500	1.511	0.000	0.125	0.318	0.000	0.270	0.463
	1915	CB-9	0.550	1.375	0.081	0.339	0.388	0.184	0.487	0.697
	1920	CB-9	0.537	1.408	0.000	0.076	0.524	0.000	0.445	0.171
Wall EL-7.4m ~EL-2.0m	6007	CB-9	0.676	1.491	0.355	0.512	1.489	0.994	2.110	0.242
	4006	CB-9	0.672	1.500	0.355	1.481	1.225	0.988	1.881	0.787
	4010	CB-9	0.673	1.498	0.355	0.702	0.479	0.989	1.247	0.563
Wall EL-2.0m ~EL4.65m	6043	CB-9	0.675	1.494	0.355	0.649	1.847	0.992	2.413	0.269
	4036	CB-3	0.673	1.498	0.710	0.967	1.227	1.978	2.724	0.355
	4040	CB-3	0.696	1.447	0.355	0.454	1.461	1.023	2.111	0.215
Wall EL4.65m ~EL9.06m	6081	CB-9	0.673	1.497	0.000	0.291	1.494	0.000	1.270	0.229
	4066	CB-9	0.672	1.500	0.000	0.191	0.681	0.000	0.579	0.330
	4070	CB-9	0.694	1.452	0.000	0.117	0.300	0.000	0.255	0.458
Wall EL9.06m ~EL13.8m	6117	CB-9	0.493	1.533	0.000	0.412	0.562	0.000	0.478	0.863
	4096	CB-9	0.493	1.533	0.000	0.472	0.623	0.000	0.530	0.892
	4100	CB-9	0.507	1.492	0.000	0.127	0.284	0.000	0.242	0.526

Note: Load Combination ID of CB-9 in Table 6.3-5 = 7021 or 7521, whichever is greater.

Table 7.3-14 Maximum Stress Ratio of Selected Columns at the rows CB and C2, X-direction

Member Name :		C2-CB-Column-B2F (top)									
Section ID : 5002					Section Type : BOX			CBAR ID : 50006			
Flange PL : 800 x 70					Web PL : 660 x 70			j- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.513	8201	-20.42	-0.54		-99.9	-11.8		315.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.013	5601	0.16	0.18		0.8	4.0		330.9	364.0	
f_v/F_v	0.006	8101			0.12			1.1			193.1

Member Name :		C2-CB-Column-B2F (bot)									
Section ID : 5002					Section Type : BOX			CBAR ID : 50006			
Flange PL : 800 x 70					Web PL : 660 x 70			i- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.483	8201	-20.42	0.00		-99.9	0.0		315.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.002	5601	0.16	0.00		0.8	0.0		330.9	364.0	
f_v/F_v	0.006	8101			0.12			1.1			193.1

Member Name :		C2-CB-Column-B1F (top)									
Section ID : 6002					Section Type : BOX			CBAR ID : 60003			
Flange PL : 800 x 70					Web PL : 660 x 70			j- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.501	8201	-17.37	1.60		-85.0	34.8		309.6	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.021	5601	1.03	0.10		5.0	2.1		330.9	364.0	
f_v/F_v	0.017	5001			-0.37			-3.3			193.1

Member Name :		C2-CB-Column-B1F (bot)									
Section ID : 6002					Section Type : BOX			CBAR ID : 60003			
Flange PL : 800 x 70					Web PL : 660 x 70			i- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.444	8201	-17.37	0.59		-85.0	12.8		309.6	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.038	5601	1.03	0.39		5.0	8.4		330.9	364.0	
f_v/F_v	0.017	5001			-0.37			-3.3			193.1

Table 7.3-14 Maximum Stress Ratio of Selected Columns at the rows CB and C2, X-direction (Continued)

Member Name :		C2-CB-Column-1F (top)									
Section ID : 7002				Section Type : BOX				CBAR ID :		70004	
Flange PL : 800 x 60				Web PL : 680 x 60						j- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.475	8201	-11.90	2.38		-67.0	58.4		318.2	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.024	5601	1.18	-0.06		6.7	-1.5		330.9	364.0	
f_v/F_v	0.061	8101			-1.13			-11.7			193.1

Member Name :		C2-CB-Column-1F (bot)									
Section ID : 7002				Section Type : BOX				CBAR ID :		70004	
Flange PL : 800 x 60				Web PL : 680 x 60						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.485	8201	-11.90	-2.54		-67.0	-62.3		318.2	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.034	5601	1.18	-0.21		6.7	-5.1		330.9	364.0	
f_v/F_v	0.061	8101			-1.13			-11.7			193.1

Member Name :		C2-CB-Column-2F (top)									
Section ID : 8002				Section Type : BOX				CBAR ID :		80004	
Flange PL : 800 x 60				Web PL : 680 x 60						j- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.340	5101	-4.49	3.24		-25.3	79.3		277.7	364.0	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.042	5601	1.14	0.33		6.4	8.1		330.9	364.0	
f_v/F_v	0.070	5101			-1.29			-13.5			193.1

Member Name :		C2-CB-Column-2F (bot)									
Section ID : 8002				Section Type :BOX				CBAR ID :		80004	
Flange PL : 800 x 60				Web PL :680 x 60						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.282	5101	-4.49	-2.37		-25.3	-58.2		277.7	364.0	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.030	5601	1.14	-0.16		6.4	-4.0		330.9	364.0	
f_v/F_v	0.070	5101			-1.29			-13.5			193.1

Table 7.3-15 Maximum Stress Ratio of Selected Columns at the rows CB and C2, Y-direction

Member Name :			C2-CB-Column-B2F (top)								
Section ID : 5002				Section Type : BOX				CBAR ID :		50006	
Flange PL : 800 x 70				Web PL : 660 x 70						j- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.528	8201	-20.42	0.80		-99.9	17.5		315.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.028	5601	0.16	0.42		0.8	9.2		330.9	364.0	
f_v/F_v	0.008	8101			-0.17			-1.5			193.1

Member Name :			C2-CB-Column-B2F (bot)								
Section ID : 5002				Section Type : BOX				CBAR ID :		50006	
Flange PL : 800 x 70				Web PL : 660 x 70						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.483	8201	-20.42	0.00		-99.9	0.0		315.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.002	5601	0.16	0.00		0.8	0.0		330.9	364.0	
f_v/F_v	0.008	8101			-0.17			-1.5			193.1

Member Name :			C2-CB-Column-B1F (top)								
Section ID : 6002				Section Type : BOX				CBAR ID :		60003	
Flange PL : 800 x 70				Web PL : 660 x 70						j- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.499	8201	-17.37	1.57		-85.0	34.2		309.6	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.016	5601	1.03	0.01		5.0	0.3		330.9	364.0	
f_v/F_v	0.023	8201			-0.49			-4.4			193.1

Member Name :			C2-CB-Column-B1F (bot)								
Section ID : 6002				Section Type : BOX				CBAR ID :		60003	
Flange PL : 800 x 70				Web PL : 660 x 70						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.506	8201	-17.37	-1.68		-85.0	-36.6		309.6	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.020	5601	1.03	-0.09		5.0	-1.9		330.9	364.0	
f_v/F_v	0.023	8201			-0.49			-4.4			193.1

Table 7.3-15 Maximum Stress Ratio of Selected Columns at the rows CB and C2, Y-direction (Continued)

Member Name :		C2-CB-Column-1F (top)									
Section ID : 7002				Section Type : BOX				CBAR ID : 70004			
Flange PL : 800 x 60				Web PL : 680 x 60				j- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.402	8201	-11.90	1.24		-67.0	30.3		318.2	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.023	5601	1.18	-0.04		6.7	-0.9		330.9	364.0	
f_v/F_v	0.032	8201			-0.60			-6.3			193.1

Member Name :		C2-CB-Column-1F (bot)									
Section ID : 7002				Section Type : BOX				CBAR ID : 70004			
Flange PL : 800 x 60				Web PL : 680 x 60				i- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.414	8201	-11.90	-1.42		-67.0	-34.8		318.2	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.022	5601	1.18	-0.03		6.7	-0.8		330.9	364.0	
f_v/F_v	0.032	8201			-0.60			-6.3			193.1

Member Name :		C2-CB-Column-2F (top)									
Section ID : 8002				Section Type : BOX				CBAR ID : 80004			
Flange PL : 800 x 60				Web PL : 680 x 60				j- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.368	8201	-7.08	2.77		-39.9	67.9		317.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.038	8601	0.16	0.56		0.9	13.7		351.6	386.8	
f_v/F_v	0.057	8201			-1.05			-11.0			193.1

Member Name :		C2-CB-Column-2F (bot)									
Section ID : 8002				Section Type : BOX				CBAR ID : 80004			
Flange PL : 800 x 60				Web PL : 680 x 60				i- edge			
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.307	8201	-7.08	-1.80		-39.9	-44.1		317.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.024	8601	0.16	-0.34		0.9	-8.3		351.6	386.8	
f_v/F_v	0.057	8201			-1.05			-11.0			193.1

Table 7.3-16 Maximum Stress Ratio of Selected Girders at the row CB

Member Name :		CB-B1F-Girder-23 (2end)									
Section ID : 1002				Section Type : H				CBAR ID :		11016	
Flange PL : 300 x 28				Web PL : 644 x 19						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.555	8101	-1.64	-0.43		-56.6	-64.7		328.7	229.6	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.142	5501	0.36	-0.23		12.4	-34.6		330.9	330.9	
f_v/F_v	0.107	3002			-0.20			-14.8			137.9

Member Name :		CB-B1F-Girder-45 (4end)									
Section ID : 1002				Section Type : H				CBAR ID :		11022	
Flange PL : 300 x 28				Web PL : 644 x 19						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.775	8101	-1.96	-0.68		-67.6	-103.0		328.7	229.6	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.155	5501	0.06	-0.33		2.2	-49.2		330.9	330.9	
f_v/F_v	0.143	3004			-0.26			-19.7			137.9

Member Name :		CB-1F-Girder-23 (2end)									
Section ID : 2004				Section Type : H				CBAR ID :		21016	
Flange PL : 400 x 40				Web PL : 920 x 28						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.842	5201	-0.80	-4.11		-13.9	-223.2		288.1	288.2	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.701	5101	0.52	-4.10		9.4	-223.1		330.9	330.9	
f_v/F_v	0.242	8201			-1.31			-46.8			193.1

Member Name :		CB-1F-Girder-45 (4end)									
Section ID : 1002				Section Type : H				CBAR ID :		21022	
Flange PL : 300 x 28				Web PL : 644 x 19						i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.607	5201	-0.73	-0.69		-25.3	-104.7		287.6	216.1	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.348	8101	0.36	-0.73		12.3	-110.0		351.6	351.6	
f_v/F_v	0.140	8201			-0.36			-27.1			193.1

Table 7.3-16 Maximum Stress Ratio of Selected Girders at the rows CB (Continued)

Member Name :		CB-2F-Girder-23 (2end)									
Section ID : 3003				Section Type : H					CBAR ID :		31016
Flange PL : 400 x 40				Web PL : 1220 x 28							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.726	8201	-3.40	-4.38		-51.4	-168.0		329.1	351.6	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.552	5101	1.07	-4.34		16.2	-166.6		330.9	330.9	
f_v/F_v	0.200	8201			-1.41			-38.6			193.1

Member Name :		CB-2F-Girder-45 (4end)									
Section ID : 3001				Section Type : H					CBAR ID :		31022
Flange PL : 300 x 36				Web PL : 928 x 28							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.686	8201	-2.23	-1.31		-46.8	-95.0		328.4	206.7	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.163	5101	0.73	-0.53		15.4	-38.6		330.9	330.9	
f_v/F_v	0.092	8201			-0.50			-17.8			193.1

Member Name :		CB-RF-Girder-23 (2end)									
Section ID : 4003				Section Type : H					CBAR ID :		41016
Flange PL : 500 x 40				Web PL : 1220 x 28							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.841	8201	-7.13	-4.10		-96.2	-132.3		329.6	351.6	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.331	5101	0.58	-3.46		7.8	-111.9		330.9	364.0	
f_v/F_v	0.192	8201			-1.35			-37.0			193.1

Member Name :		CB-RF-Girder-45 (4end)									
Section ID : 4001				Section Type : H					CBAR ID :		41022
Flange PL : 400 x 40				Web PL : 920 x 28							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.876	8201	-5.59	-2.30		-96.7	-125.1		329.3	306.2	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.195	5101	0.87	-0.91		15.0	-49.5		330.9	330.9	
f_v/F_v	0.137	8201			-0.74			-26.4			193.1

Table 7.3-17 Maximum Stress Ratio of Selected Girders at the row C2

Member Name :		C2-B1F-Girder-CB (Cend)									
Section ID : 1002				Section Type : H					CBAR ID :		10005
Flange PL : 300 x 28				Web PL : 644 x 19							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.375	8101	-1.56	-0.30		-53.9	-44.5		328.7	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.042	5501	0.39	0.00		13.5	-0.4		330.9	364.0	
f_v/F_v	0.037	8101			-0.10			-7.2			193.1

Member Name :		C2-B1F-Girder-BA (Bend)									
Section ID : 1001				Section Type : H					CBAR ID :		10007
Flange PL : 400 x 36				Web PL : 628 x 28							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.638	8101	-2.21	-1.69		-47.6	-157.8		329.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.290	5601	0.47	-1.01		10.2	-94.5		330.9	364.0	
f_v/F_v	0.207	3003			-0.56			-28.6			137.9

Member Name :		C2-1F-Girder-CB (Cend)									
Section ID : 2002				Section Type : H					CBAR ID :		20005
Flange PL : 300 x 28				Web PL : 644 x 19							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.229	5201	-0.56	-0.33		-19.3	-49.2		287.6	364.0	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.186	8101	0.56	-0.34		19.2	-50.7		351.6	386.8	
f_v/F_v	0.059	8201			-0.15			-11.3			193.1

Member Name :		C2-1F-Girder-BA (Bend)									
Section ID : 2001				Section Type : H					CBAR ID :		20007
Flange PL : 400 x 40				Web PL : 720 x 28							i- edge
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.453	5201	-0.82	-1.89		-15.6	-137.4		288.2	364.0	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.415	8101	0.91	-1.94		17.4	-141.5		351.6	386.8	
f_v/F_v	0.202	8201			-0.87			-39.1			193.1

Table 7.3-17 Maximum Stress Ratio of Selected Girders at the rows CB (Continued)

Member Name :		C2-2F-Girder-CB (Cend)									
Section ID : 3002					Section Type : H			CBAR ID :		30005	
Flange PL : 300 x 28					Web PL : 944 x 19					i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.400	8201	-2.02	-0.44		-58.1	-41.8		328.5	351.6	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.157	5101	0.46	-0.45		13.2	-42.8		330.9	364.0	
f_v/F_v	0.049	8201			-0.18			-9.5			193.1

Member Name :		C2-2F-Girder-BA (Bend)									
Section ID : 3001					Section Type : H			CBAR ID :		30007	
Flange PL : 300 x 36					Web PL : 928 x 28					i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.607	8201	-2.23	-2.02		-46.9	-147.0		328.4	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.346	5101	0.67	-1.52		14.0	-110.6		330.9	364.0	
f_v/F_v	0.156	8201			-0.84			-30.1			193.1

Member Name :		C2-RF-Girder-CB (Cend)									
Section ID : 4002					Section Type : H			CBAR ID :		40005	
Flange PL : 300 x 28					Web PL : 944 x 19					i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.684	8201	-3.36	-0.81		-96.7	-76.2		328.5	351.6	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.190	5101	0.75	-0.48		21.7	-45.4		330.9	364.0	
f_v/F_v	0.046	8201			-0.17			-8.9			193.1

Member Name :		C2-RF-Girder-BA (Bend)									
Section ID : 4001					Section Type : H			CBAR ID :		40007	
Flange PL : 400 x 40					Web PL : 920 x 28					i- edge	
Maximum Ratio		Load ID	Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)		
			P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.777	8201	-5.56	-2.22		-96.2	-120.6		329.3	386.8	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.226	5101	0.77	-1.25		13.3	-67.8		330.9	364.0	
f_v/F_v	0.180	8201			-0.97			-34.7			193.1

Table 7.3-18 Column Stress Check Results

Member Name : C2-CB-Column-B2F (top)								
Section ID : 5002			Section Type : BOX				CBAR ID :	50006
Flange PL : 800 x 70			Web PL : 660 x 70					j- edge
	X-direction			Y-direction			Ratio	
	Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	8201	0.513	0.317	8201	0.528	0.317	0.725	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	5601	0.013	0.002	5601	0.028	0.002	0.039	
f_v/F_v	8101	0.006		8101	0.008			0.010

Member Name : C2-CB-Column-B2F (bot)								
Section ID : 5002			Section Type : BOX				CBAR ID :	50006
Flange PL : 800 x 70			Web PL : 660 x 70					i- edge
	X-direction			Y-direction			Ratio	
	Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	8201	0.483	0.317	8201	0.483	0.317	0.649	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	5601	0.002	0.002	5601	0.002	0.002	0.002	
f_v/F_v	8101	0.006		8101	0.008			0.010

Member Name : C2-CB-Column-B1F (top)								
Section ID : 6002			Section Type : BOX				CBAR ID :	60003
Flange PL : 800 x 70			Web PL : 660 x 70					j- edge
	X-direction			Y-direction			Ratio	
	Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	8201	0.501	0.275	8201	0.499	0.275	0.726	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	5601	0.021	0.015	5601	0.016	0.015	0.022	
f_v/F_v	5001	0.017		8201	0.023			0.028

Member Name : C2-CB-Column-B1F (bot)								
Section ID : 6002			Section Type : BOX				CBAR ID :	60003
Flange PL : 800 x 70			Web PL : 660 x 70					i- edge
	X-direction			Y-direction			Ratio	
	Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	8201	0.444	0.275	8201	0.506	0.275	0.675	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	5601	0.038	0.015	5601	0.020	0.015	0.044	
f_v/F_v	5001	0.017		8201	0.023			0.028

Table 7.3-18 Column Stress Check Results (Continued)

Member Name : C2-CB-Column-1F (top)								
Section ID : 7002 Flange PL : 800 x 60			Section Type : BOX Web PL : 680 x 60				CBAR ID : 70004 j- edge	
	X-direction			Y-direction			Ratio	
	Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	8201	0.475	0.211	8201	0.402	0.211	0.667	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	5601	0.024	0.020	5601	0.023	0.020	0.027	
f_v/F_v	8101	0.061		8201	0.032			0.069

Member Name : C2-CB-Column-1F (bot)								
Section ID : 7002 Flange PL : 800 x 60			Section Type : BOX Web PL : 680 x 60				CBAR ID : 70004 i- edge	
	X-direction			Y-direction			Ratio	
	Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	8201	0.485	0.211	8201	0.414	0.211	0.688	
$f_{at}/F_{at}+f_{bt}/F_{bt}$	5601	0.034	0.020	5601	0.022	0.020	0.036	
f_v/F_v	8101	0.061		8201	0.032			0.069

Member Name : C2-CB-Column-2F (top)												
Section ID : 8002 Flange PL : 800 x 60				Section Type : BOX Web PL : 680 x 60						CBAR ID : 80004 j- edge		
Maximum Ratio		X-direction					Y-direction					
		Load ID	R_{NS}	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-R_{fa/Fa}$	Load ID	R_{NS}	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-R_{fa/Fa}$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.541	5101	0.340	0.213	0.091	0.462	8201	0.298	0.368	0.126	0.541
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.066	5601	0.042	0.020	0.019	0.042	8601	0.031	0.038	0.003	0.066
f_v/F_v	0.076	5101	0.070	0.029	-	0.076	8201	0.036	0.057	-	0.067

Member Name : C2-CB-Column-2F (bot)											
Section ID : 8002 Flange PL : 800 x 60				Section Type : BOX Web PL : 680 x 60						CBAR ID : 80004 i- edge	
Maximum Ratio		X-direction					Y-direction				
		Load ID	R_{NS}	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-R_{fa/Fa}$	Load ID	R_{NS}	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-R_{fa/Fa}$
$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.452	5101	0.282	0.189	0.091	0.380	8201	0.271	0.307	0.126	0.452
$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.051	5601	0.030	0.020	0.019	0.031	8601	0.030	0.024	0.003	0.051
f_v/F_v	0.076	5101	0.070	0.029	-	0.076	8201	0.036	0.057	-	0.067

Table 7.4-1 Dynamic Soil Pressures for Evaluating CB External Walls

EL (m)	H (m)	C1 and C5 Walls σ (MN/m^2)	CA and CD Walls σ (MN/m^2)
4.650			
	7.770	-	-
-3.120			
	0.845	0.060	0.068
-3.965			
	1.720	0.244	0.274
-5.685			
	1.715	0.489	0.550
-7.400			
	3.000	-	-
-10.400			

Table 7.4-2 Rebar and Concrete Stresses of CB External Walls: Site-Specific Seismic Load Combination CB-9

Location	Element ID	Concrete Stress (MPa)		Primary Reinforcement Stress (MPa)				
		Calculated	Allowable	Calculated				Allowable
				Horizontal direction		Vertical direction		
				Inside	Outside	Inside	Outside	
Wall EL-7.4m ~EL-2.0m	6007	-9.5	-29.3	32.7	138.0	25.5	149.9	372.2
	4006	-10.4		33.1	122.2	-23.7	132.8	
	4010	-3.3		62.4	96.4	22.0	173.7	
Wall EL-2.0m ~EL4.65m	6043	-9.8	-29.3	93.7	194.2	-27.7	127.4	372.2
	4036	-6.0		112.7	128.8	142.4	108.1	
	4040	-5.1		122.5	141.6	144.1	213.3	

Notes: Negative value means compression.
Load Combination ID in Table 6.3-5 = 7021 or 7521, whichever is greater.

Table 7.4-3 Maximum Transverse Shear of CB External Walls

Location	Element ID	Load ID	d (m)	ρ_w (%)	ρ_v (%)	Shear Forces (MN/m)				$V_u/\phi V_n$
						V_u	V_c	V_s	ϕV_n	
Wall EL-7.4m ~EL-2.0m	6007	7021	0.679	1.485	0.355	0.553	0.638	0.998	1.391	0.397
	4006	7021	0.672	1.500	0.355	1.160	1.488	0.988	2.104	0.551
	4010	7021	0.675	1.493	0.355	0.559	0.539	0.992	1.301	0.430
Wall EL-2.0m ~EL4.65m	6043	7511	0.674	1.495	0.355	0.164	0.608	0.991	1.359	0.121
	4036	7511	0.673	1.498	0.710	0.135	0.523	1.978	2.126	0.063
	4040	7021	0.677	1.489	0.355	0.279	0.532	0.995	1.298	0.215

{ }

Figure 3.3-1 Concrete Outline Plan at EL -7.40

{ }

Figure 3.3-2 Concrete Outline Plan at EL -2.00

{ }

Figure 3.3-3 Concrete Outline Plan at EL 4.65

{ }

Figure 3.3-4 Concrete Outline Plan at EL 9.06

{ }

Figure 3.3-5 Concrete Outline Plan at EL 13.80

{ }

Figure 3.3-6 Concrete Outline E-W Section

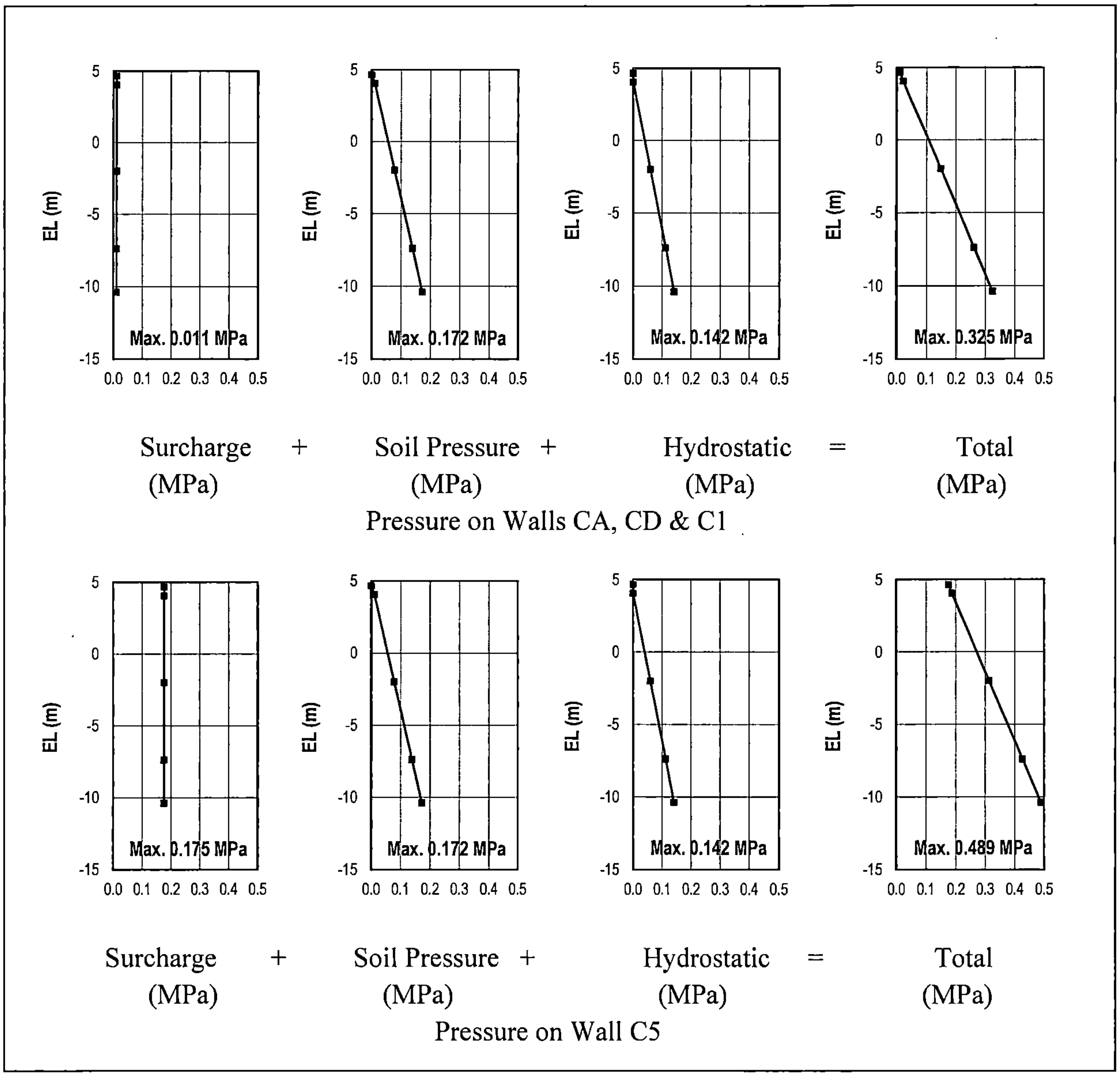


Figure 5.2-1 Soil Pressure at Rest

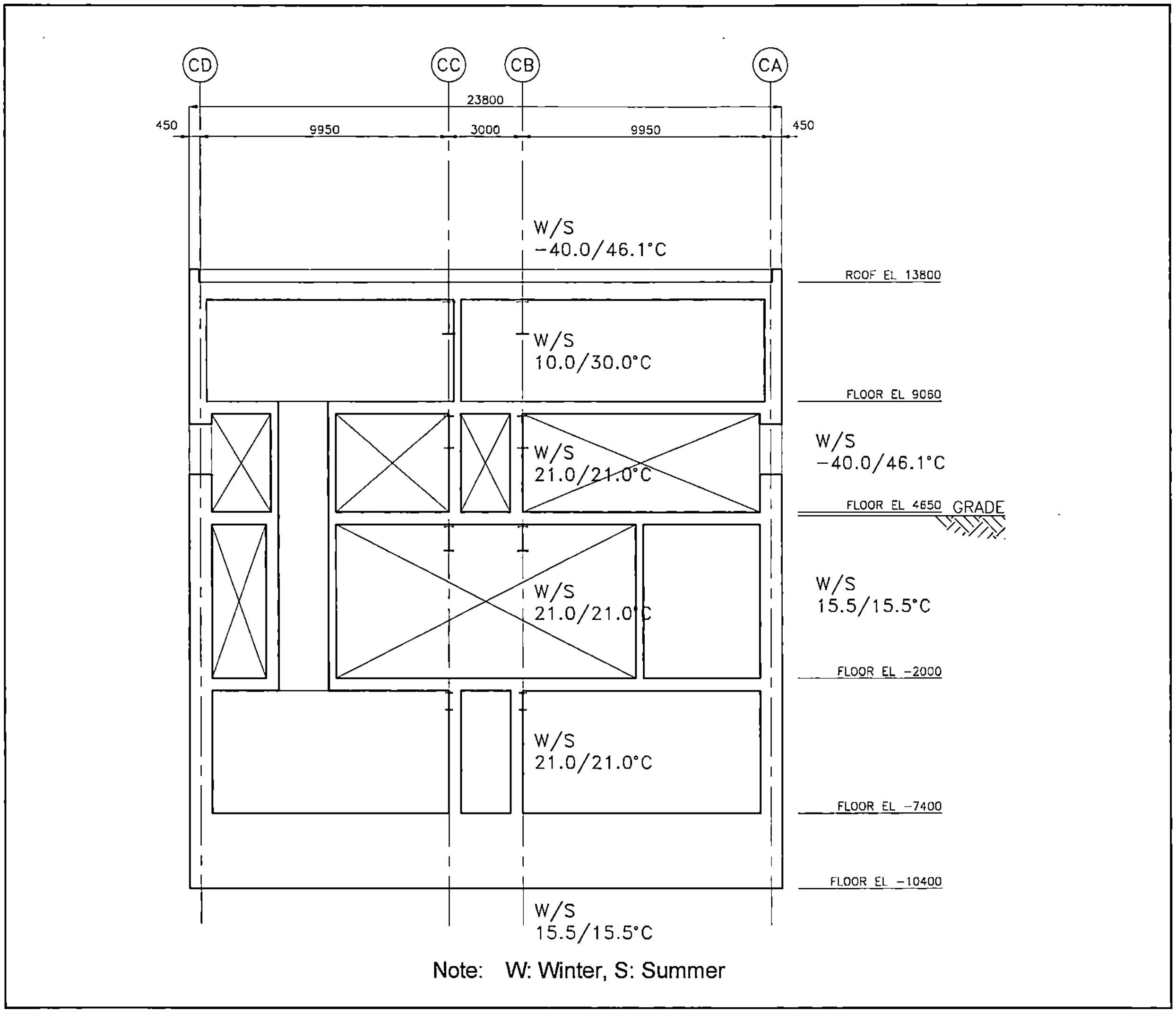


Figure 5.3-1 Normal Operation Temperatures

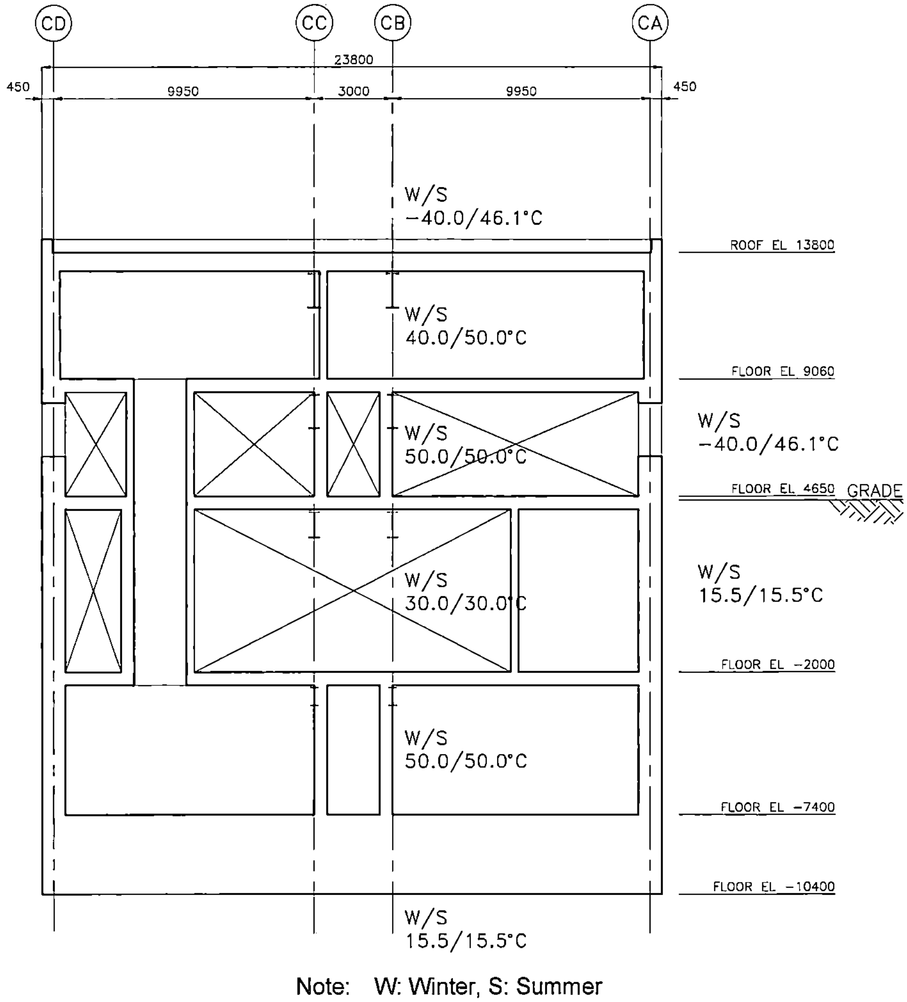
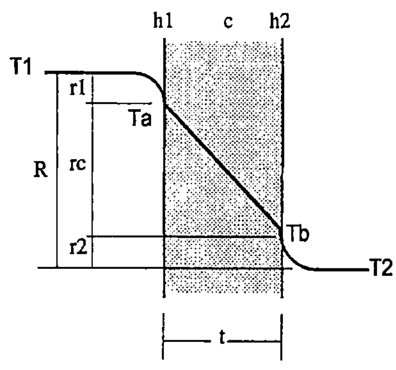


Figure 5.3-2 DBA Temperatures



c = thermal conductivity of concrete
1.4 (kcal/m h °C)

h1, h2 = thin film coefficient (kcal/m2 h °C)

r1, r2, rc = resistance of heat conduction

r1, r2 = 1/h1, 1/h2 (m2 h °C/kcal)

rc = t/c (m2 h °C/kcal)

R = total thermal resistance = r1 + r2 + rc

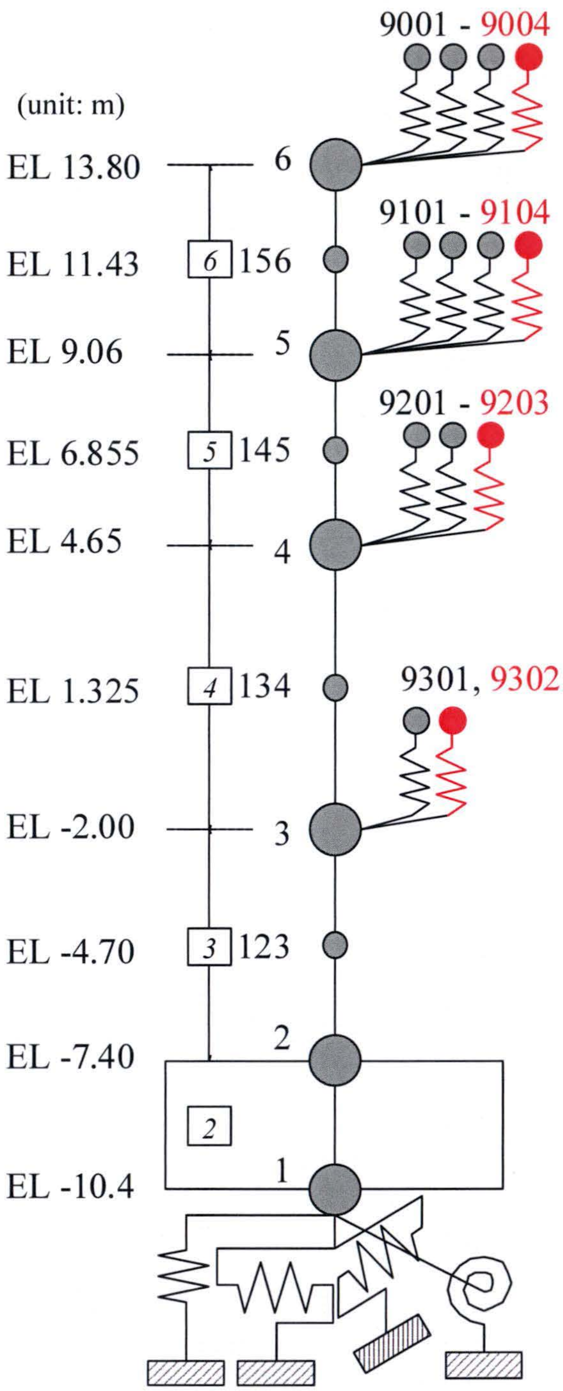
Ta = T1 - (T1-T2) r1/ R

Tb = T1 - (T1-T2) (r1+rc)/ R

Td = (Ta+Tb) / 2

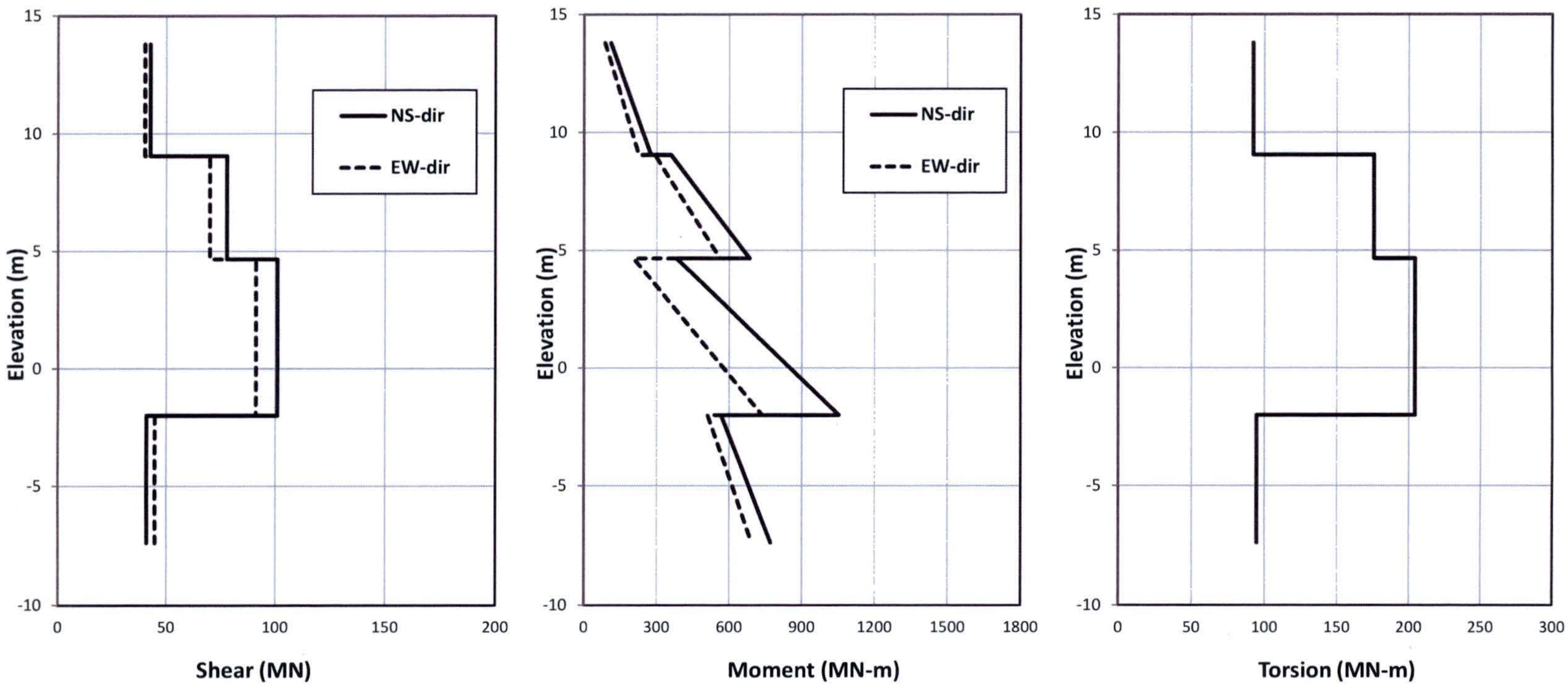
Tg = Ta-Tb

Figure 5.3-3 Heat Transfer Analysis



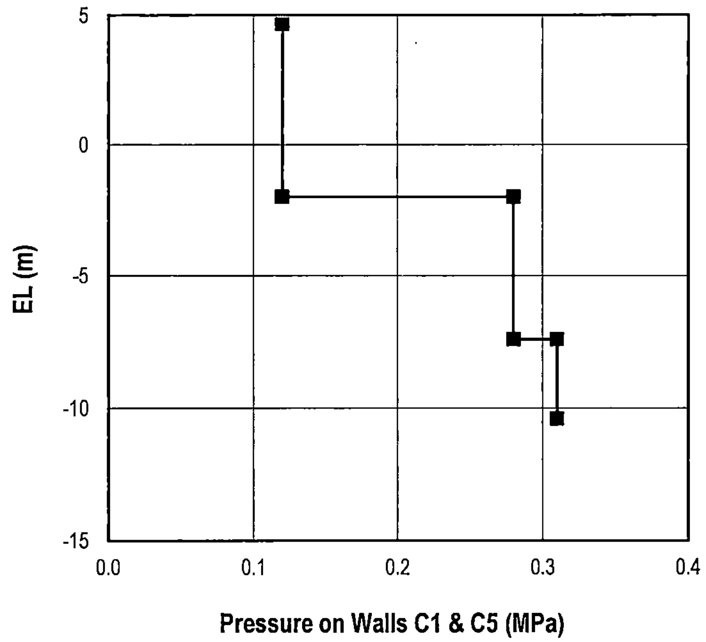
Note: Oscillators in red are only added in Cracked model.

Figure 5.6-1 Dynamic Analysis Model



Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k.

Figure 5.6-2 Design Seismic Shear and Moments for CB



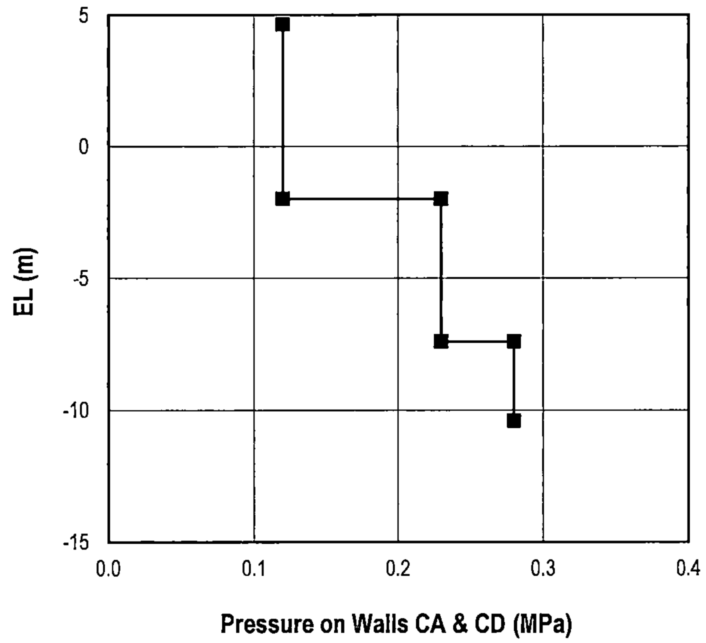
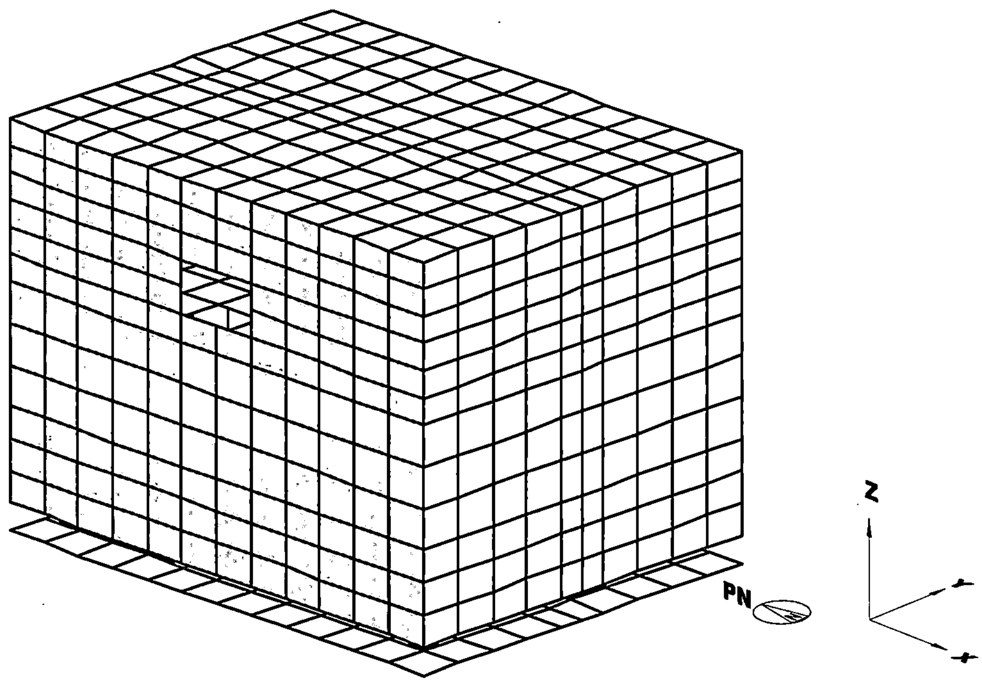
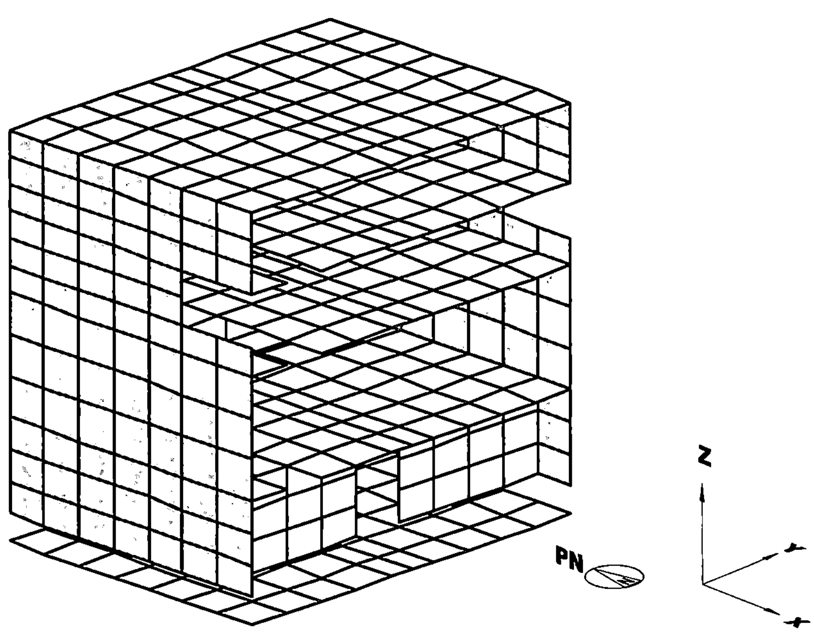


Figure 5.6-3 Seismic Lateral Soil Pressure



Whole View



Cut View

Figure 6.2-1 FE Model (Isometric View)

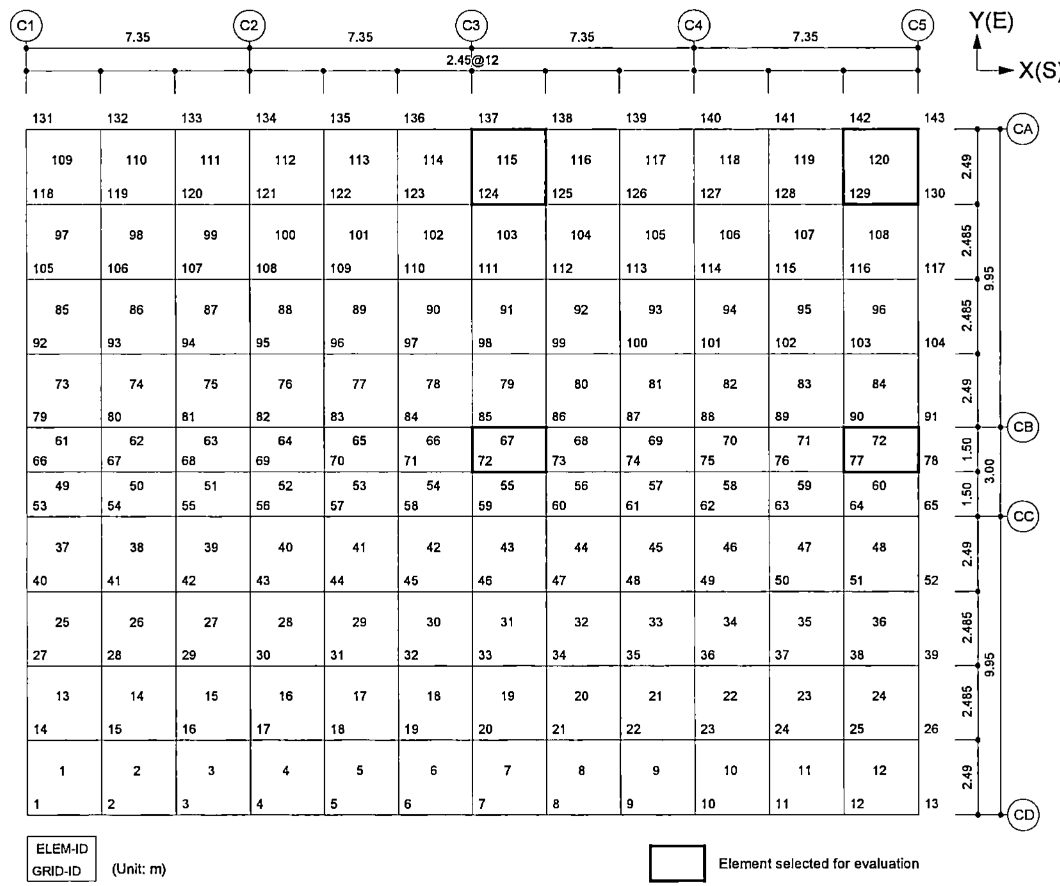


Figure 6.2-2 FE Model, Basemat EL -7.40

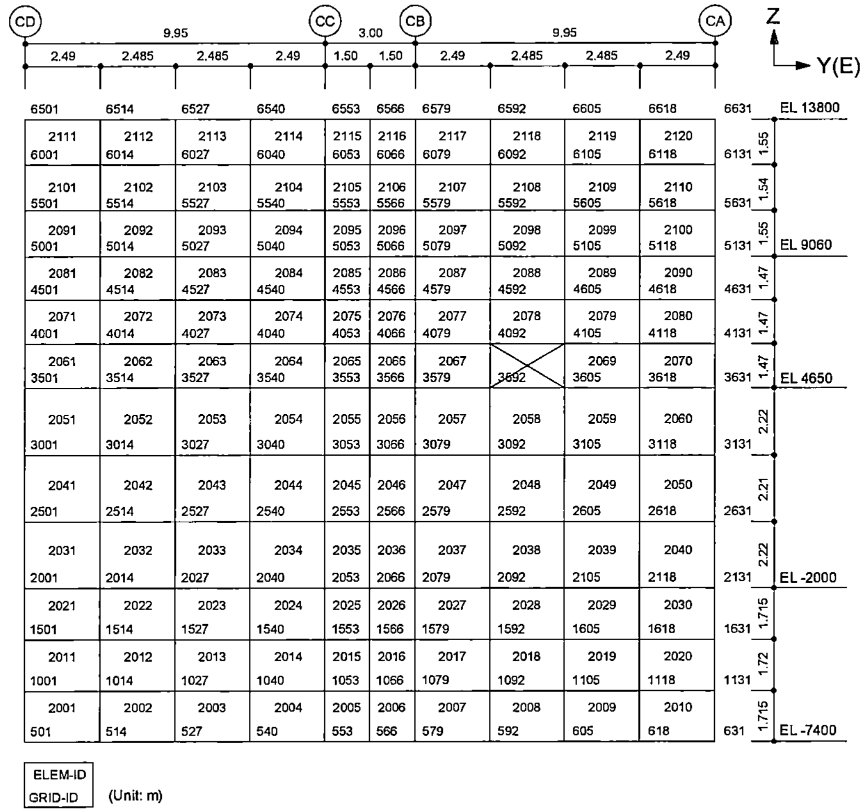


Figure 6.2-3 FE Model, North Wall

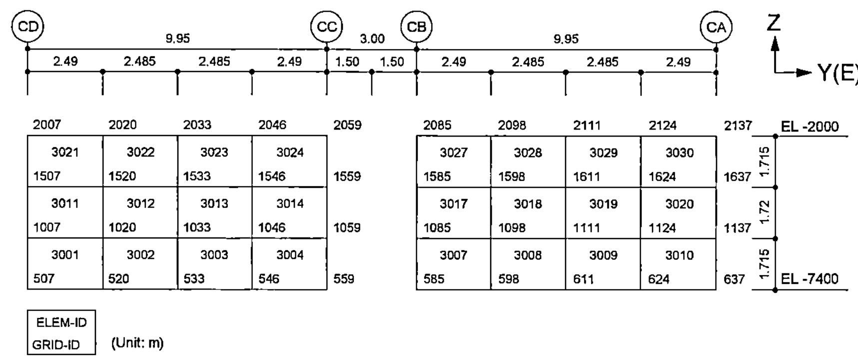


Figure 6.2-4 FE Model, Inner Wall

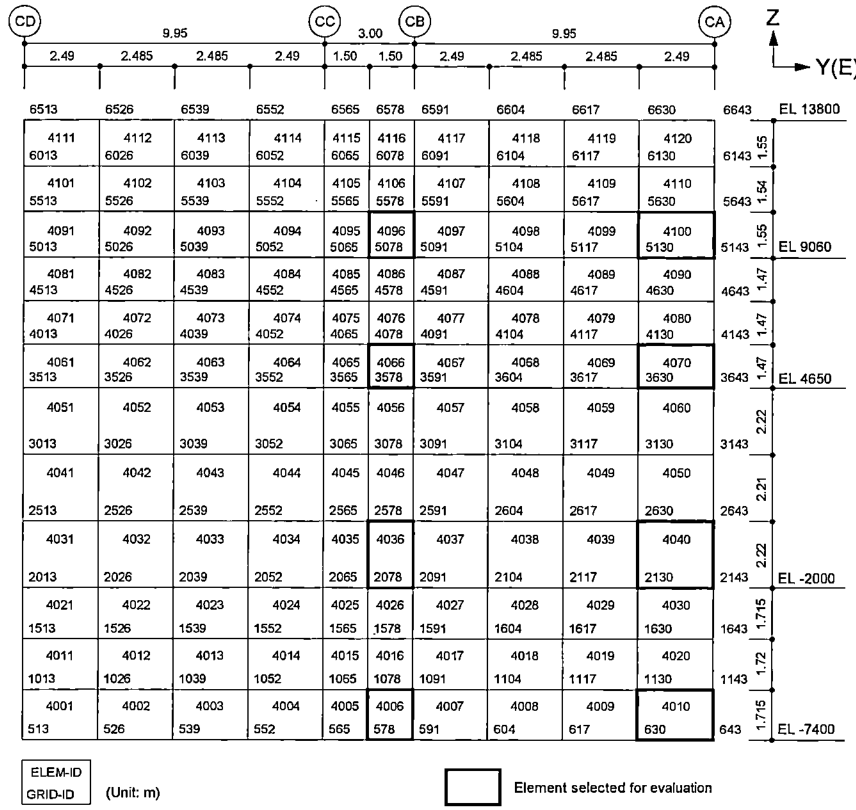


Figure 6.2-5 FE Model, South Wall

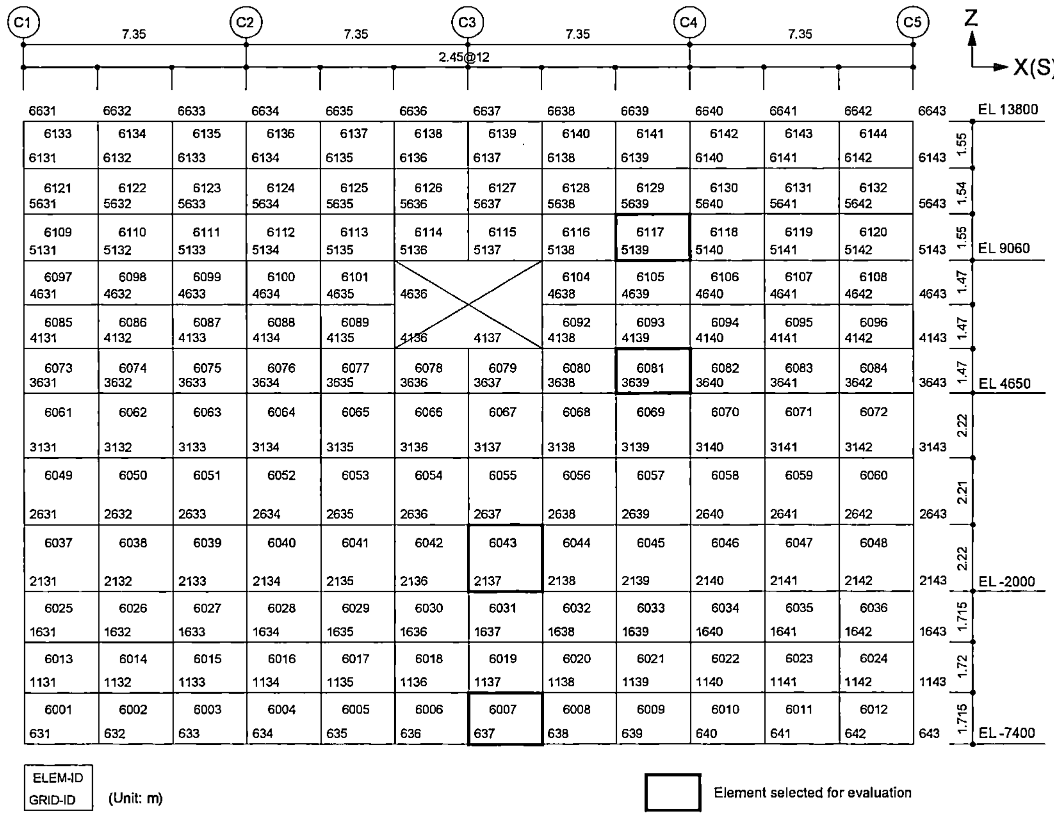


Figure 6.2-6 FE Model, East Wall

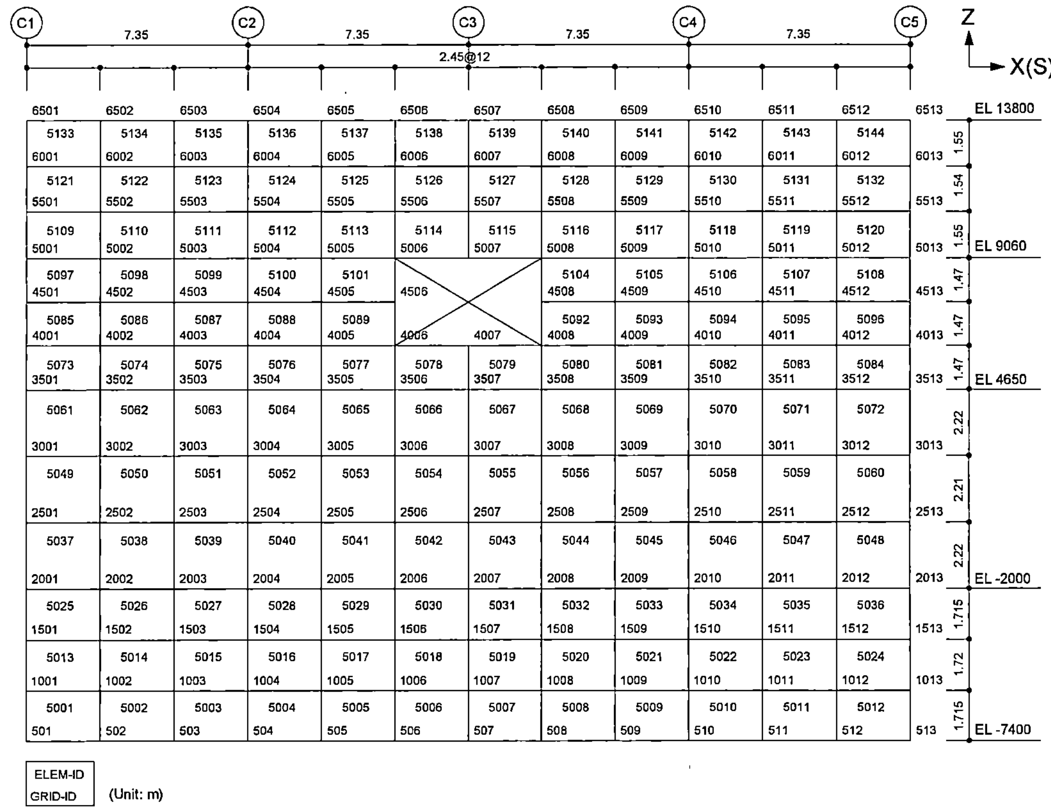


Figure 6.2-7 FE Model, West Wall

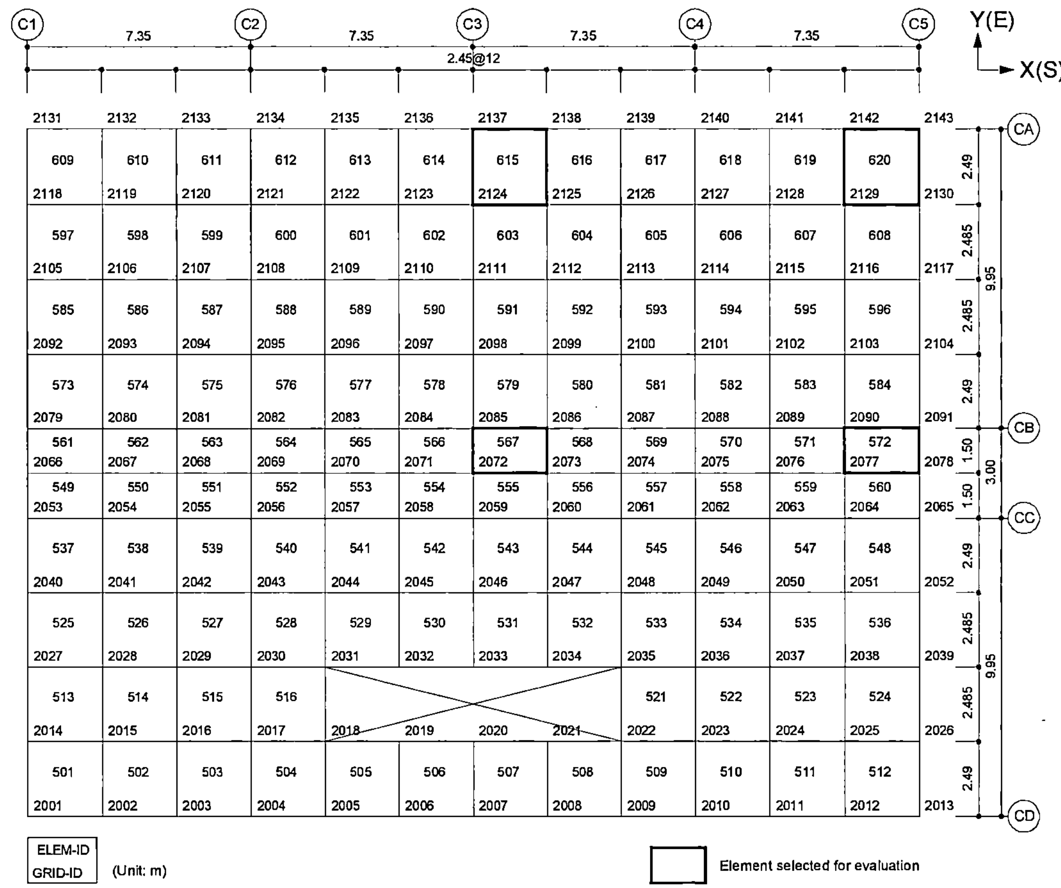


Figure 6.2-8 FE Model, B1F EL -2.00

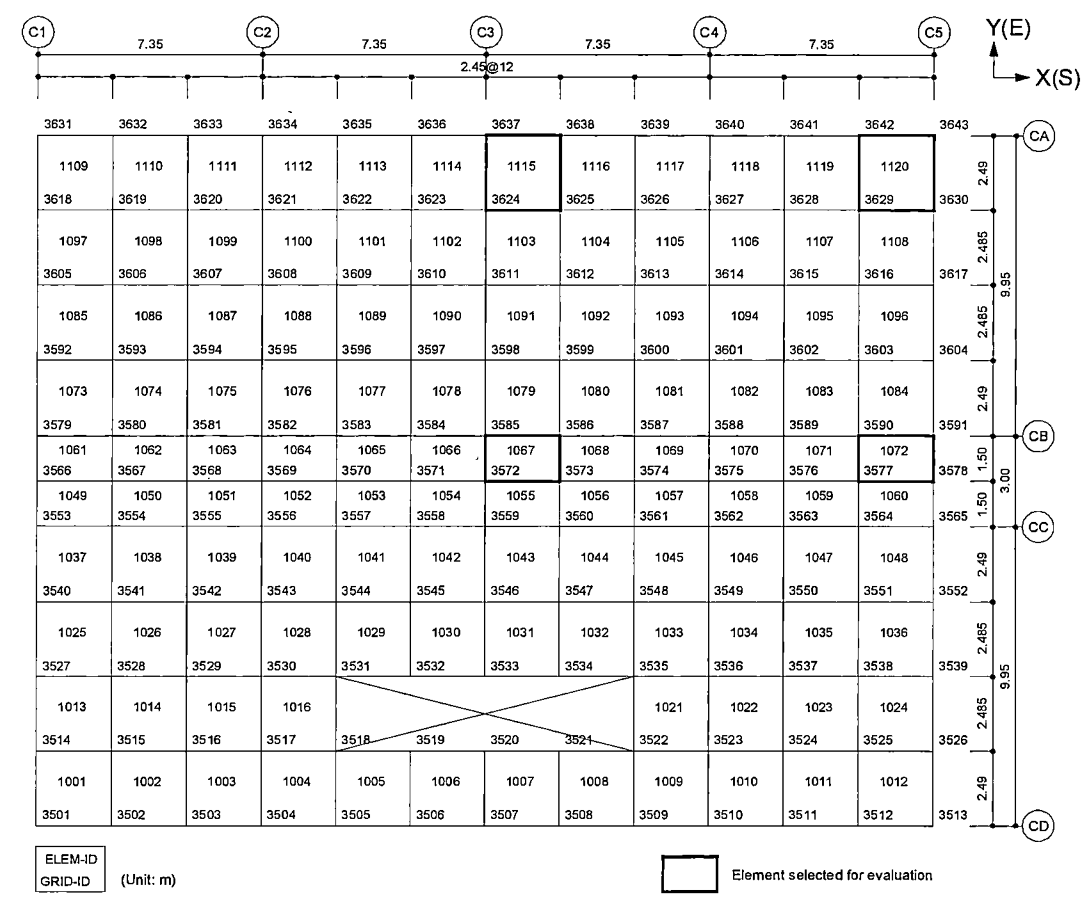


Figure 6.2-9 FE Model, 1F EL 4.65

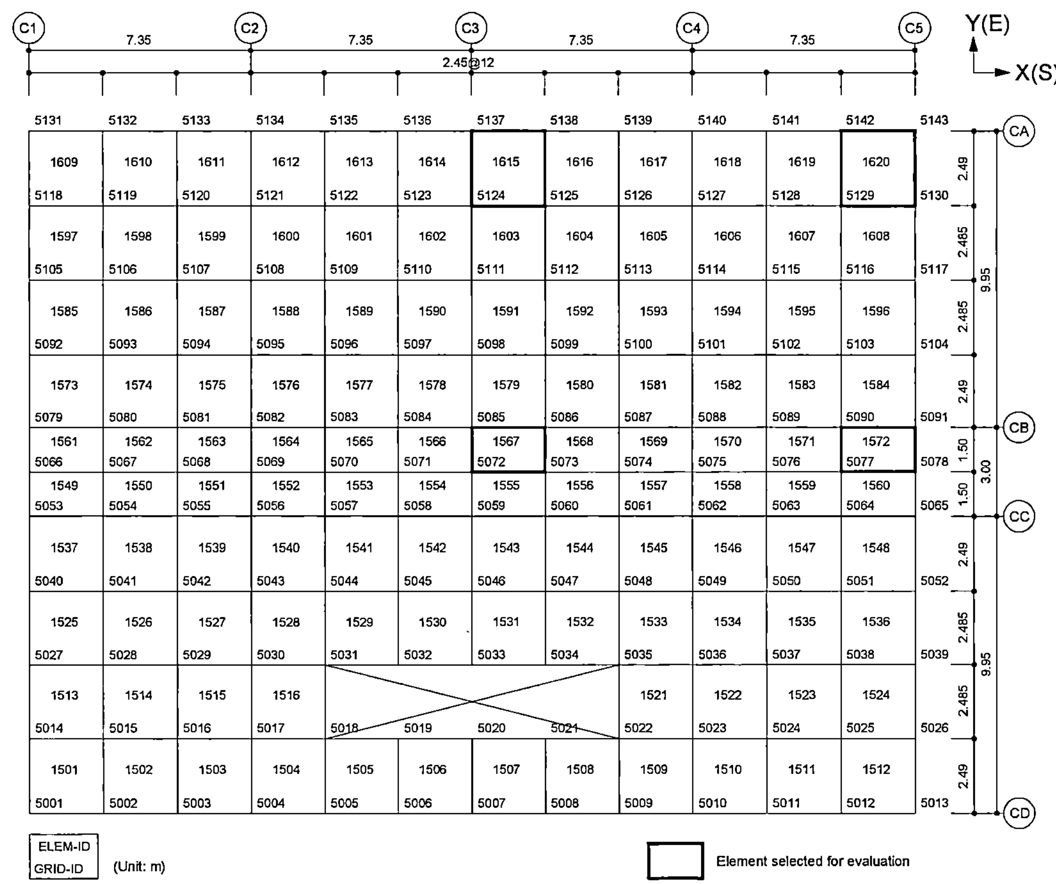


Figure 6.2-10 FE Model, 2F EL 9.06

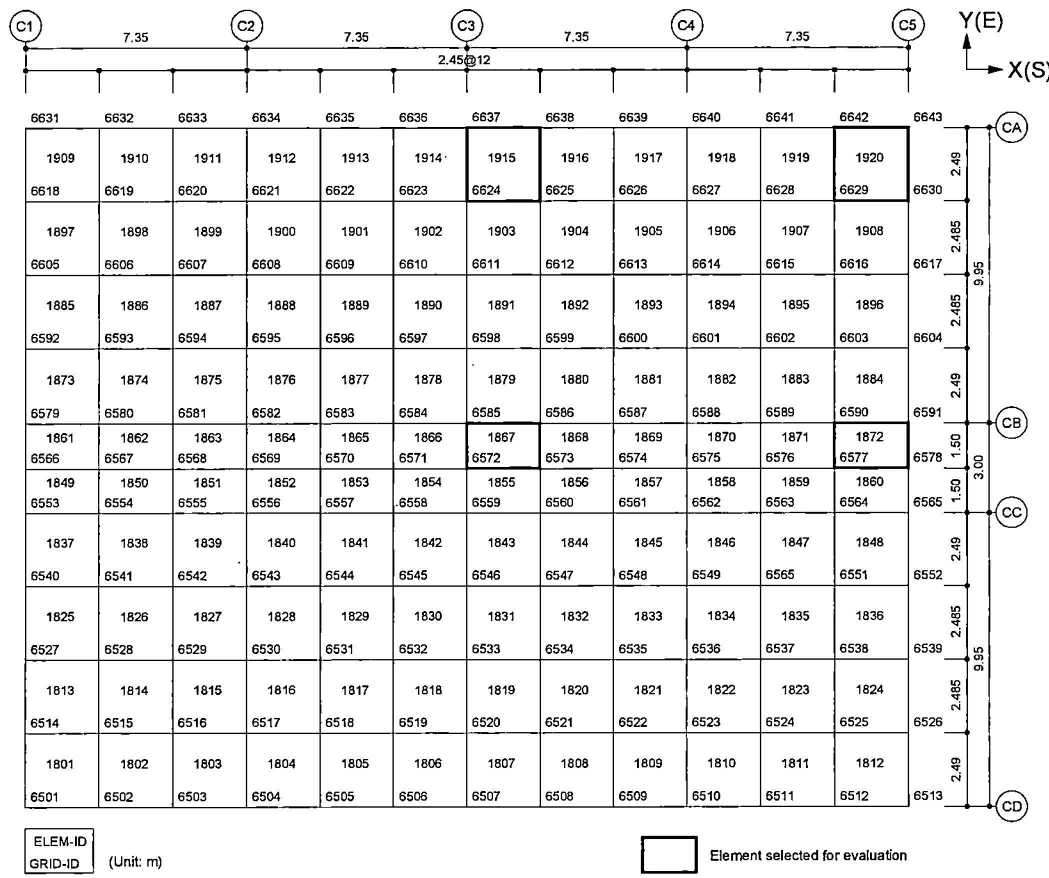


Figure 6.2-11 FE Model, Roof EL 13.80

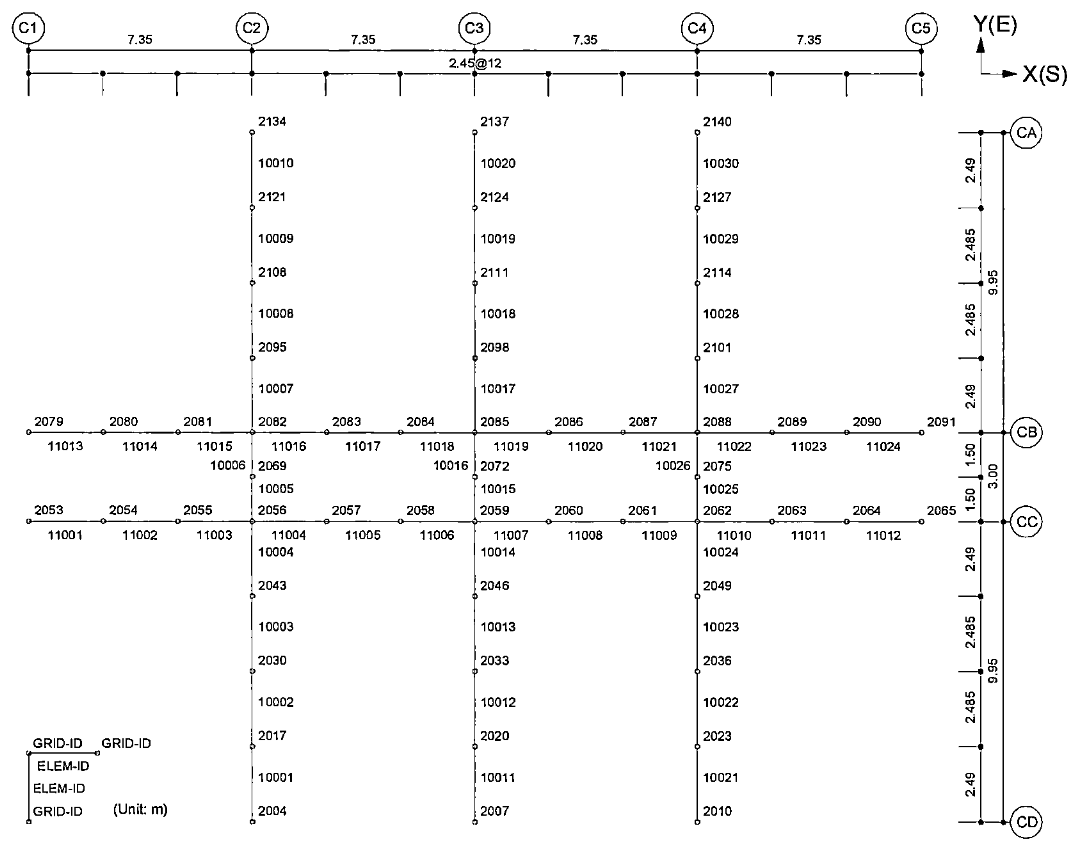


Figure 6.2-12 FE Model of Steel Plan, EL -2.00

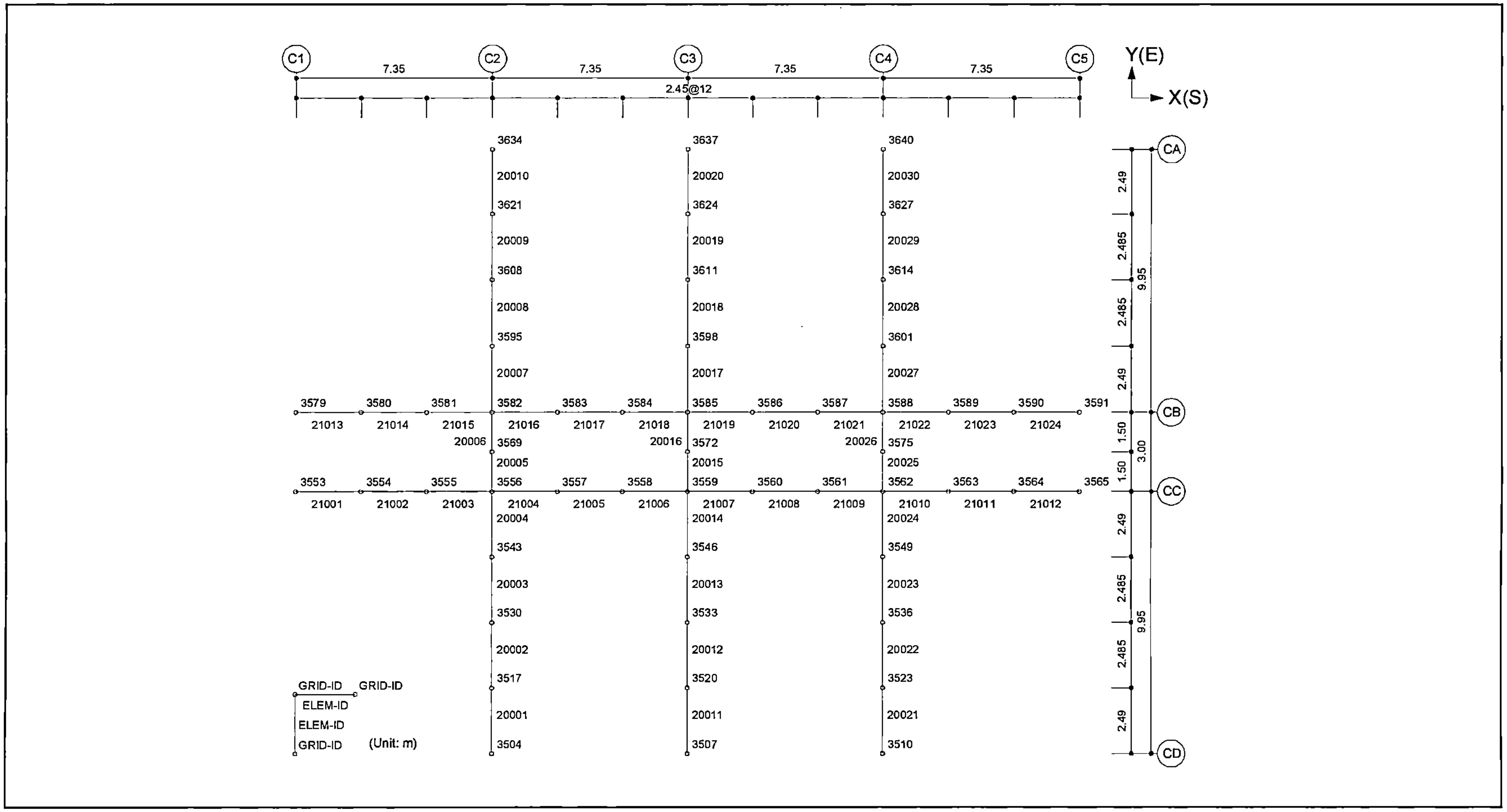


Figure 6.2-13 FE Model of Steel Plan, EL 4.65

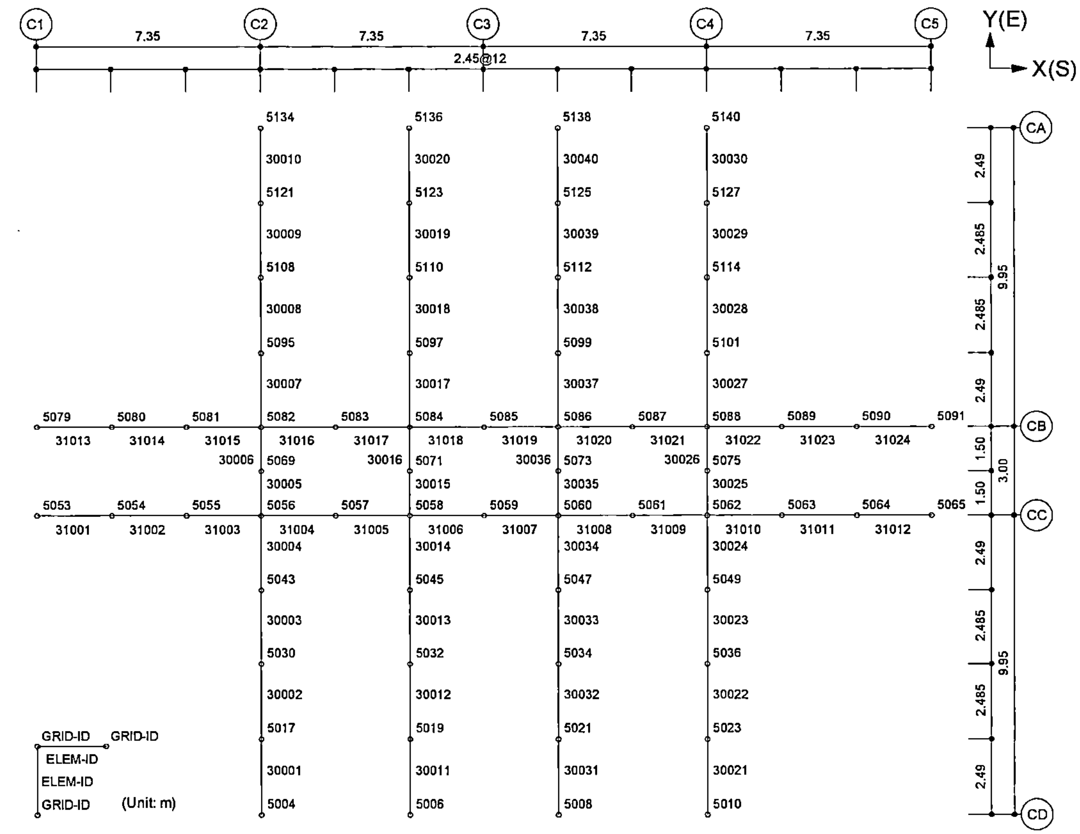


Figure 6.2-14 FE Model of Steel Plan, EL 9.06

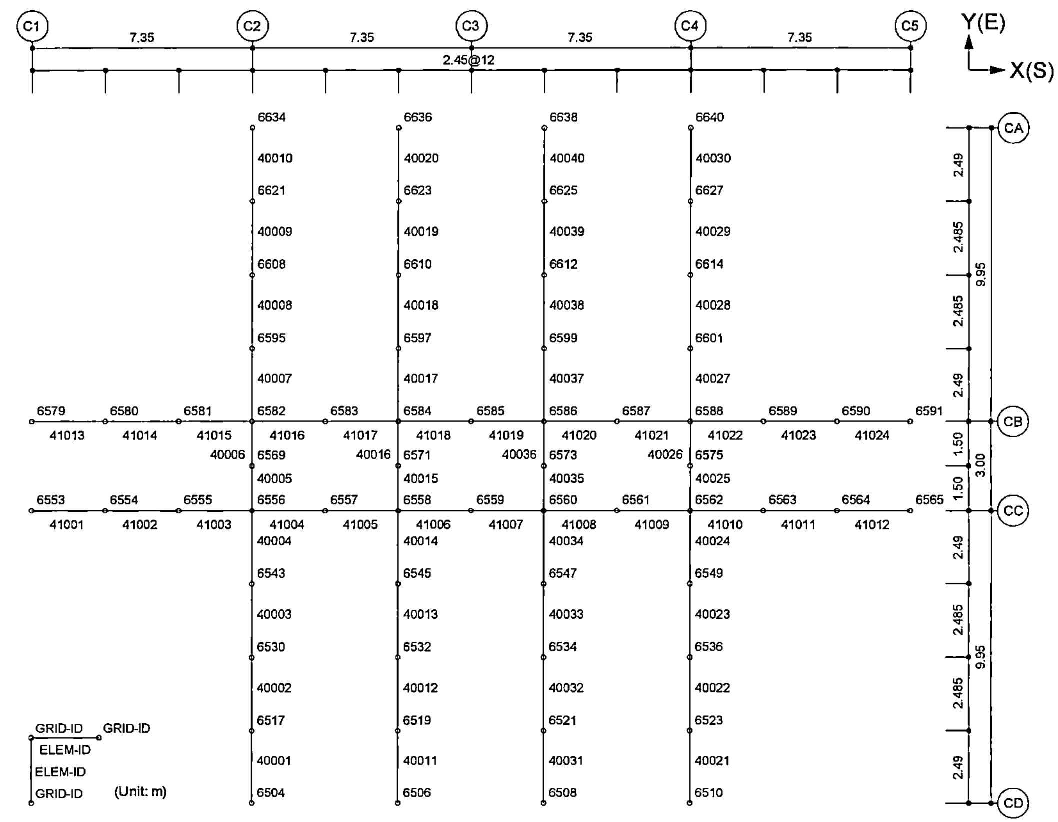


Figure 6.2-15 FE Model of Steel Plan, EL 13.80

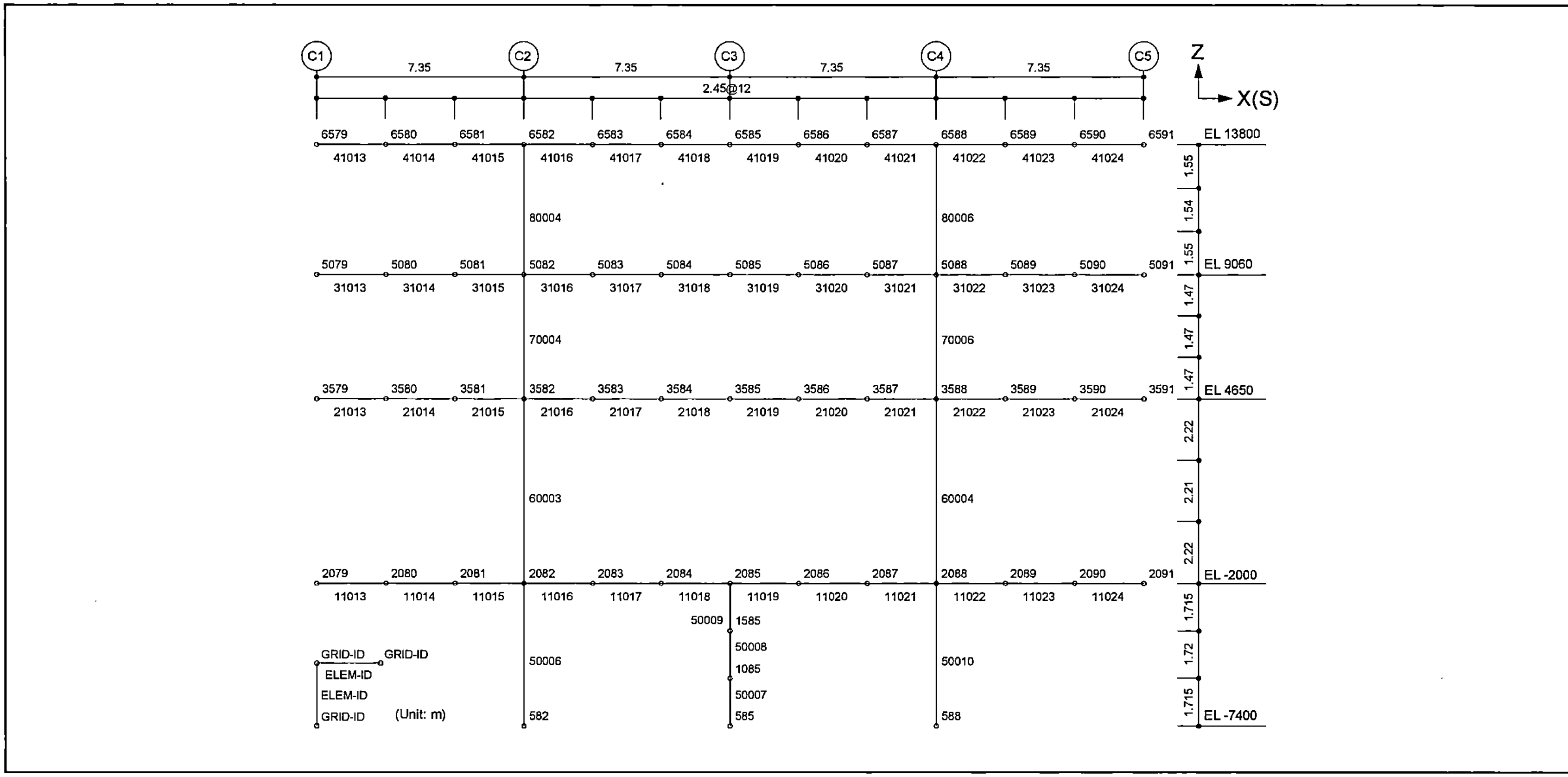


Figure 6.2-16 FE Model of CB Steel Frame

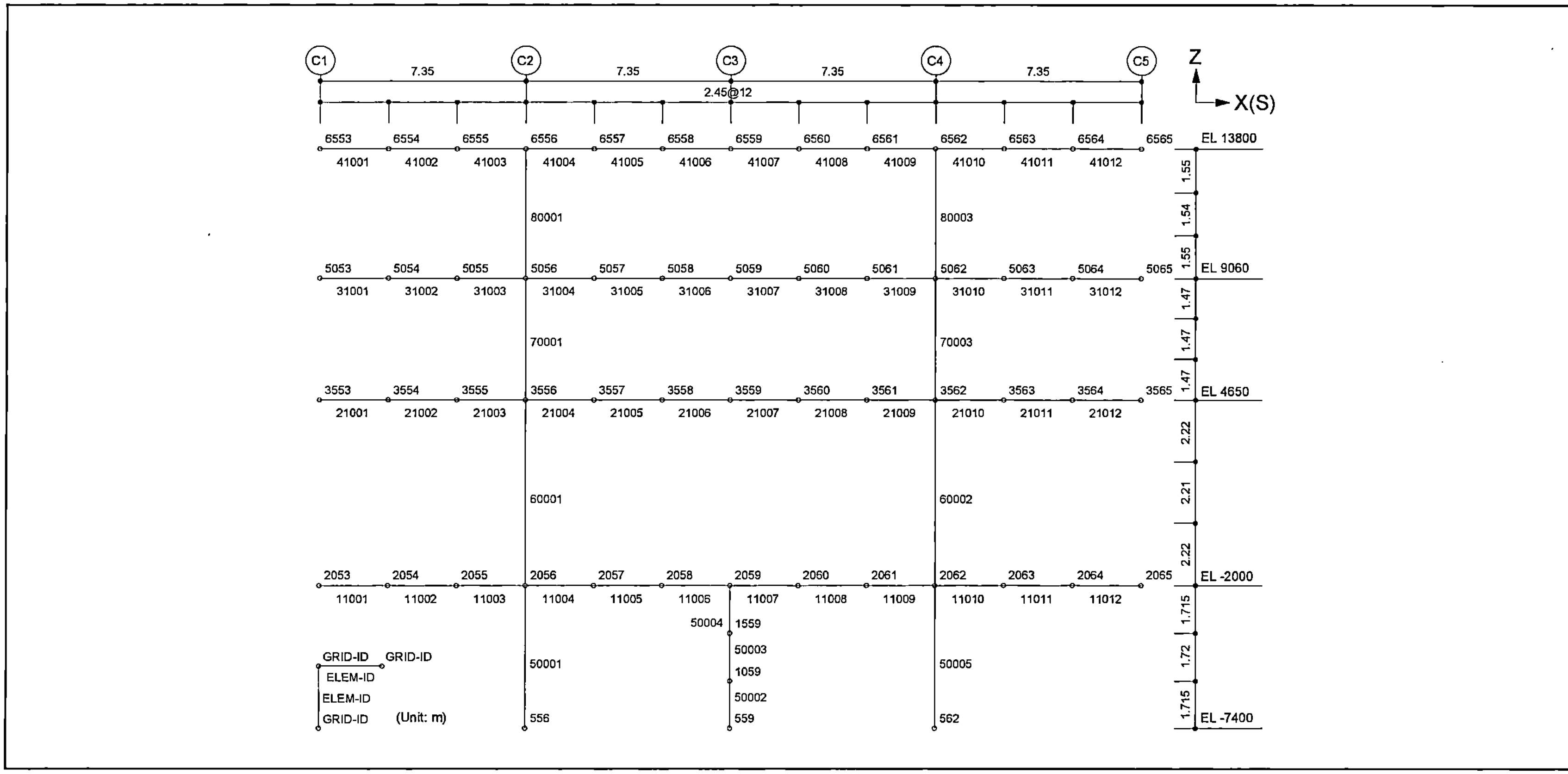


Figure 6.2-17 FE Model of CC Steel Frame

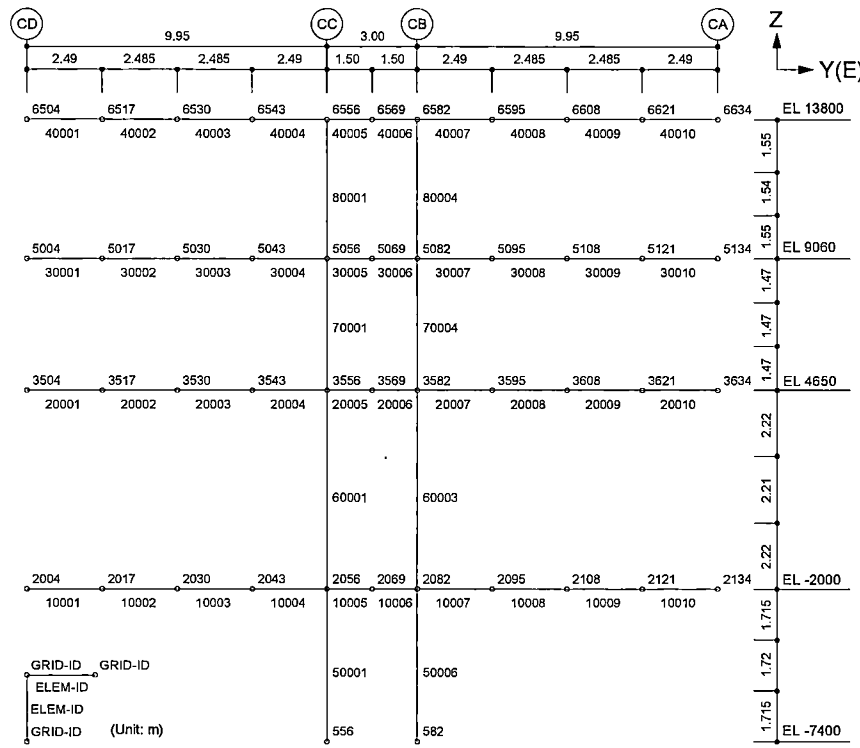


Figure 6.2-18 FE Model of C2 Steel Frame

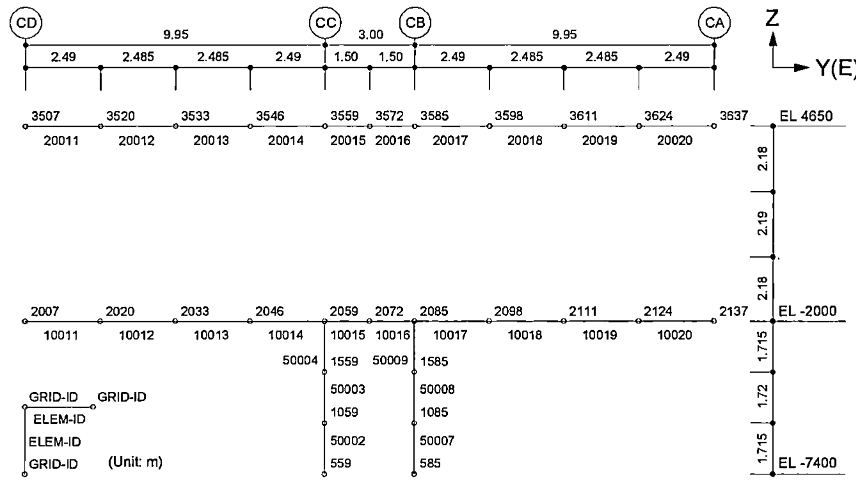


Figure 6.2-19 FE Model of C3 Steel Frame

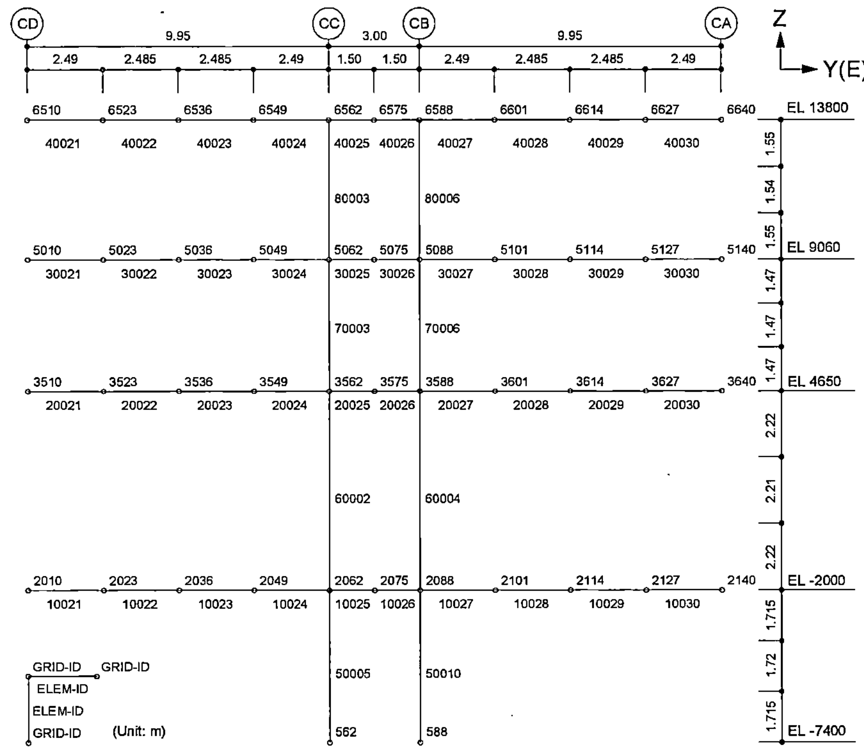


Figure 6.2-20 FE Model of C4 Steel Frame

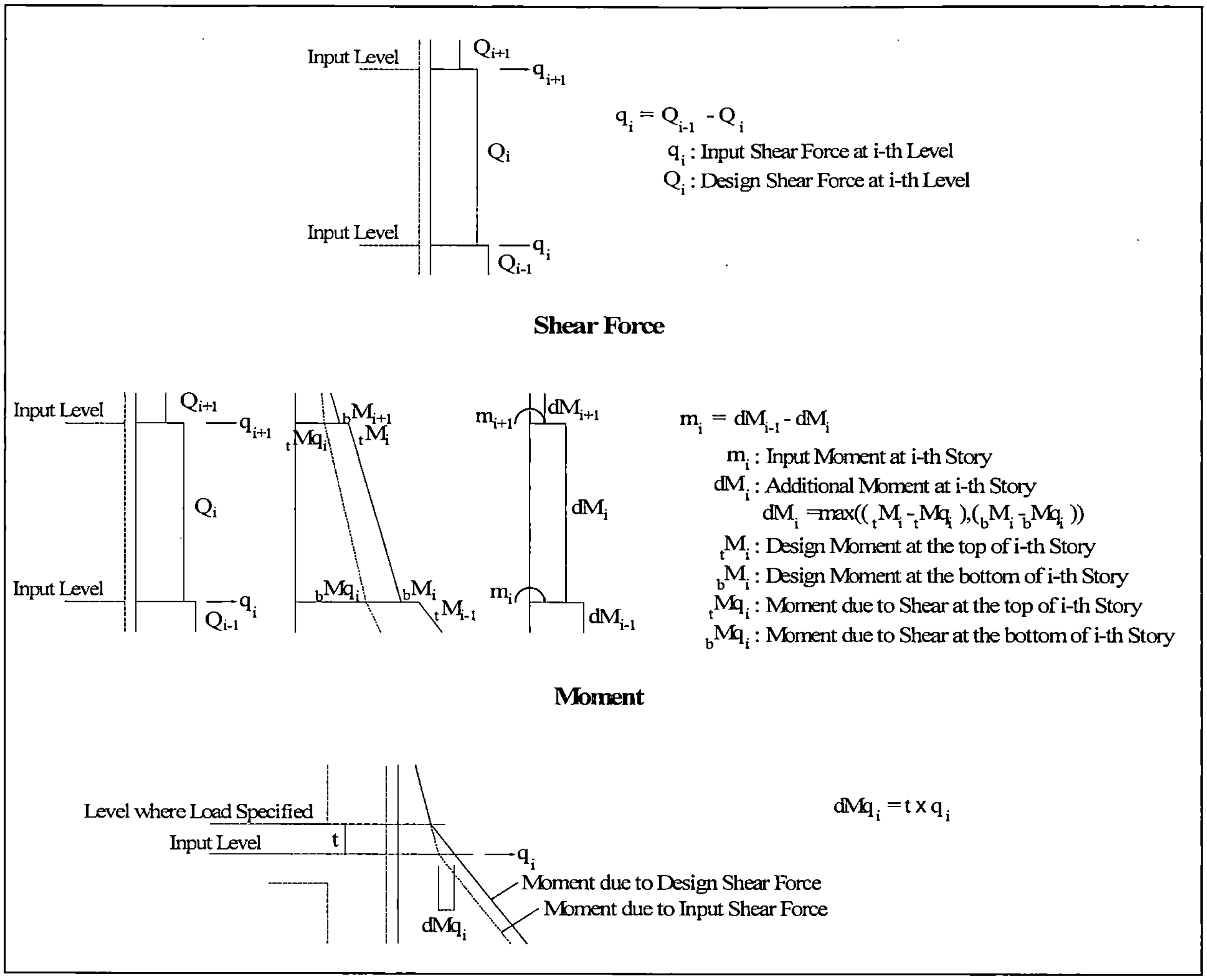
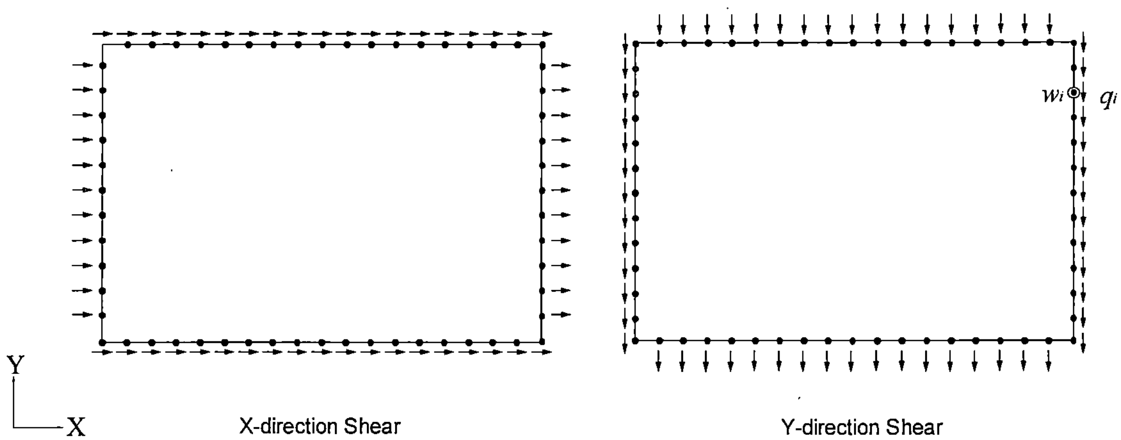


Figure 6.2-21 Calculation Method for Shear Forces and Overturning Moments



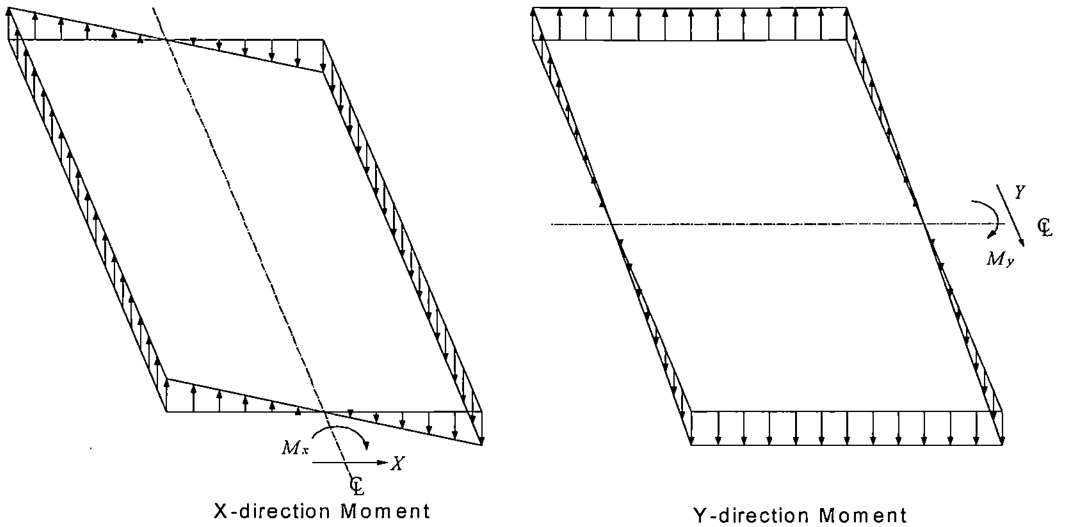
Note: Shear force applied to each grid point q_i is calculated as follows:

$$q_i = q\frac{w_i}{\sum w_i}$$

where, q : Input shear force

w_i : Weight of each grid point

Figure 6.2-22 Method of Applying Shear Forces



Note: Vertical nodal force applied to each grid point due to overturning moment F_i is calculated as follows:

$$F_i = M_X \frac{X_i}{I_X} A_i \quad \text{(for X-direction)} \qquad F_i = M_Y \frac{Y_i}{I_Y} A_i \quad \text{(for Y-direction)}$$

where,

M_x, M_y: Overturning moment

I_x, I_y: Moment inertia of total walls around Y-axis and X-axis respectively

X_i, Y_i: Distance from the center line to each wall

A_i: Tributary wall area at the Grid Point

Figure 6.2-23 Method of Applying Overturning Moments

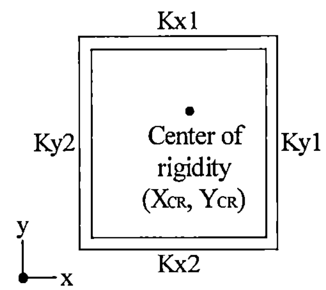
Calculation of Wall Stiffness K

$$K = \frac{12EI}{h^3(1+\phi)}, \quad \phi = \frac{12EI}{AGh^2}$$

where : A = shear area, E = Young's modulus
I = moment inertia, G = shear modulus
h = height

Calculation of Center of Rigidity X_{CR}, Y_{CR}

$$X_{CR} = \frac{\Sigma(K_{yi} X_i)}{\Sigma K_{yi}}, \quad Y_{CR} = \frac{\Sigma(K_{xi} Y_i)}{\Sigma K_{xi}}$$



Calculation of Torsional Stiffness of Boxwalls Kt

$$K_t = \Sigma(K_{xi} (Y_i - Y_{CR})^2) + \Sigma(K_{yi} (X_i - X_{CR})^2)$$

Calculation of Shear Force

$$Q_{xi} = \frac{M_t}{K_t} K_{xi} (Y_i - Y_{CR}), \quad Q_{yi} = \frac{M_t}{K_t} K_{yi} (X_i - X_{CR})$$

Figure 6.2-24 Method of Calculation Shear Forces due to Torsion

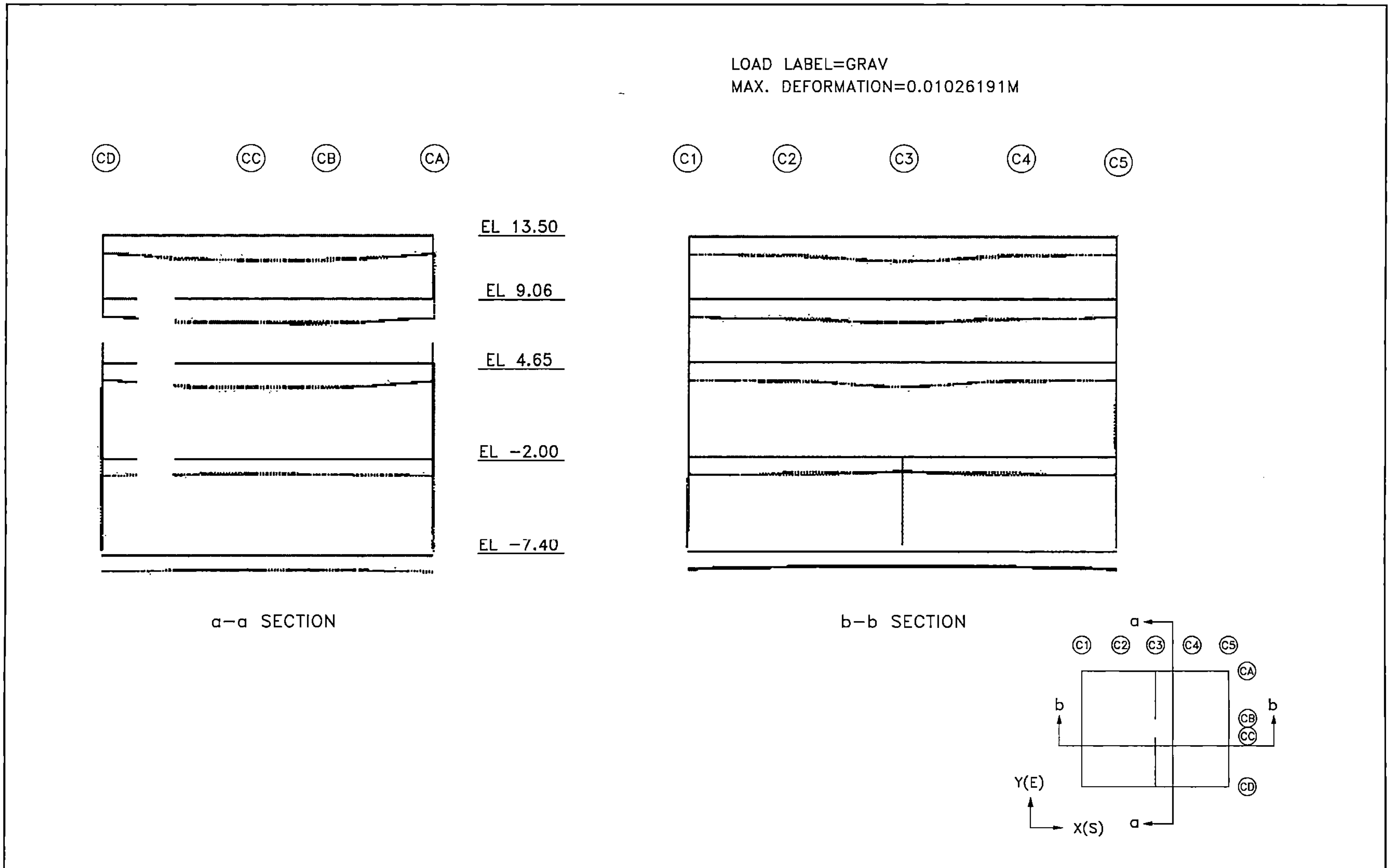


Figure 6.2-25 Deformation due to Structure Load, GRAV

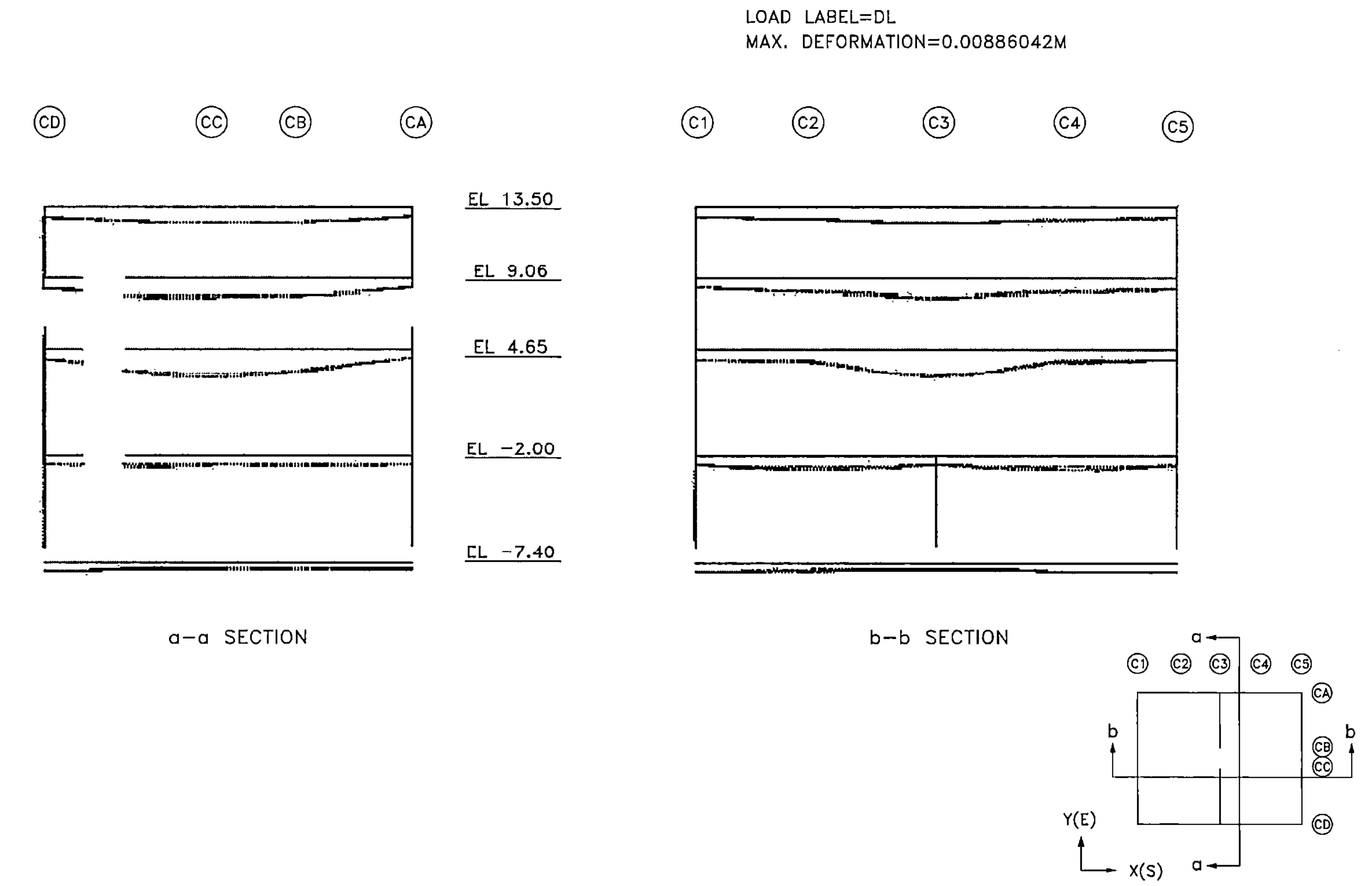


Figure 6.2-26 Deformation due to Structure Load, DL

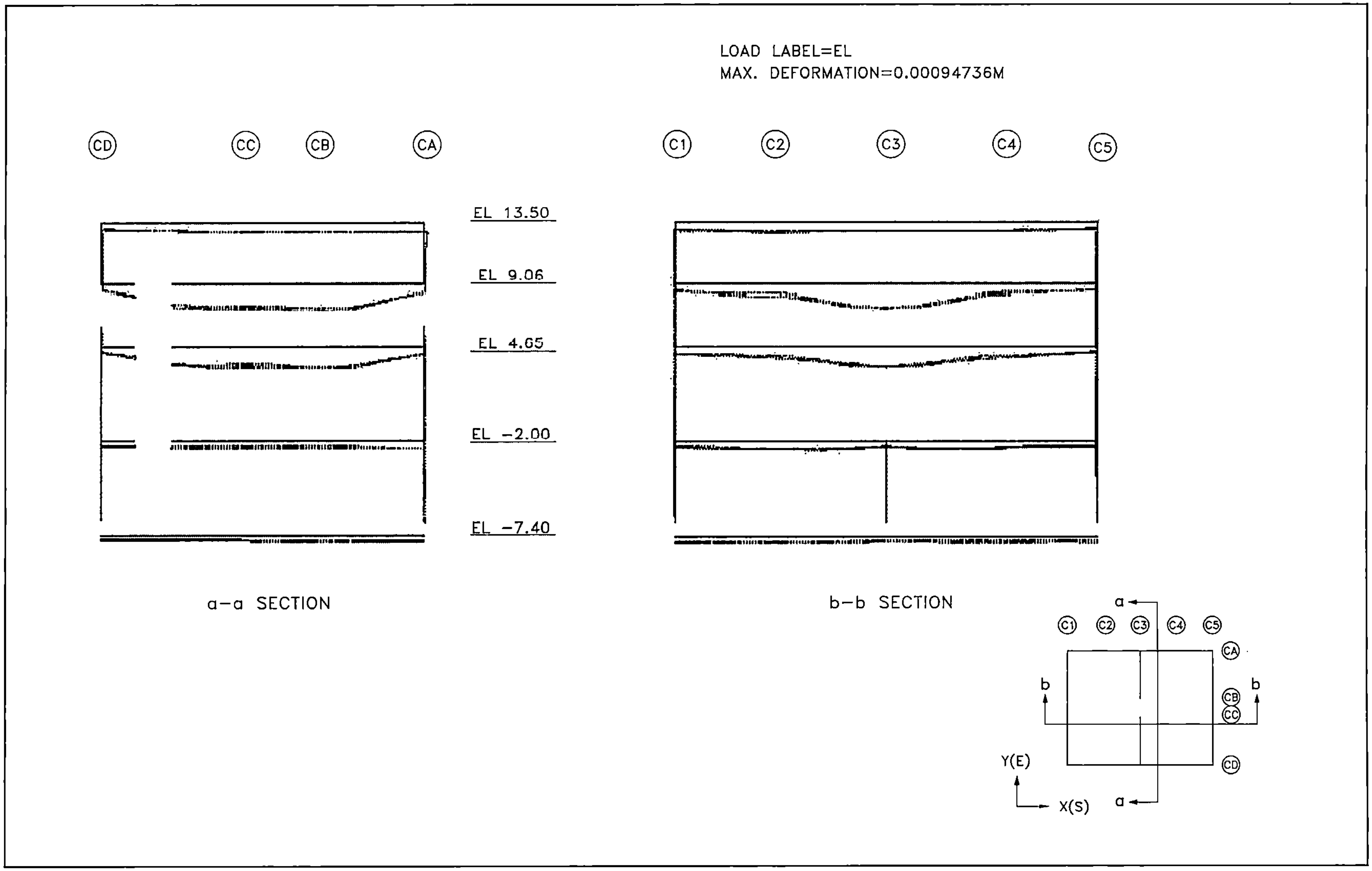


Figure 6.2-27 Deformation due to Structure Load, EL

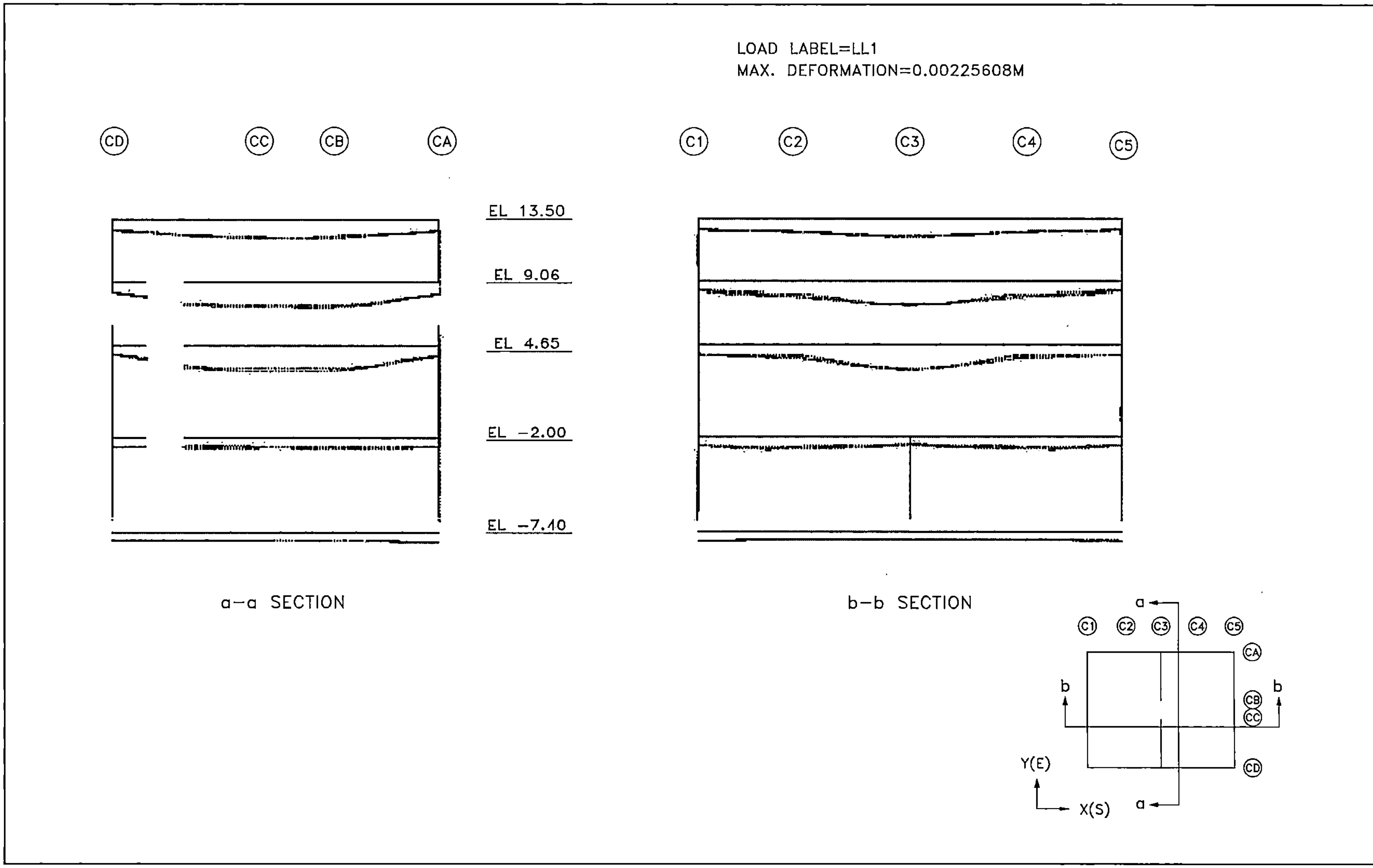


Figure 6.2-28 Deformation due to Structure Load, LL

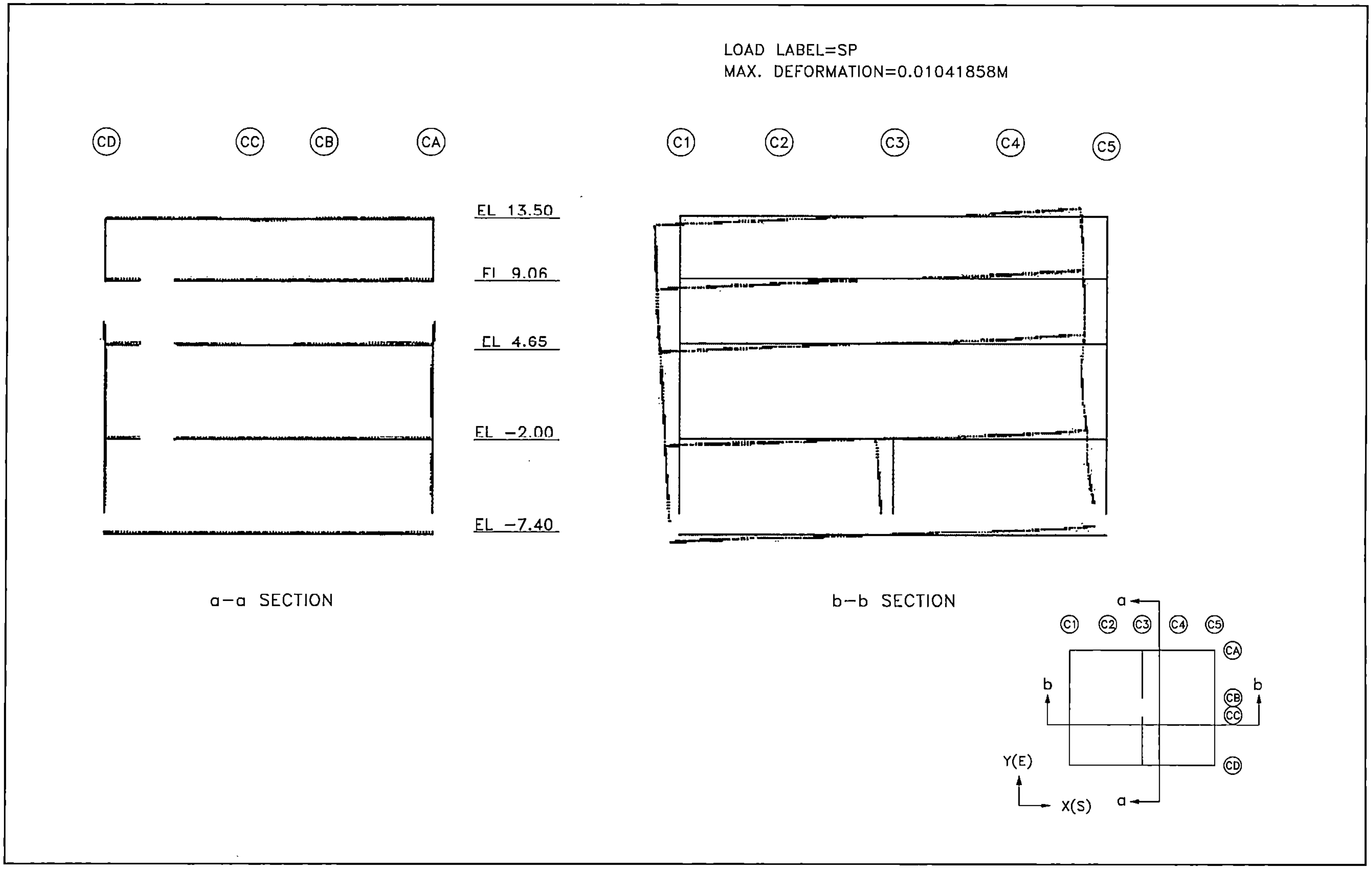


Figure 6.2-29 Deformation due to Structure Load, SP

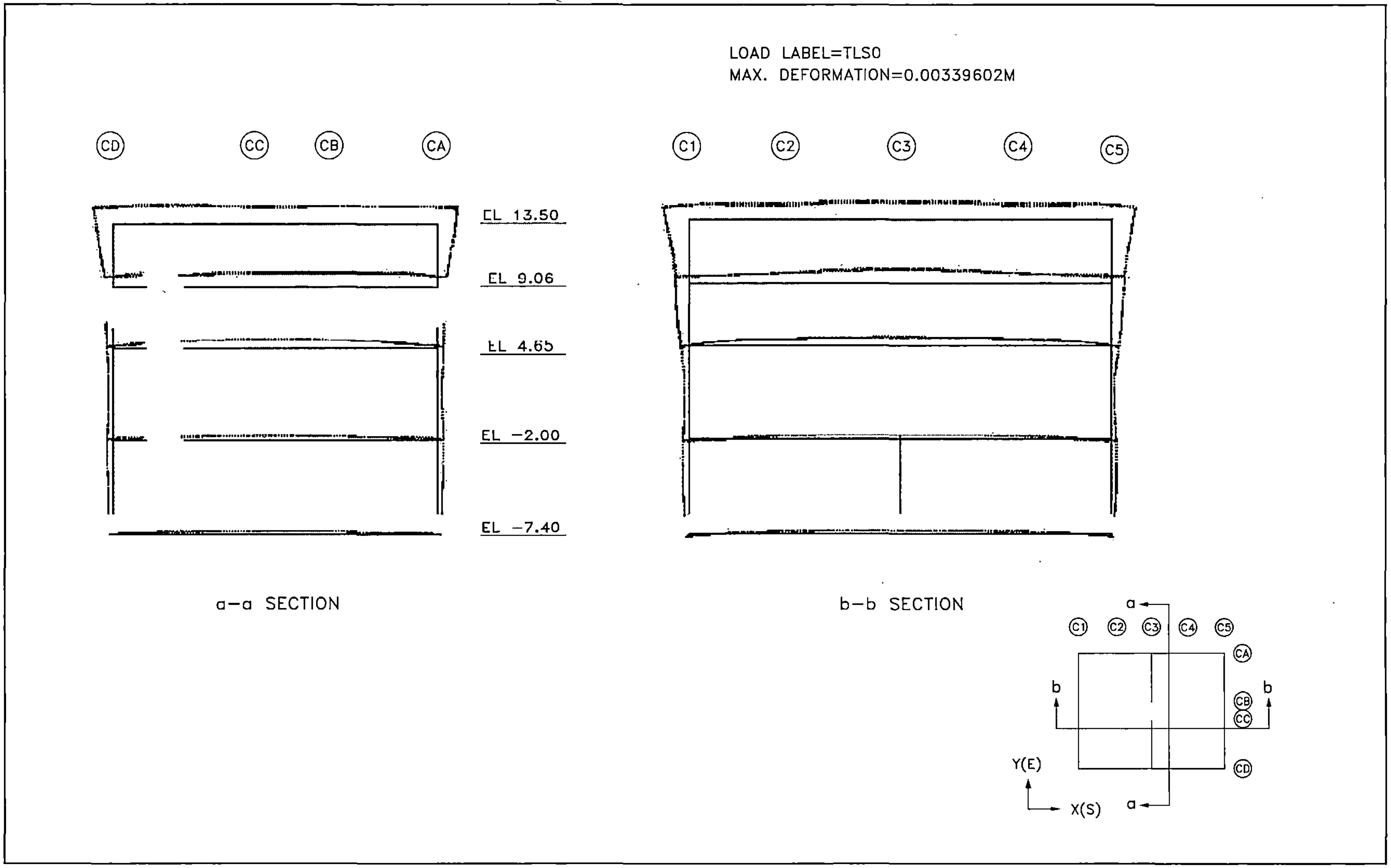


Figure 6.2-30 Deformation due to Structure Load, TLS0

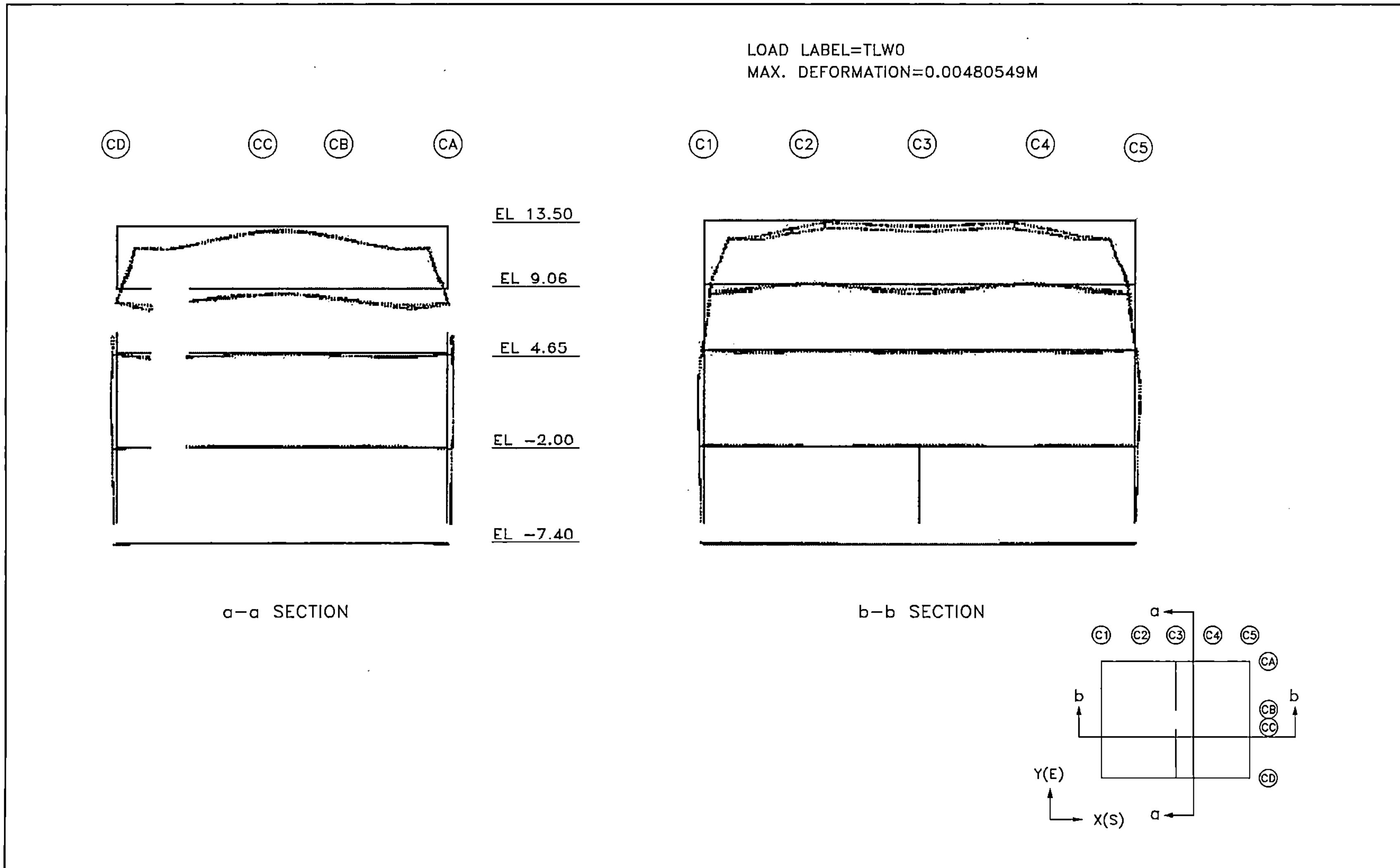


Figure 6.2-31 Deformation due to Structure Load, TLW0

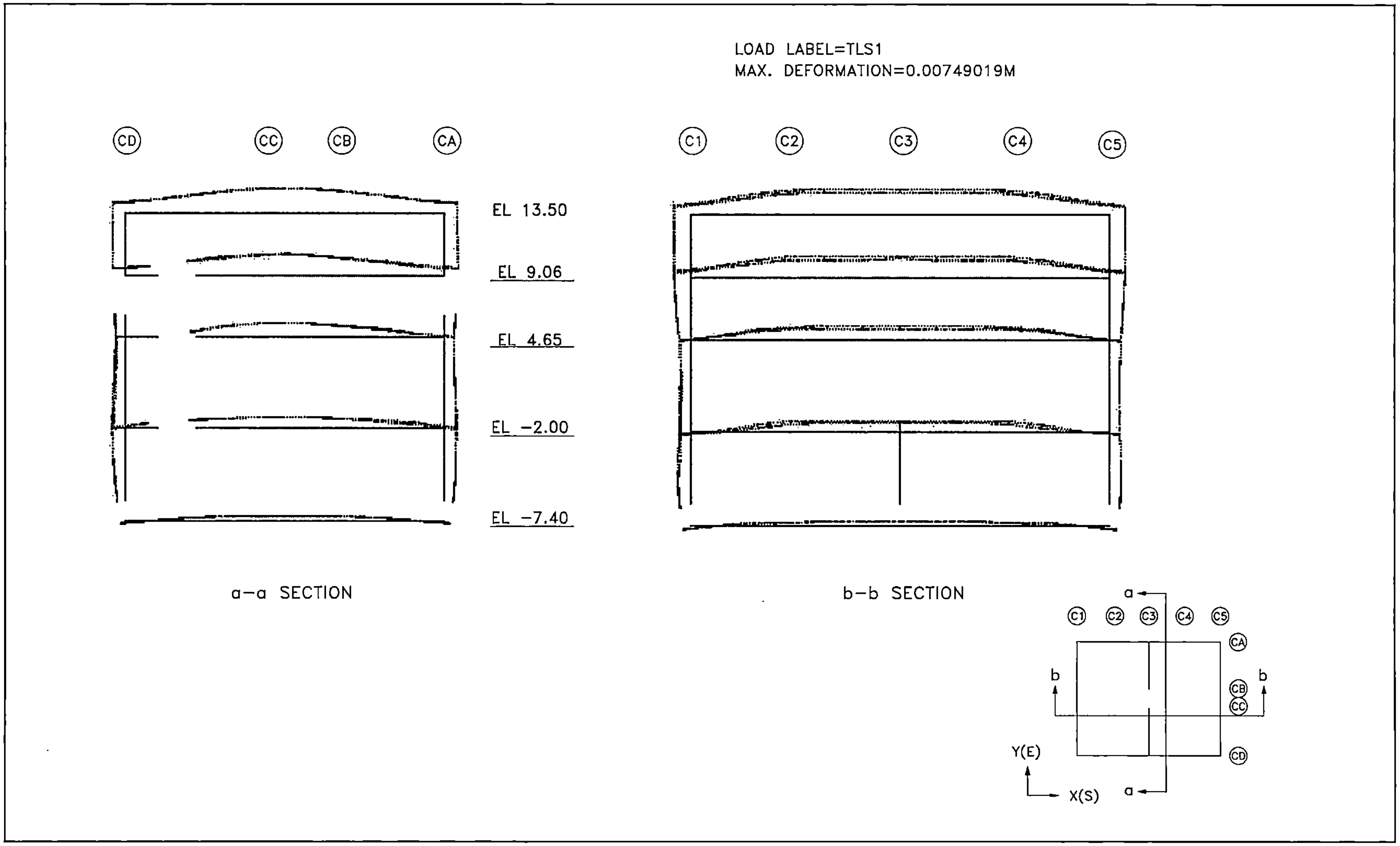


Figure 6.2-32 Deformation due to Structure Load, TLS1

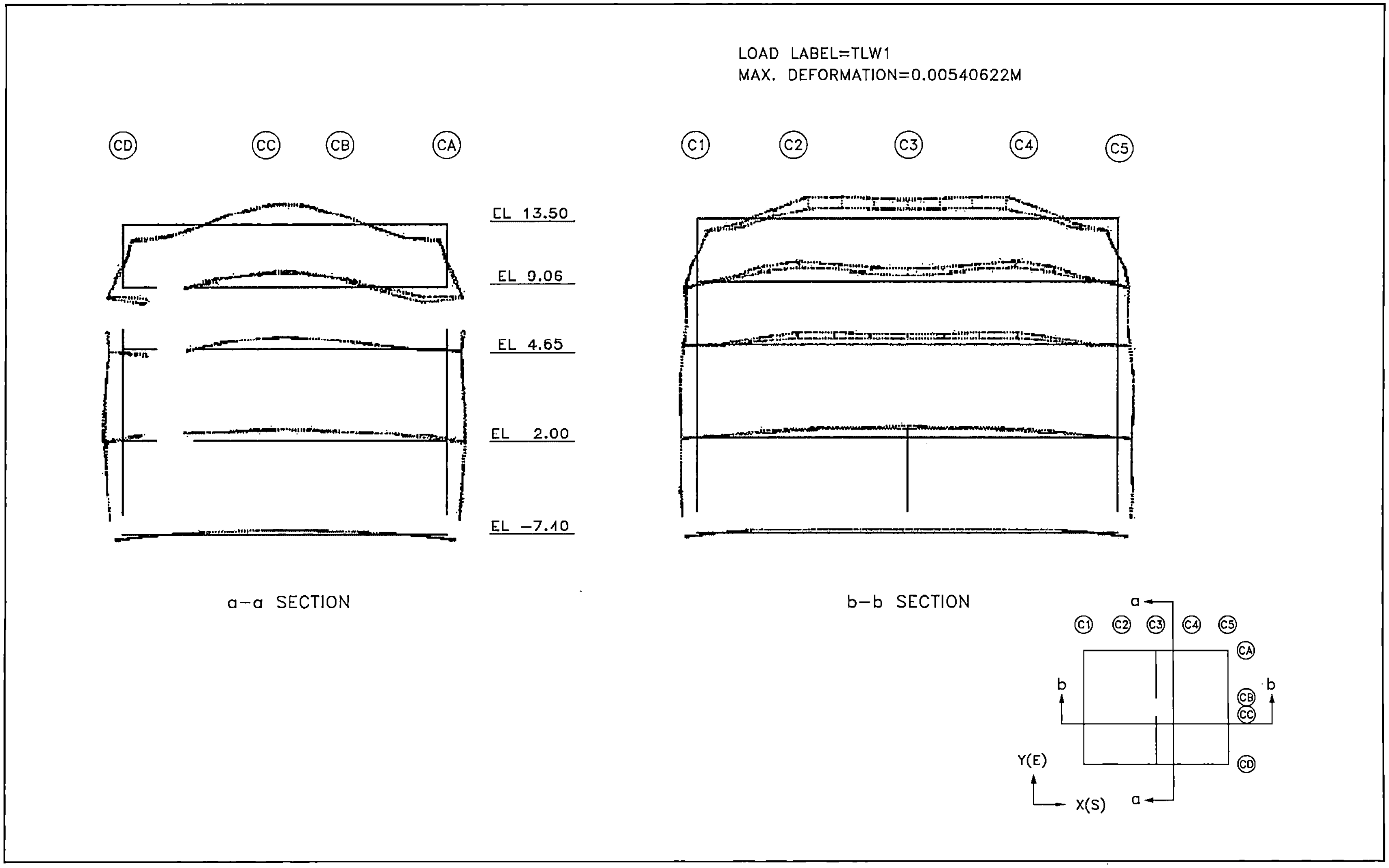


Figure 6.2-33 Deformation due to Structure Load, TLW1

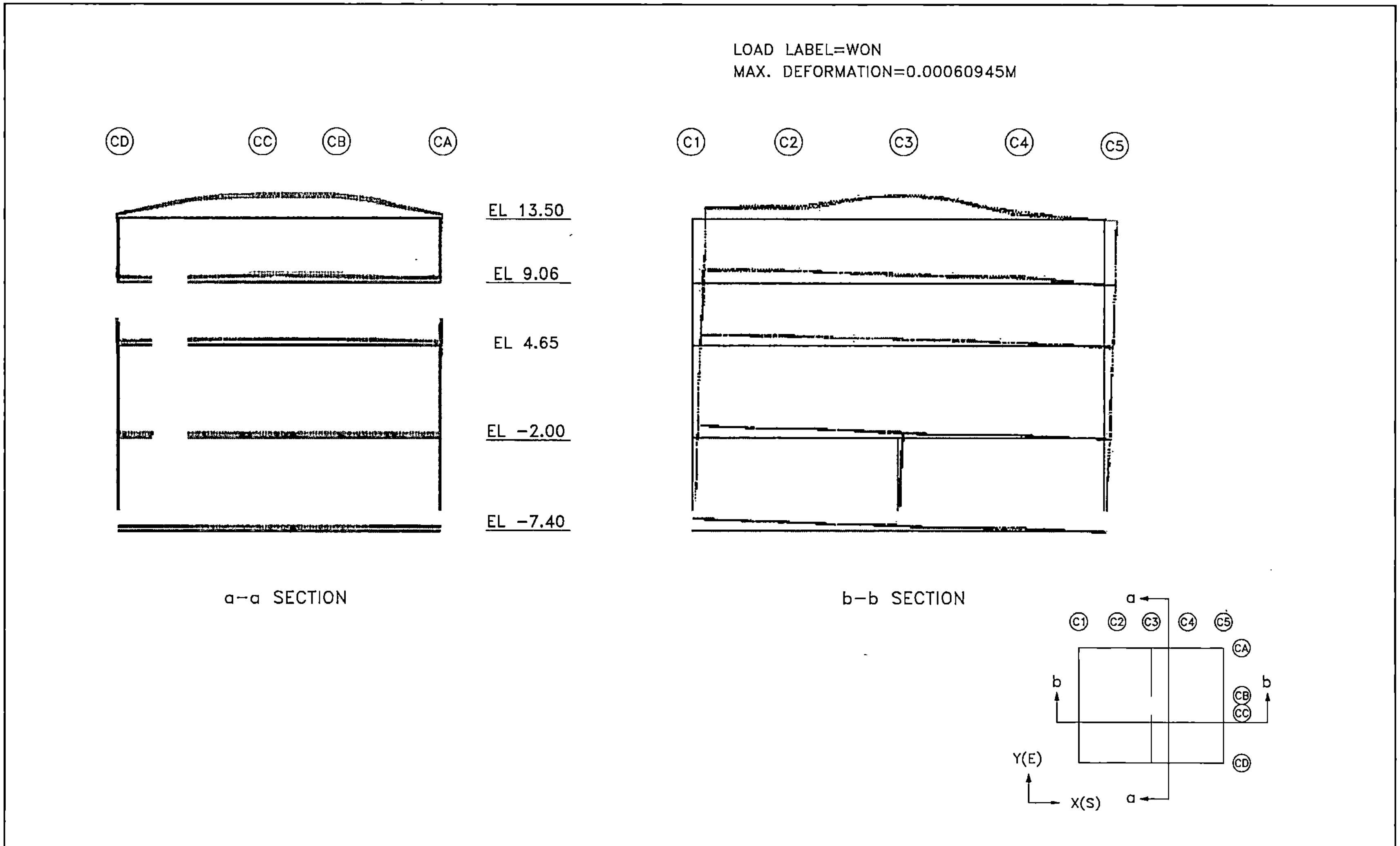


Figure 6.2-34 Deformation due to Structure Load, WON

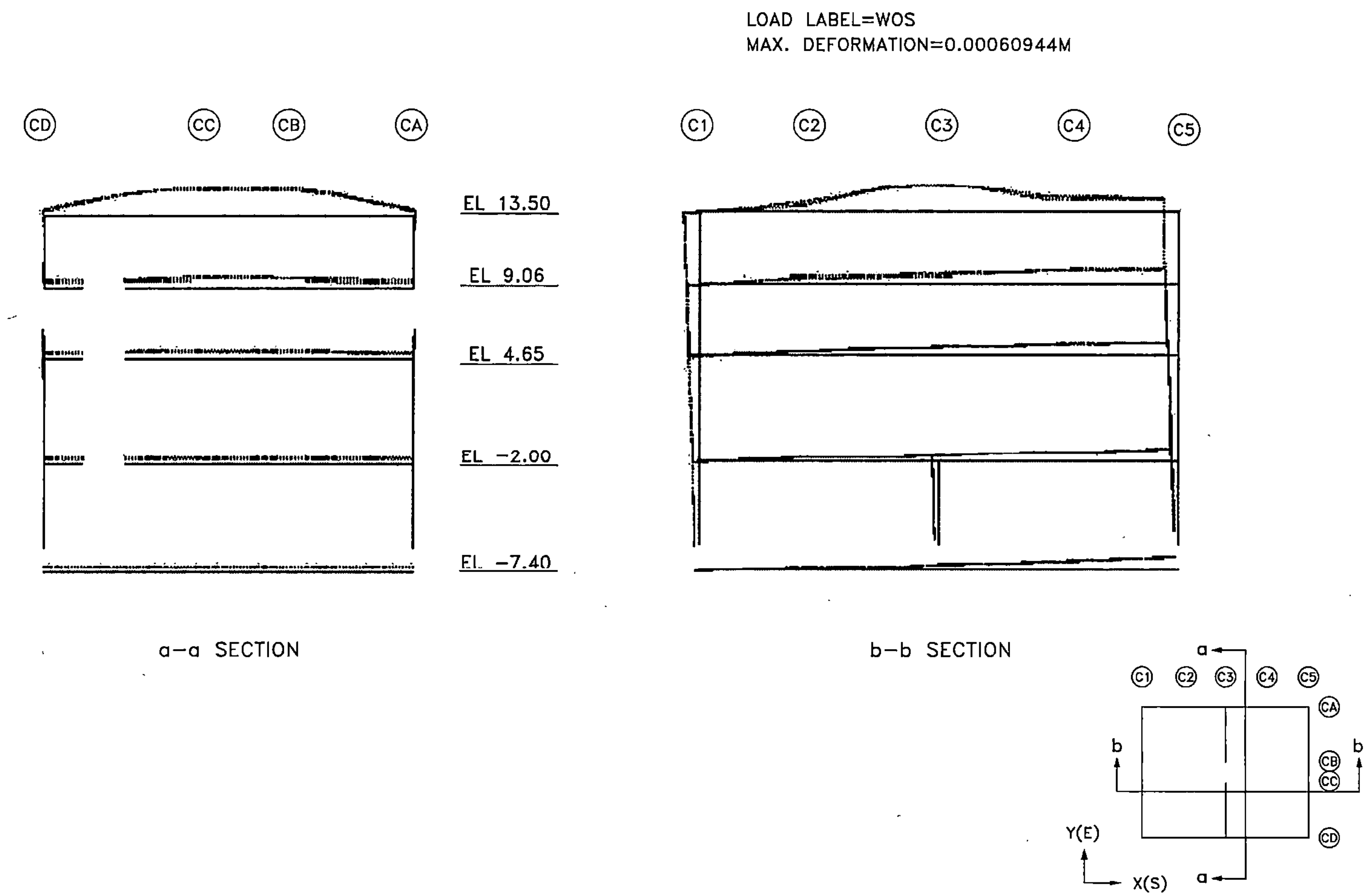


Figure 6.2-35 Deformation due to Structure Load, WOS

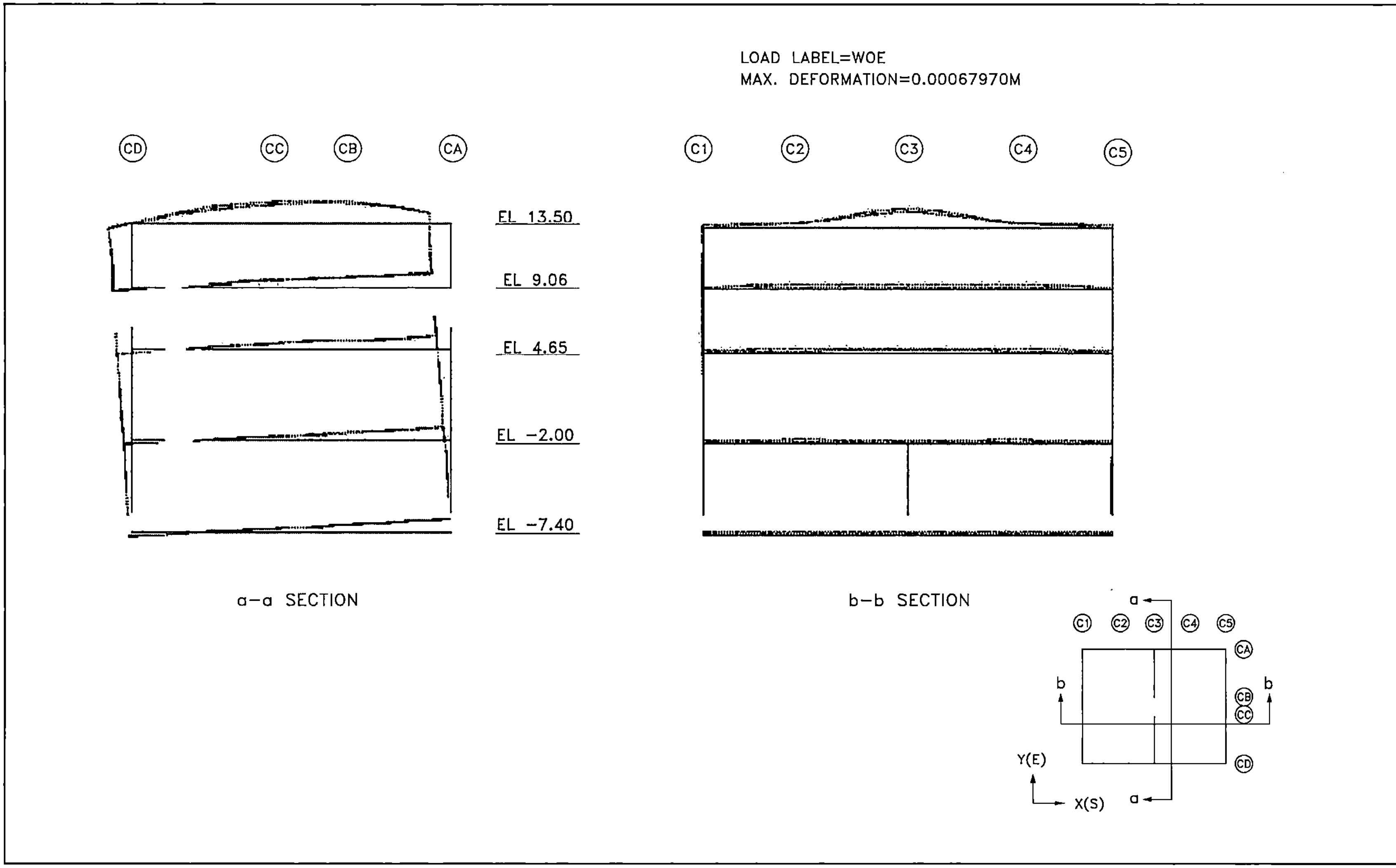


Figure 6.2-36 Deformation due to Structure Load, WOE

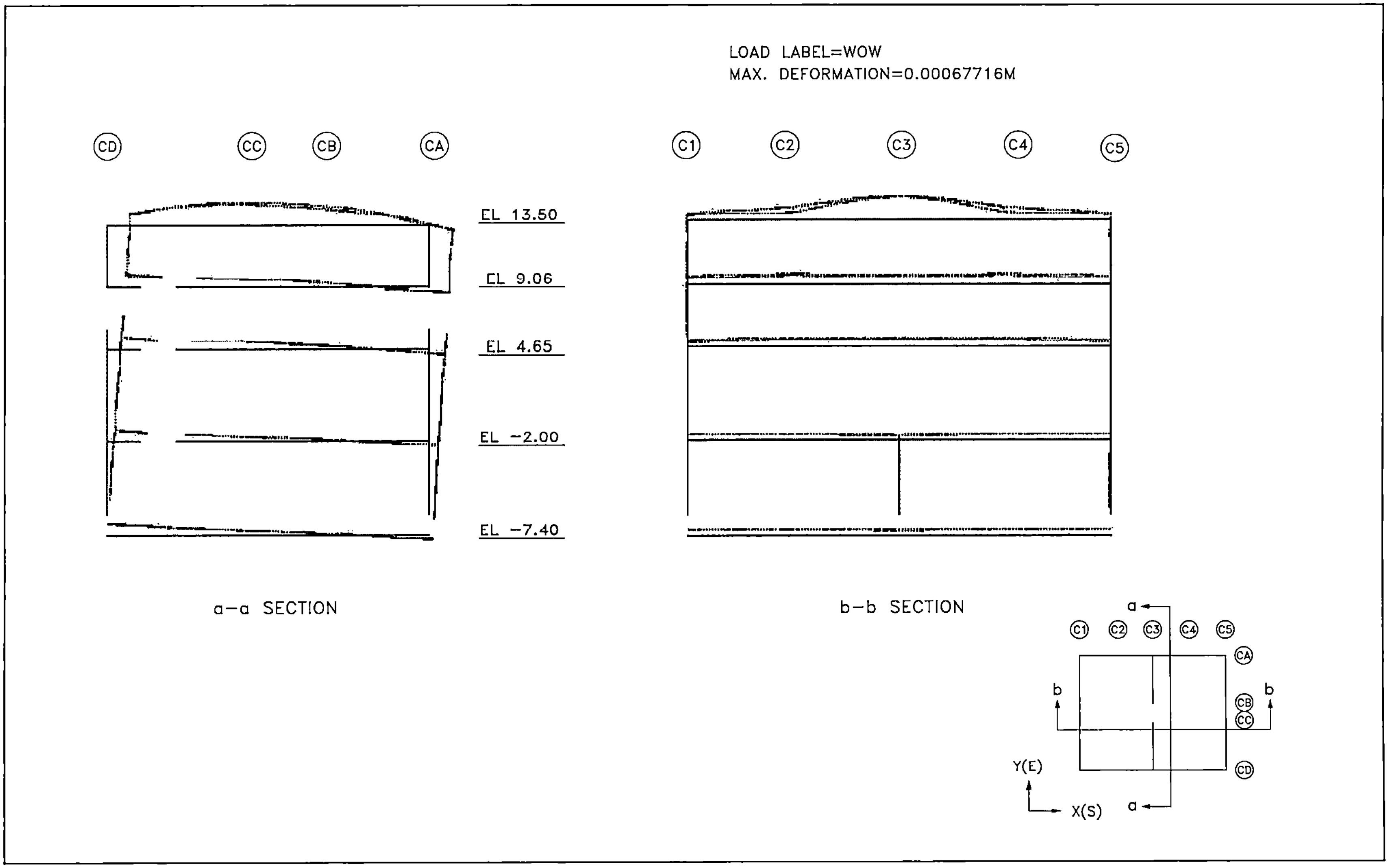


Figure 6.2-37 Deformation due to Structure Load, WOW

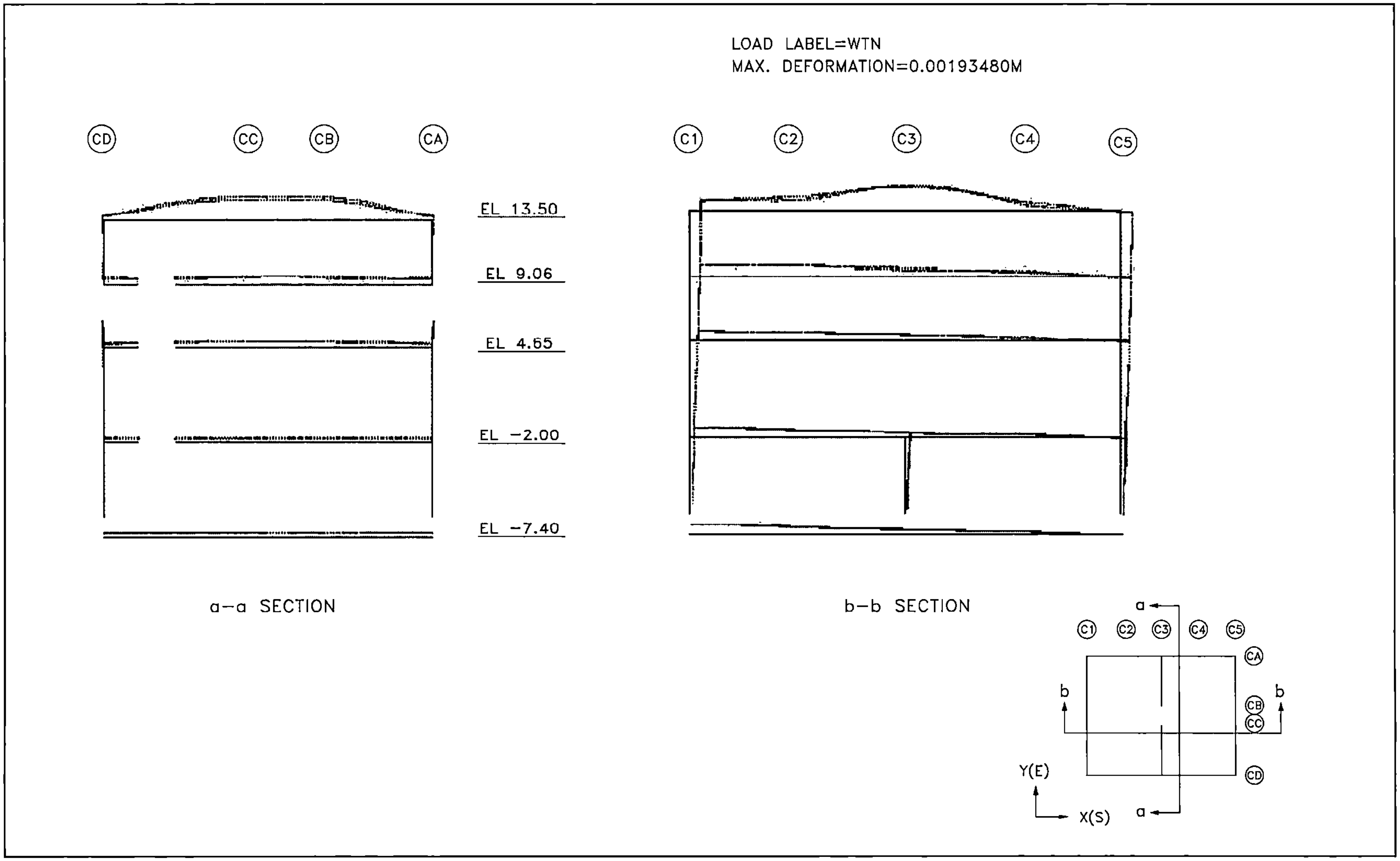


Figure 6.2-38 Deformation due to Structure Load, WTN

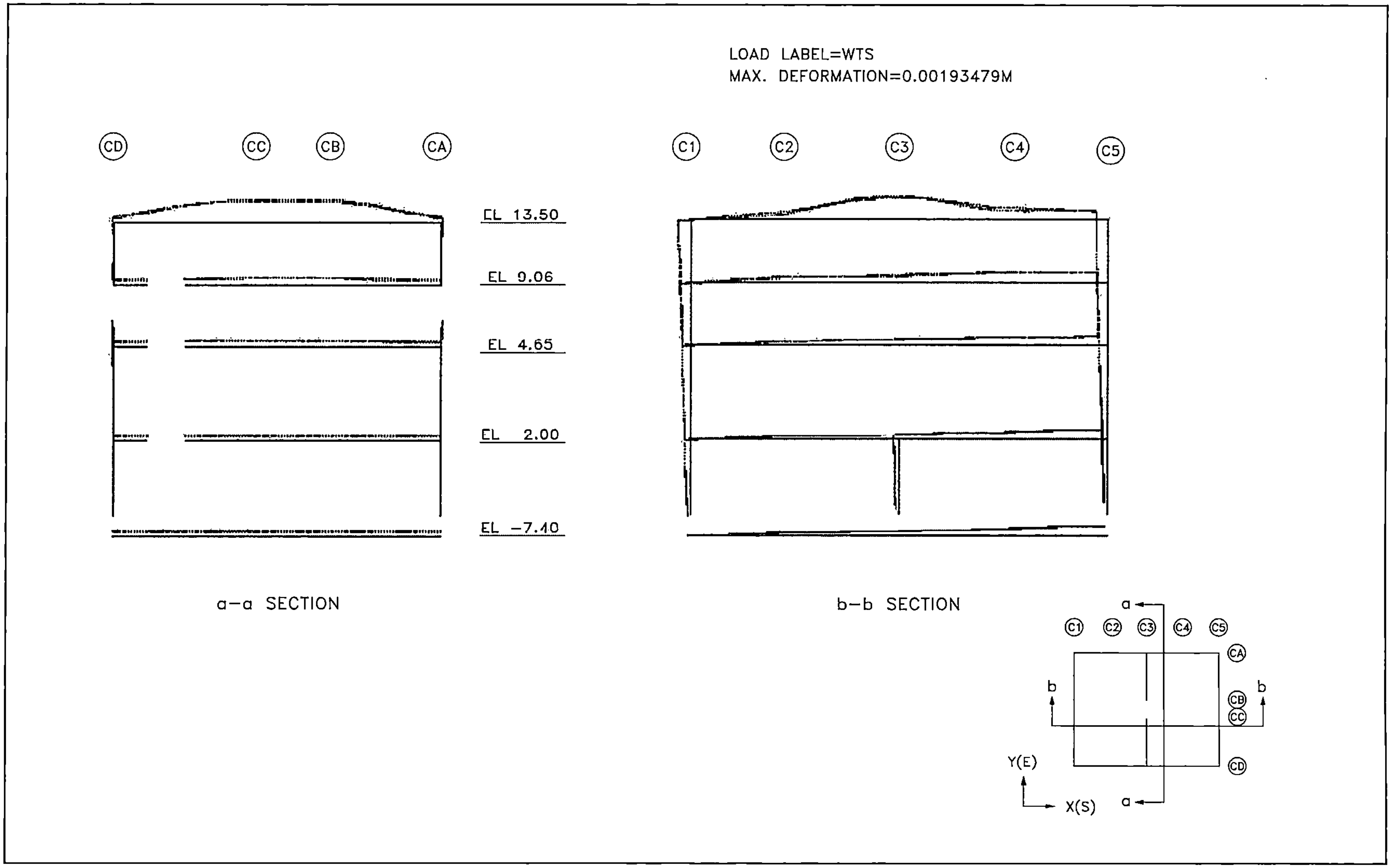


Figure 6.2-39 Deformation due to Structure Load, WTS

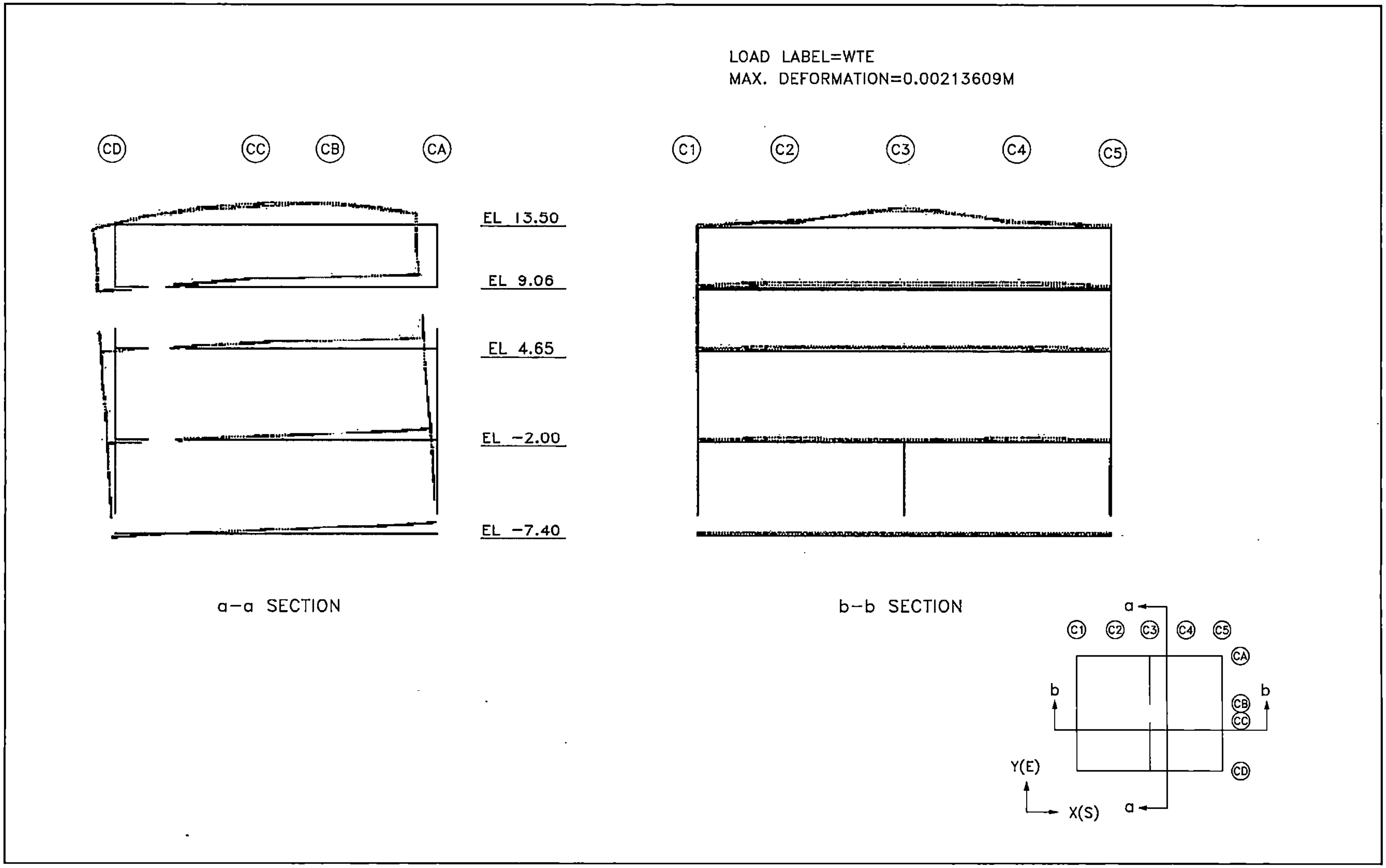


Figure 6.2-40 Deformation due to Structure Load, WTE

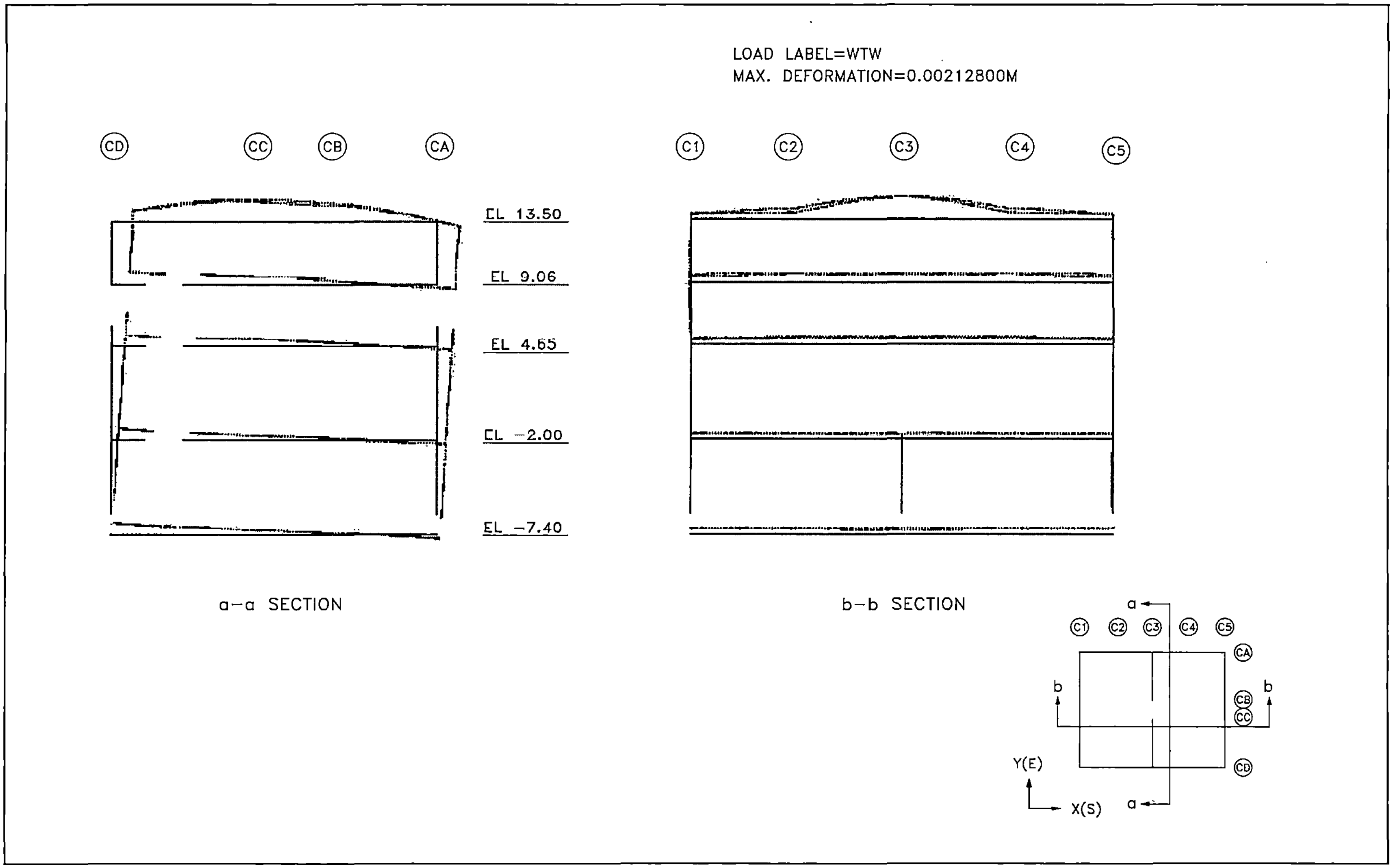


Figure 6.2-41 Deformation due to Structure Load, WTW

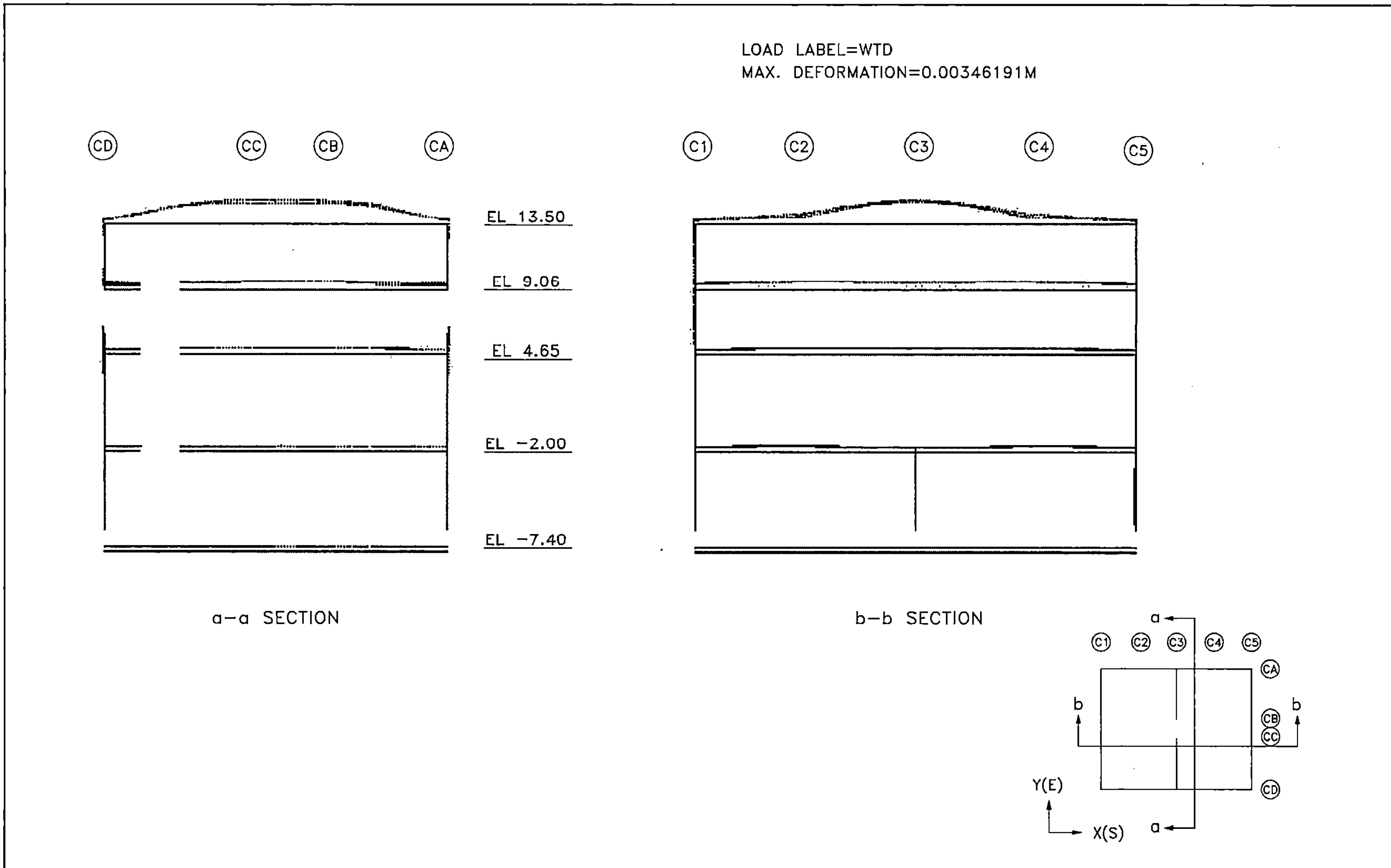


Figure 6.2-42 Deformation due to Structure Load, WTD

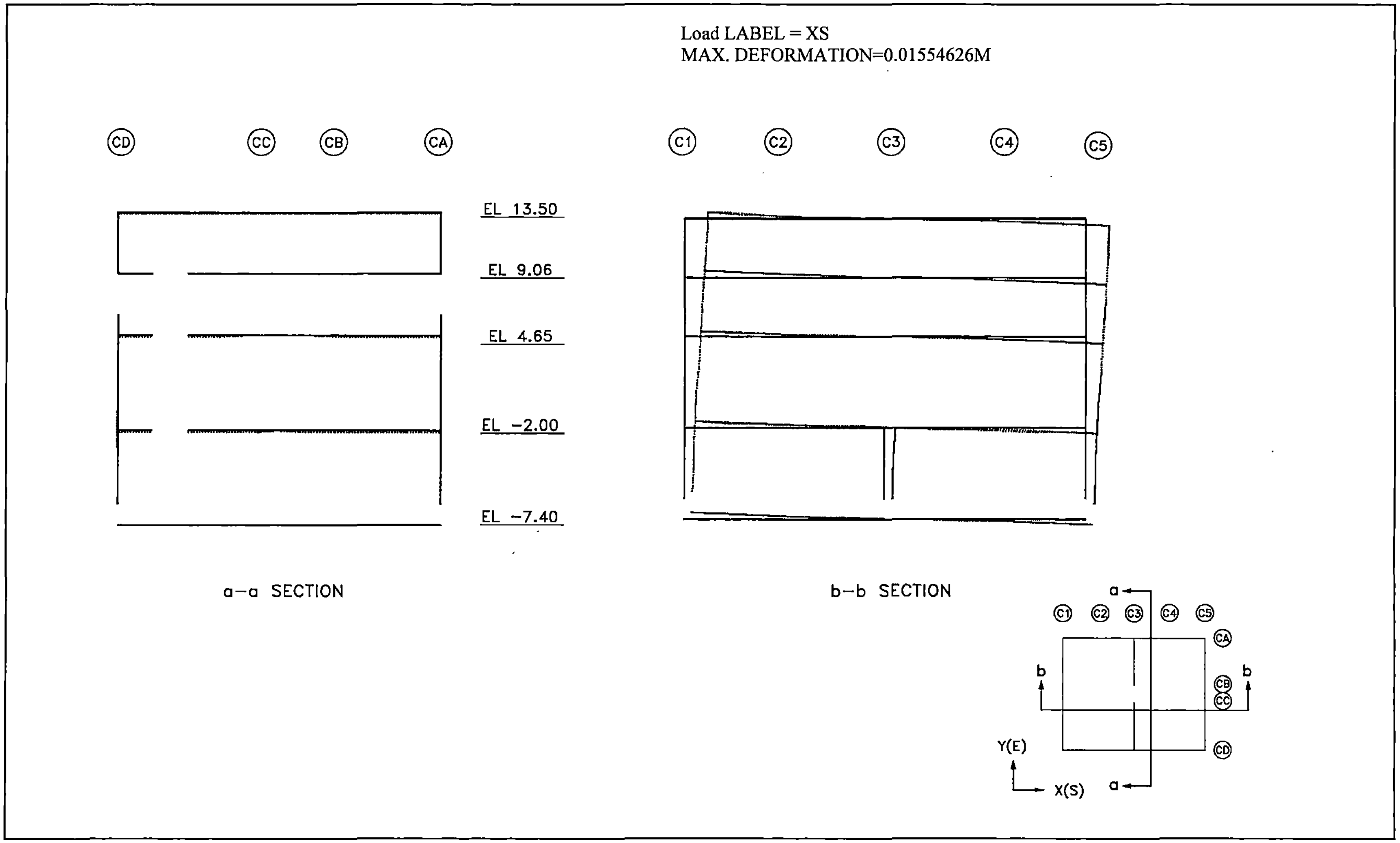


Figure 6.2-43 Deformation due to Structure Load, XS

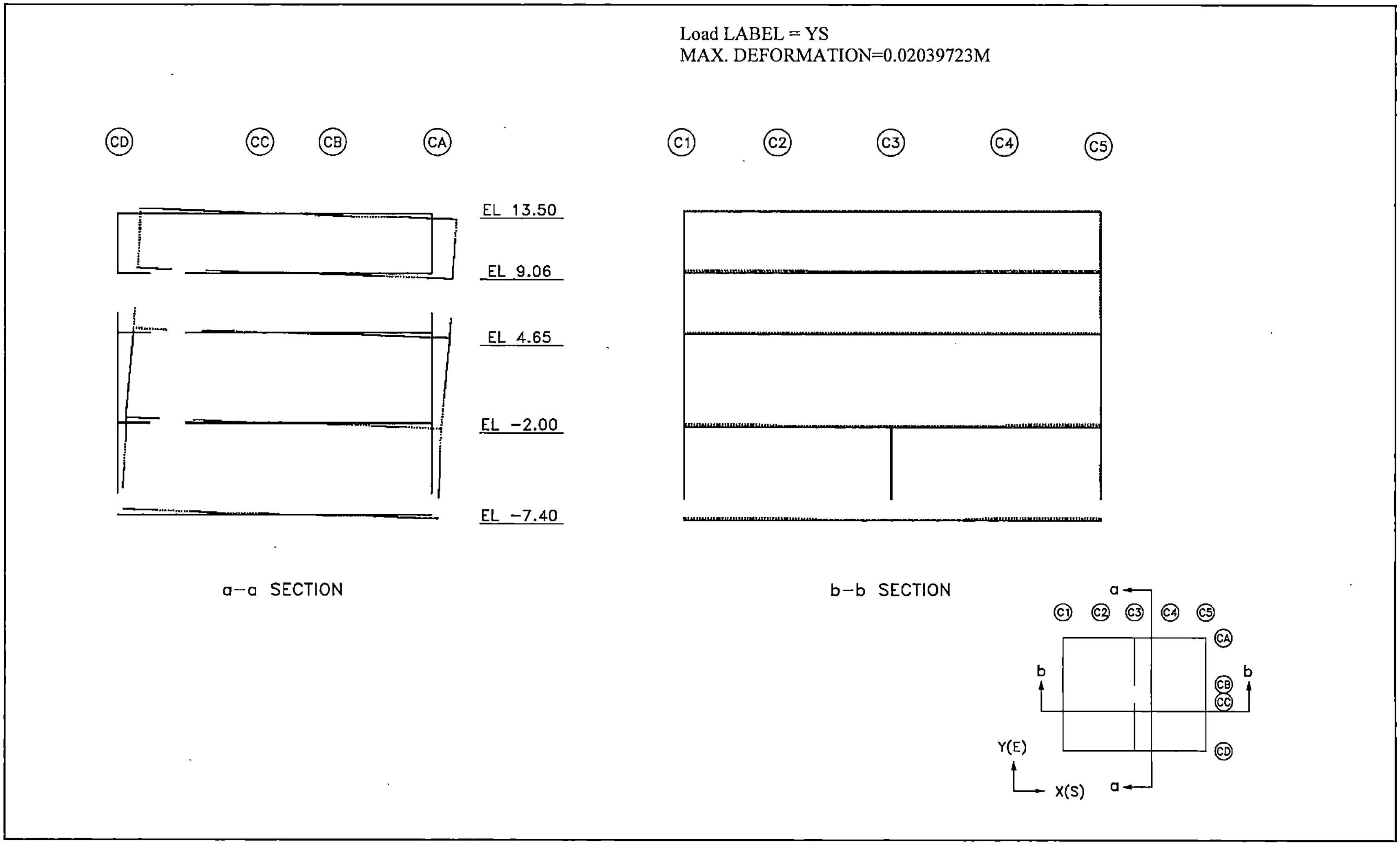


Figure 6.2-44 Deformation due to Structure Load, YS

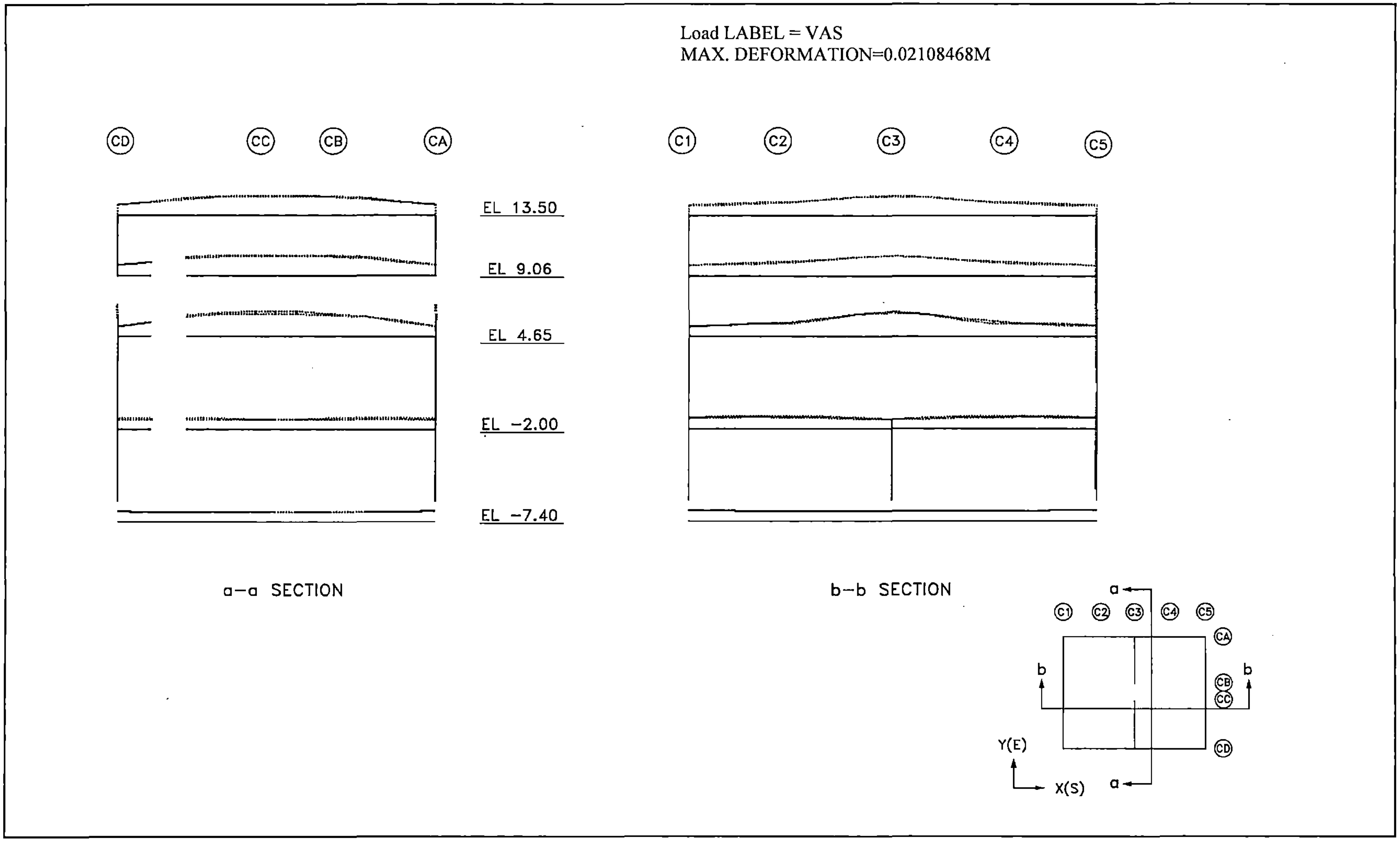


Figure 6.2-45 Deformation due to Structure Load, VAS

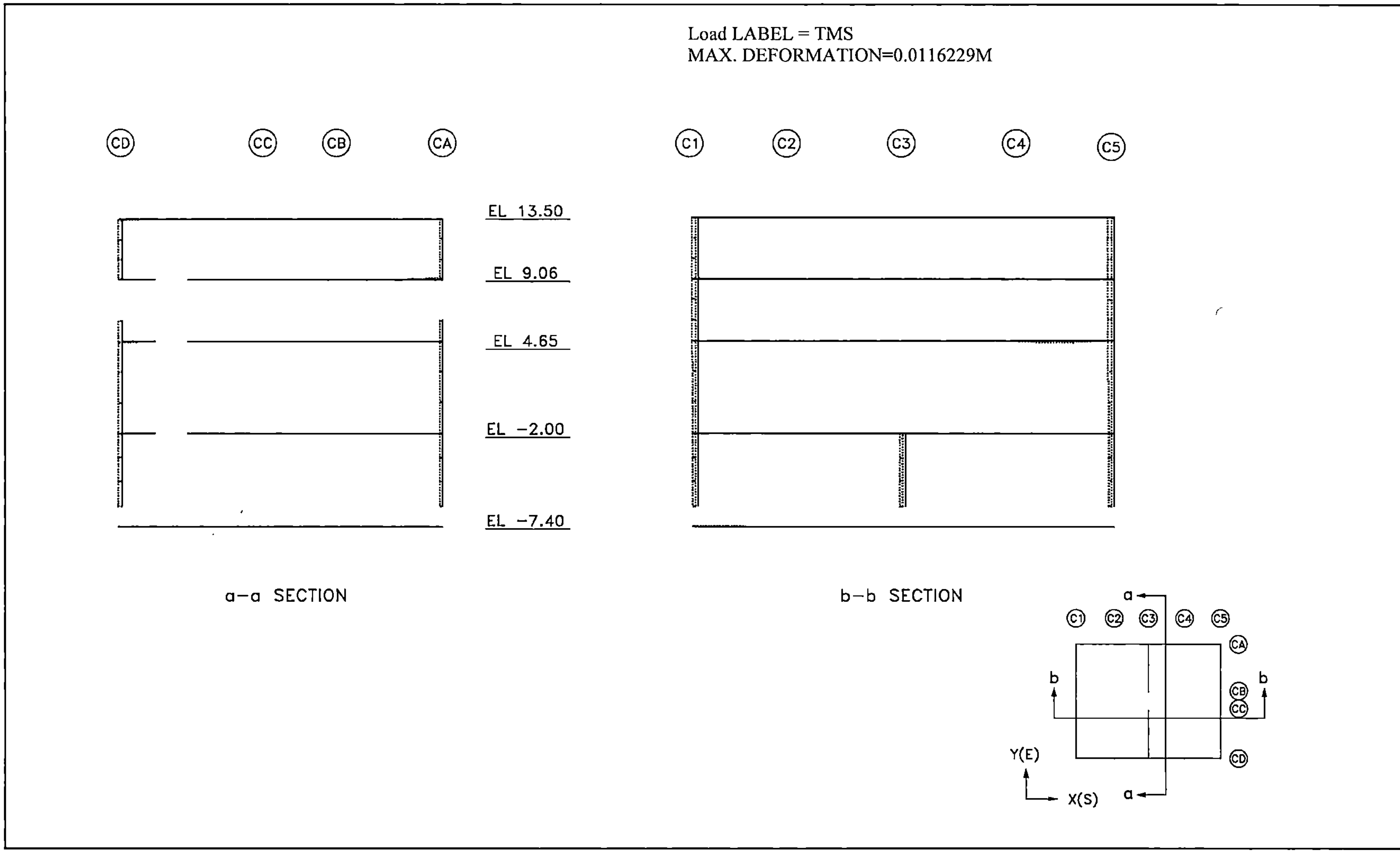


Figure 6.2-46 Deformation due to Structure Load, TMS

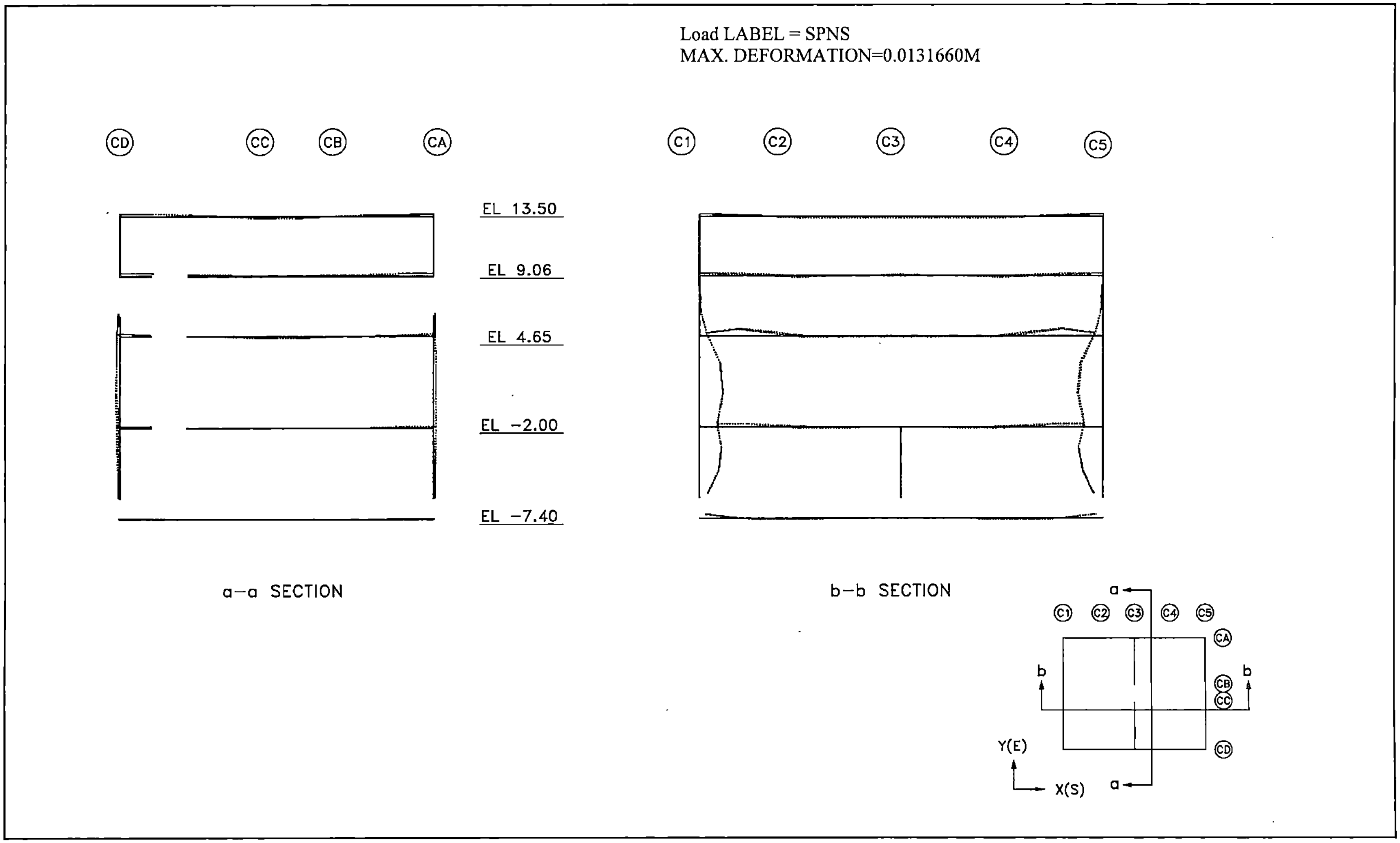


Figure 6.2-47 Deformation due to Structure Load, SPNS

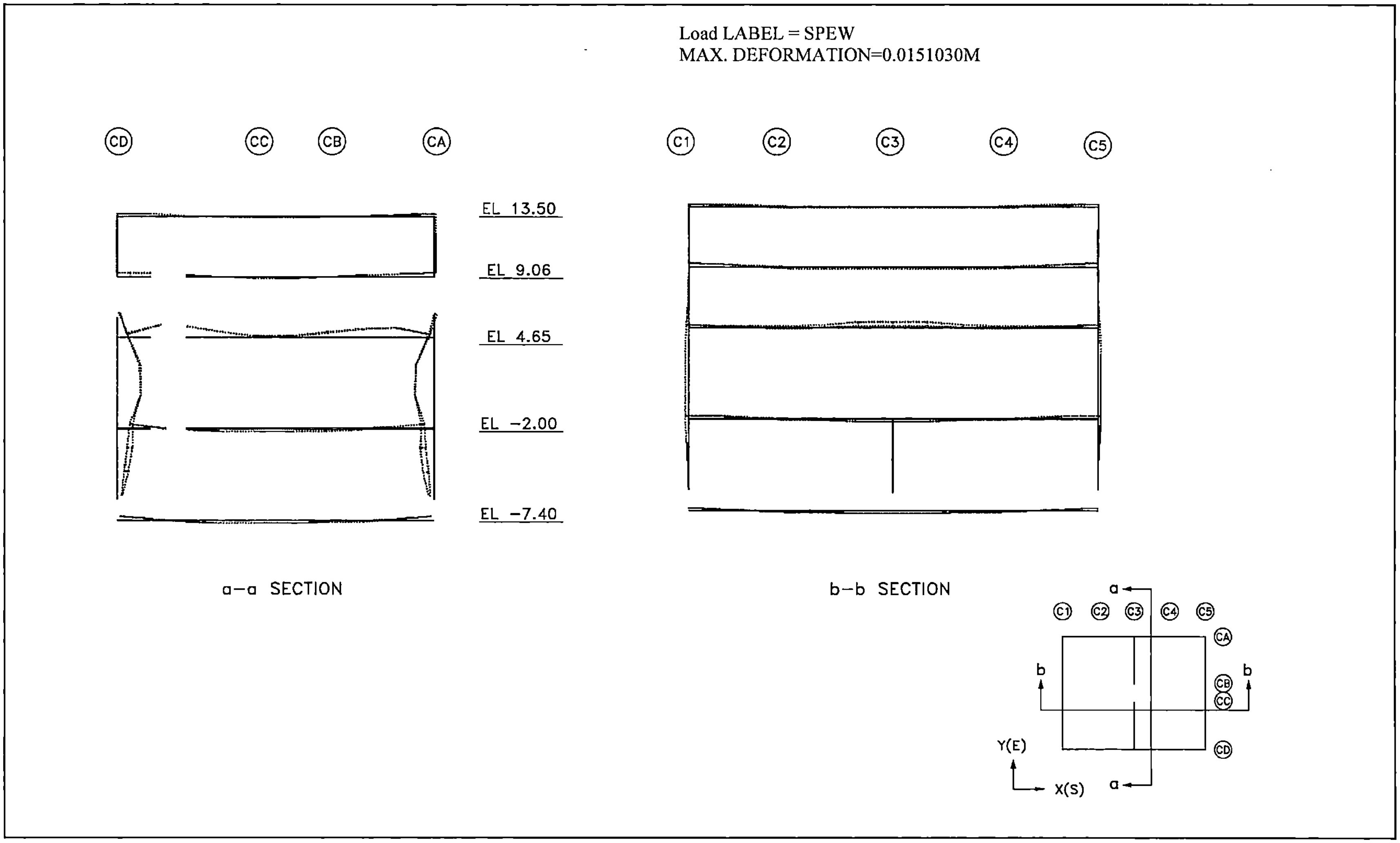
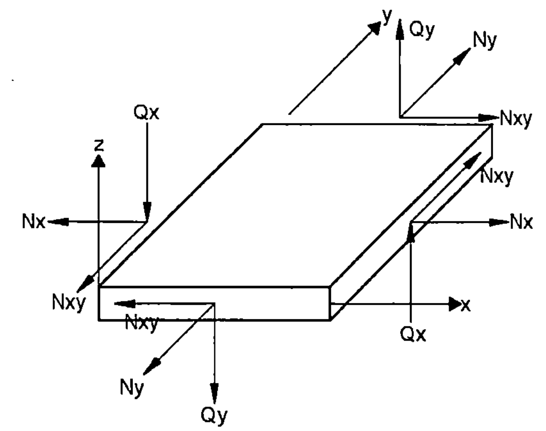
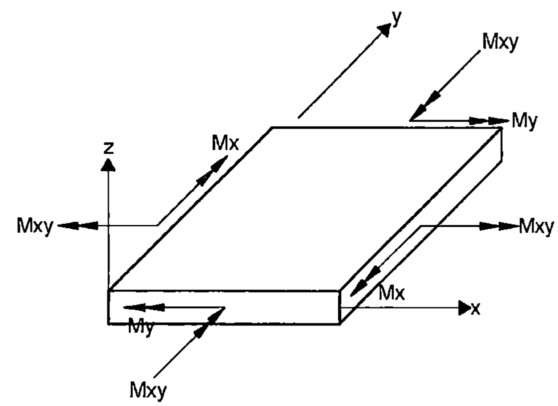


Figure 6.2-48 Deformation due to Structure Load, SPEW



Membrane and Shear Forces

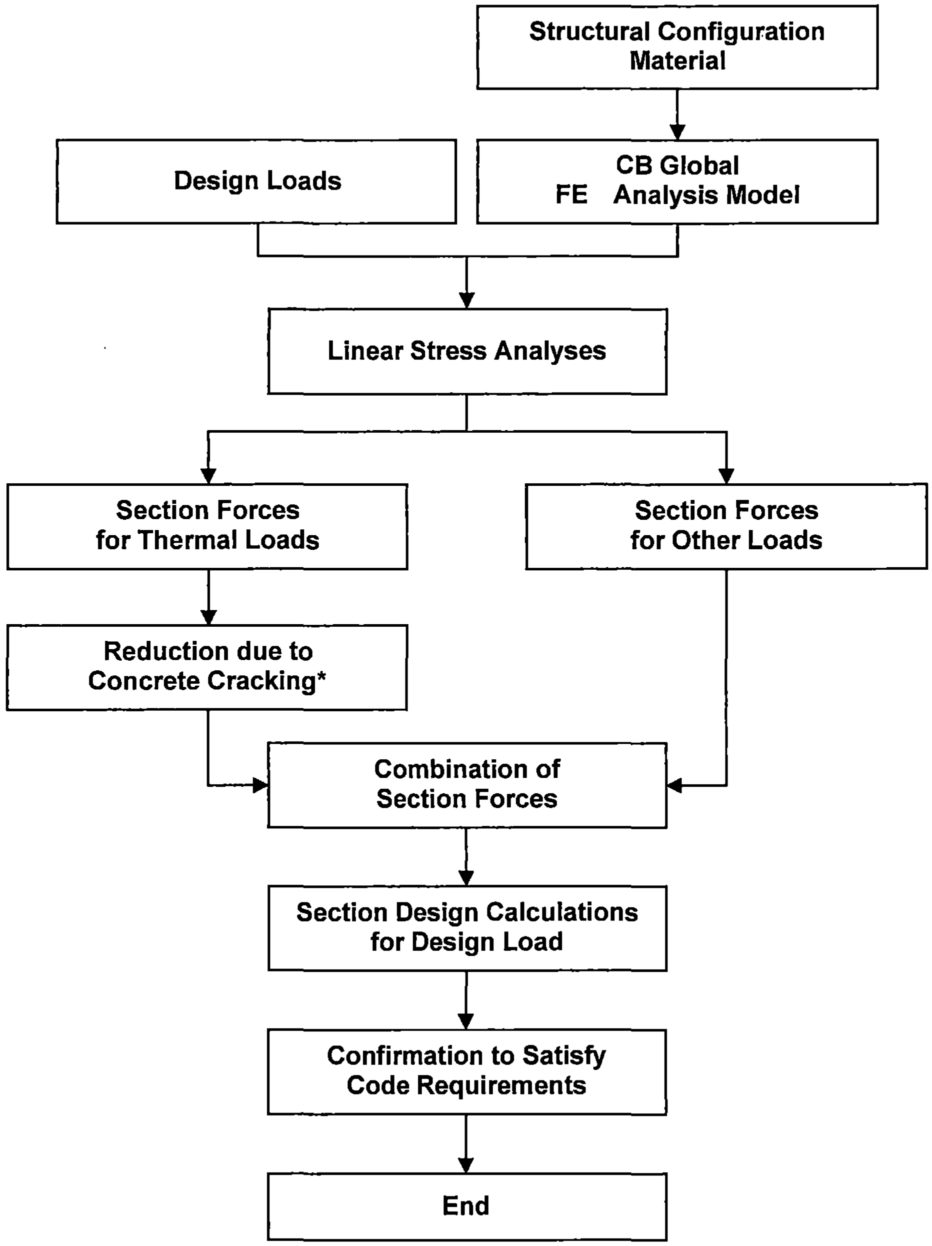


Moments

Definition of Element Coordinate System

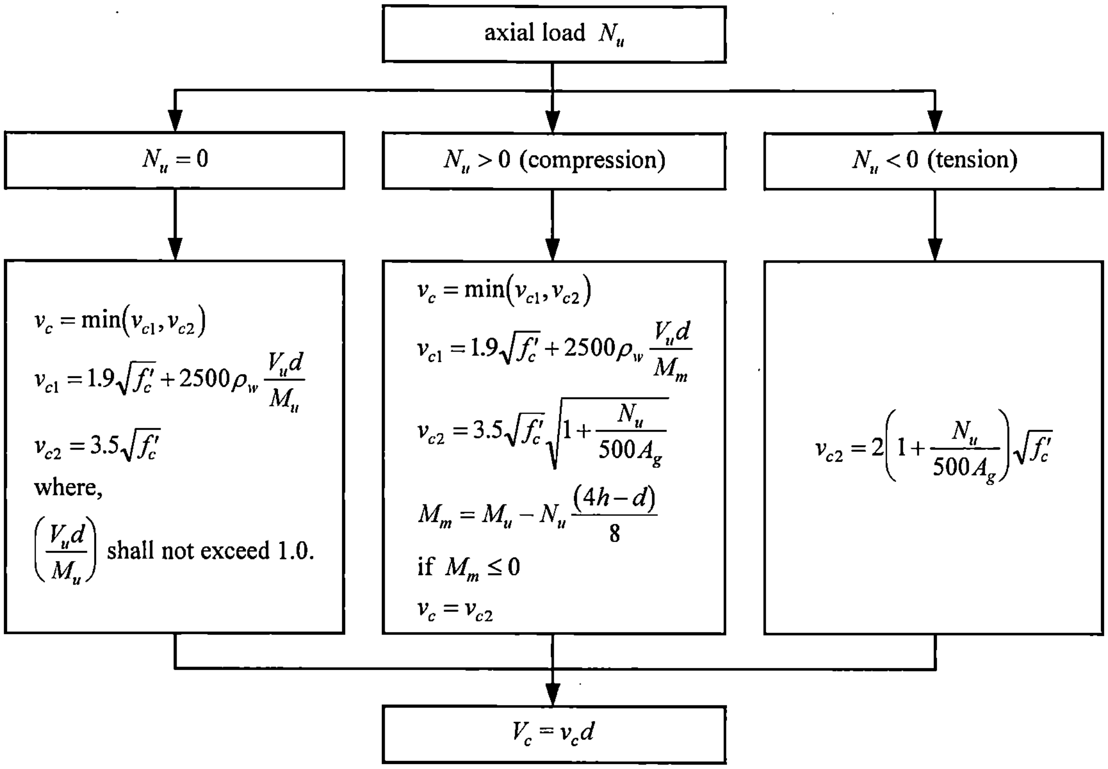
Structure	x	y	z
Wall in N-S Direction	horizontal	vertical	toward West
Wall in E-W Direction	horizontal	vertical	toward South
Foundation Mat Floor Slab	toward South	toward East	upward

Figure 6.2-49 Forces and Moments in Shell Element



*: Thermal section forces are reduced using the section design calculation program, SSDP-2D.

Figure 6.4-1 Design Flow Chart of Reinforced Concrete Structures



where,

v_c: allowable shear stress carried by concrete, psi
V_c: shear strength provided by concrete, lb / in
d: distance from extreme compression fiber to centroid of tension reinforcement, in
f'_c: specified compressive strength of concrete, psi
ρ_w: ratio of tension reinforcement $(= A_s / b_w d)$
V_u: shear force at section, lb
M_u: moment at section, lb - in
N_u: axial load at section, compression positive, lb
h: overall thickness of section, in
A_g: gross area of section, in^2

Figure 6.4-2 Calculation of Shear Strength Provided by Concrete

Check of laterally unsupported length : l_b

$l_b \le L_c$

where $L_c = min\left(\frac{76 b_f}{\sqrt{F_y}}, \frac{20000}{(d / A_f) F_y}\right)$

$l_b \le L_c$ → Check of compact section of web

$l_b > L_c$ → Tension or Compression

Check of compact section of web

$\frac{d}{t_w} \le \frac{640}{\sqrt{F_y}}\left(1 - 3.74 \frac{f_a}{F_y}\right)$ for $f_a / F_y \le 0.16$

$\frac{d}{t_w} \le \frac{257}{\sqrt{F_y}}$ for $f_a / F_y > 0.16$

Compact → Check of compact section of flange

Non-compact → $F_b = 0.60 F_y$

Check of compact section of flange

$\frac{b_f}{2 t_f} \le \frac{65}{\sqrt{F_y}}$

Compact → $F_b = 0.66 F_y$

Non-compact →

$F_b = F_y\left[0.79 - 0.002 \frac{b_f}{2 t_f}\sqrt{F_y}\right]$ (for rolled member)

$F_b = F_y\left[0.79 - 0.002 \frac{b_f}{2 t_f}\sqrt{\frac{F_y}{k_c}}\right]$ (for built-up member)

where $k_c = \frac{4.05}{(h / t_w)^{0.46}}$ if $h / t_w > 70$, otherwise $k_c = 1.0$

Tension or Compression

Tension → $F_b = 0.60 F_y$

Compression →

when $\sqrt{\frac{102 \times 10^3 C_b}{F_y}} \le \frac{l_b}{r_T} \le \sqrt{\frac{510 \times 10^3 C_b}{F_y}}$:

$F_b = max\left(\left[\frac{2}{3} - \frac{F_y (l_b / r_T)^2}{1530 \times 10^3 C_b}\right] F_y, \frac{12 \times 10^3 C_b}{l_b d / A_f}\right) \le 0.60 F_y$

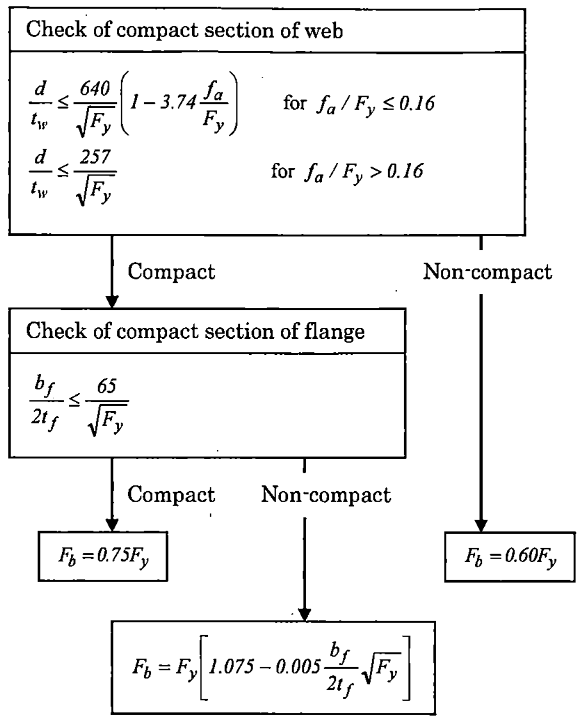
when $\frac{l_b}{r_T} \ge \sqrt{\frac{510 \times 10^3 C_b}{F_y}}$:

$F_b = max\left(\frac{170 \times 10^3 C_b}{(l_b / r_T)^2}, \frac{12 \times 10^3 C_b}{l_b d / A_f}\right) \le 0.60 F_y$

where,

- d = full depth of steel member, in.
- b_f = flange width, in.
- t_f = flange thickness, in.
- t_w = web thickness, in.
- A_f = area of compression flange, in.2
- r_t = radius of gyration of a section comprising the compression flange plus 1/3 of the compression web area, taken about an axis in the plane of the web, in.
- C_b = 1.0 (conservatively taken)

Figure 6.4-3 Allowable Stress of W-shaped Members (Strong Axis Bending)



where,

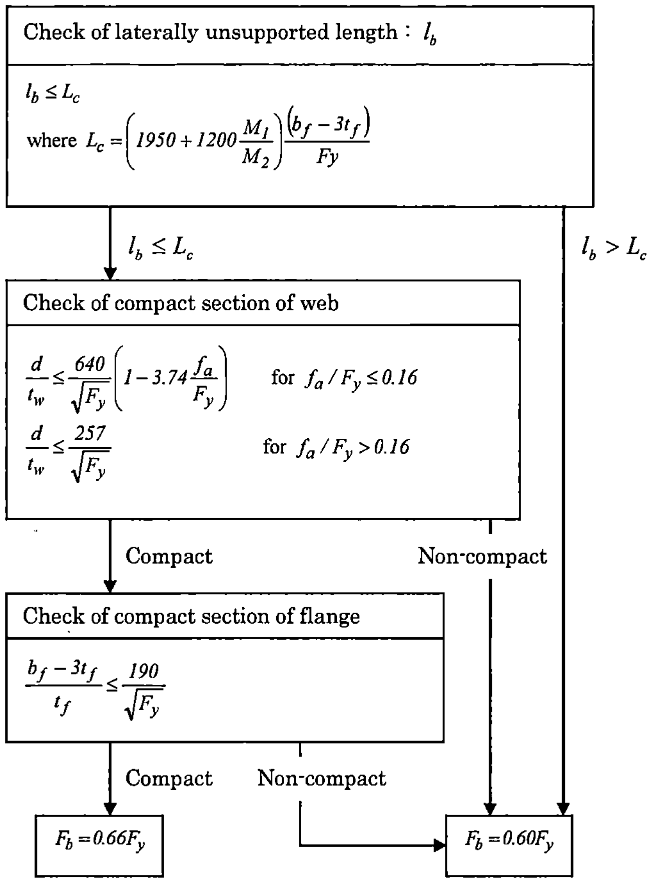
d = full depth of steel member, in.

b_f = flange width, in.

t_f = flange thickness, in.

t_w = web thickness, in.

Figure 6.4-4 Allowable Stress of W-shaped Members (Weak Axis Bending)



where,

d = full depth of steel member, in.
b_f = full flange width, in.
t_f = flange thickness, in.
t_w = web thickness, in.
M_1 = the smaller bending moment at the ends of the unbraced length
M_2 = the larger bending moment at the ends of the unbraced length

Figure 6.4-5 Allowable Bending Stress of Box Members

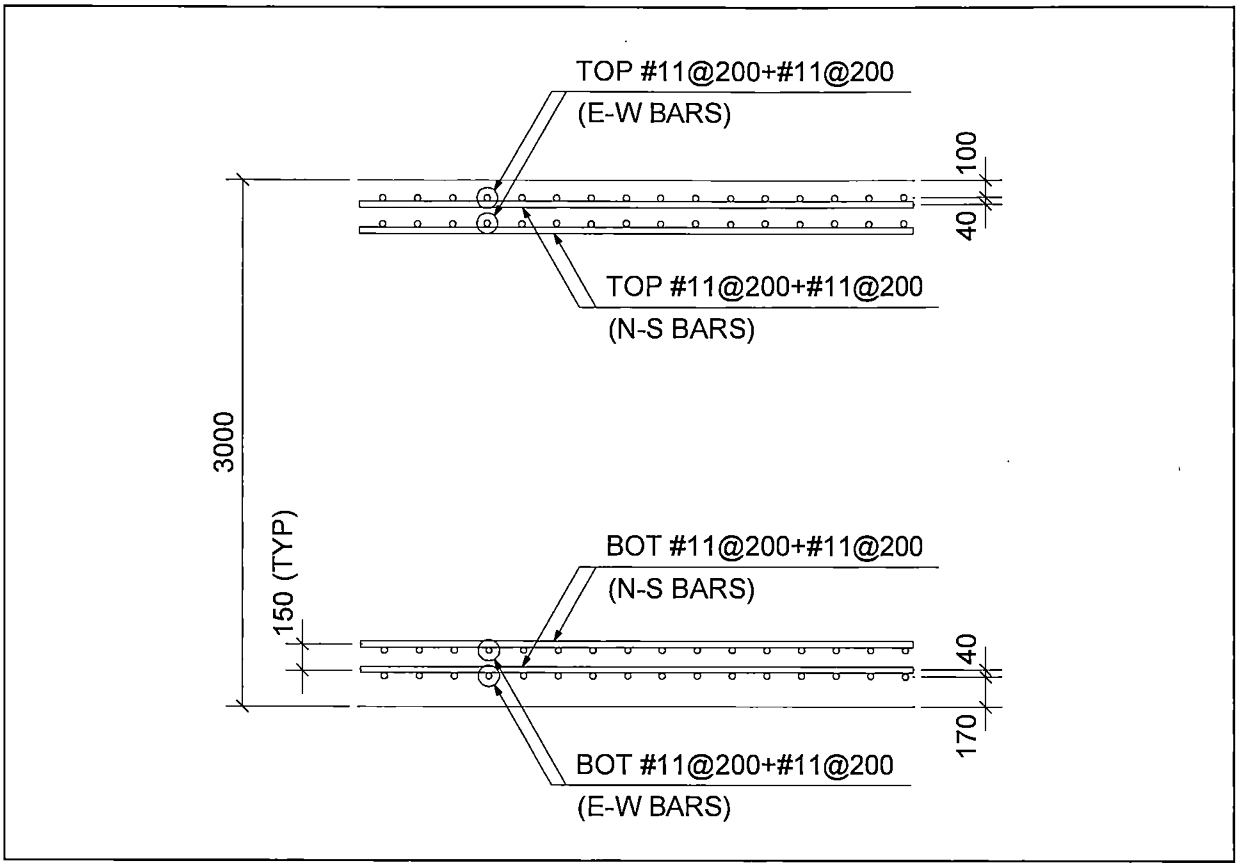


Figure 7.1-1 Assumed Basemat Rebar Arrangement (unit: mm)

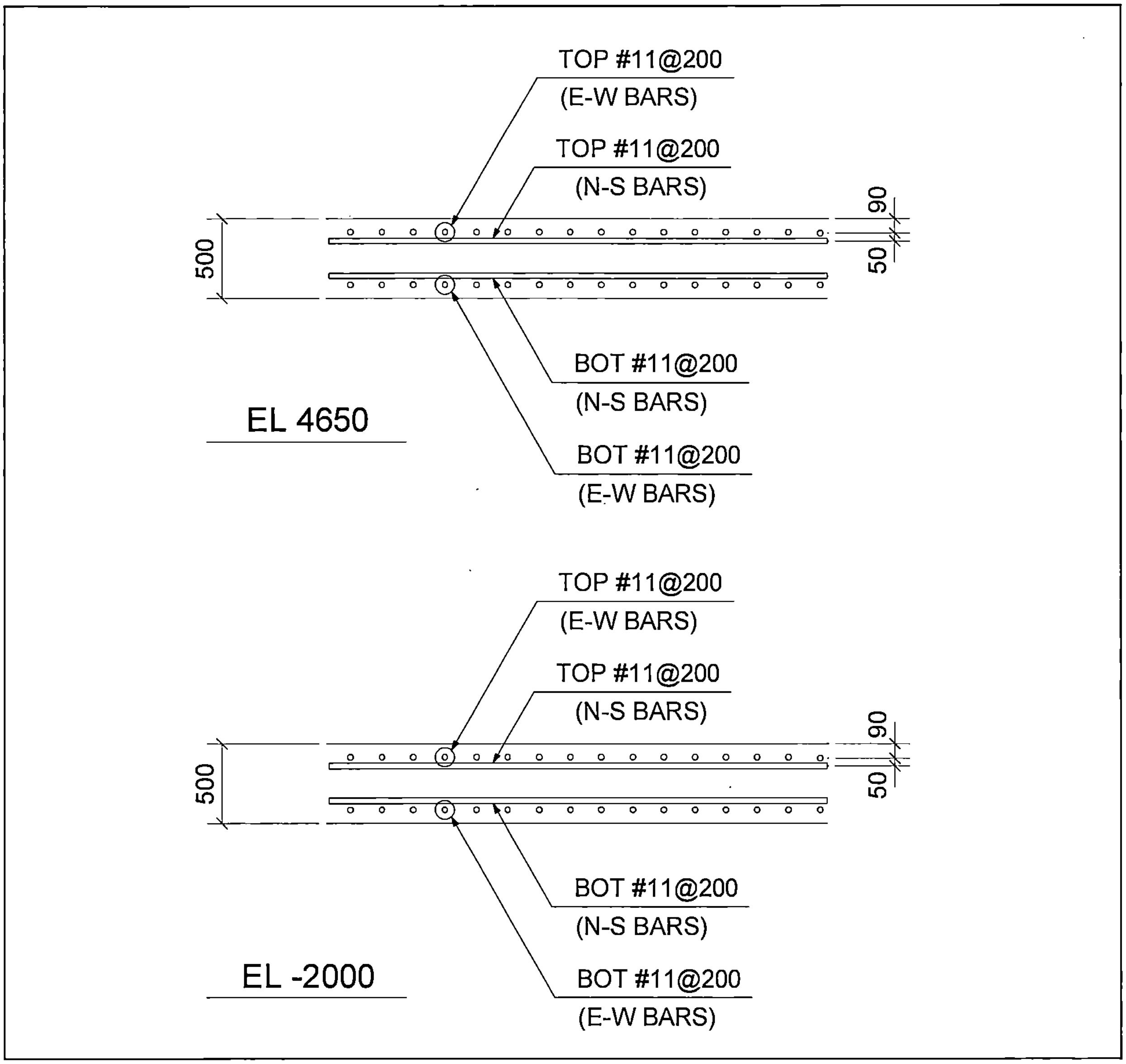


Figure 7.1-2 Assumed Floor Slabs Rebar Arrangement (unit: mm)

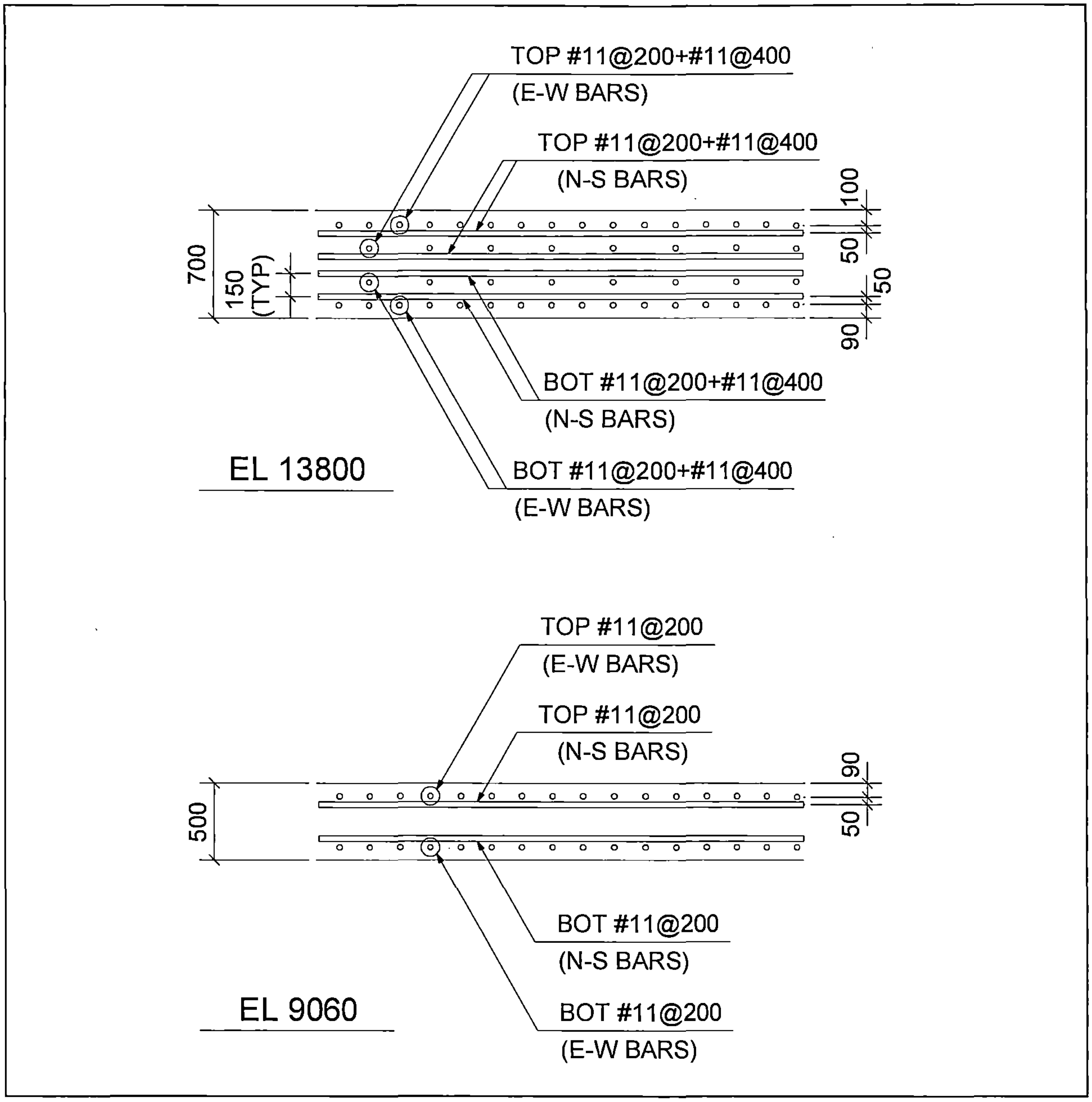


Figure 7.1-2 Assumed Floor Slabs Rebar Arrangement (Continued)

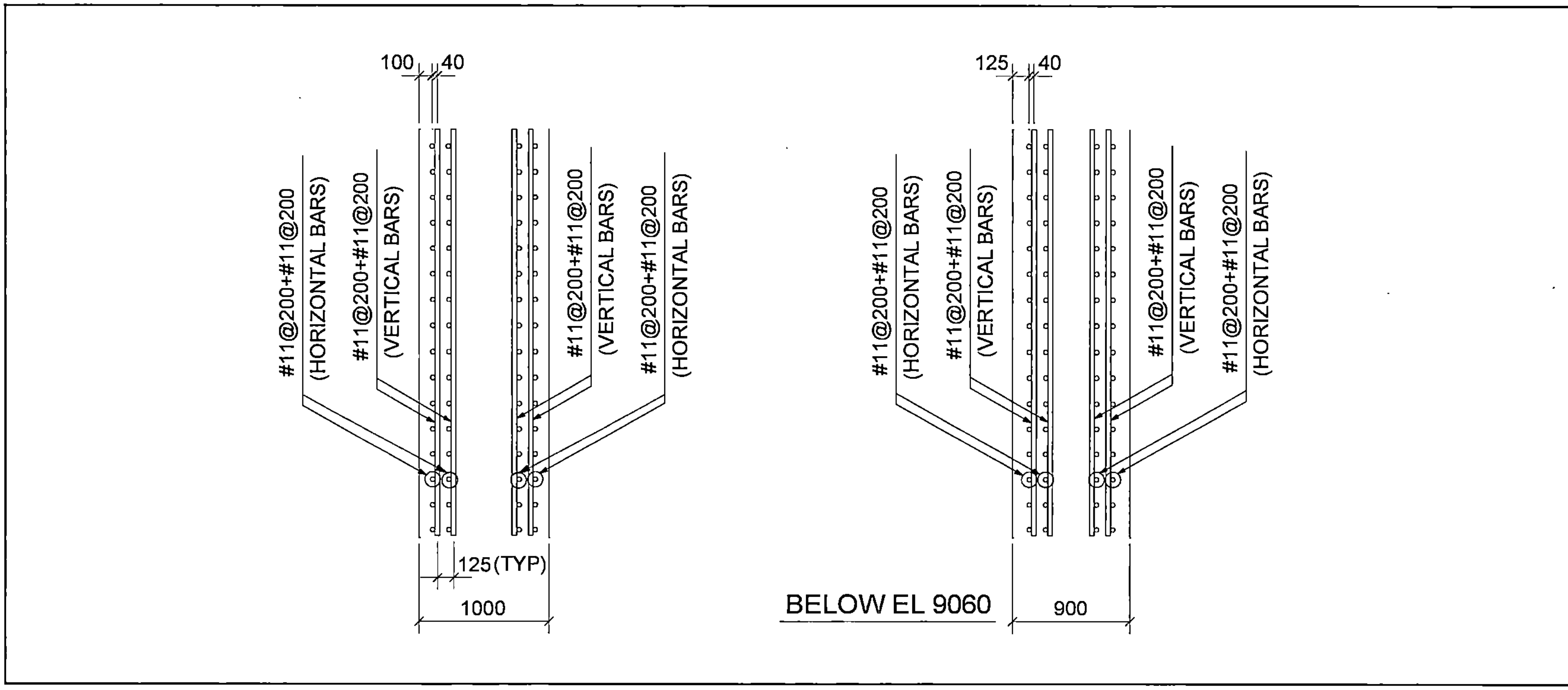


Figure 7.1-3 Assumed Walls Rebar Arrangement (unit: mm)

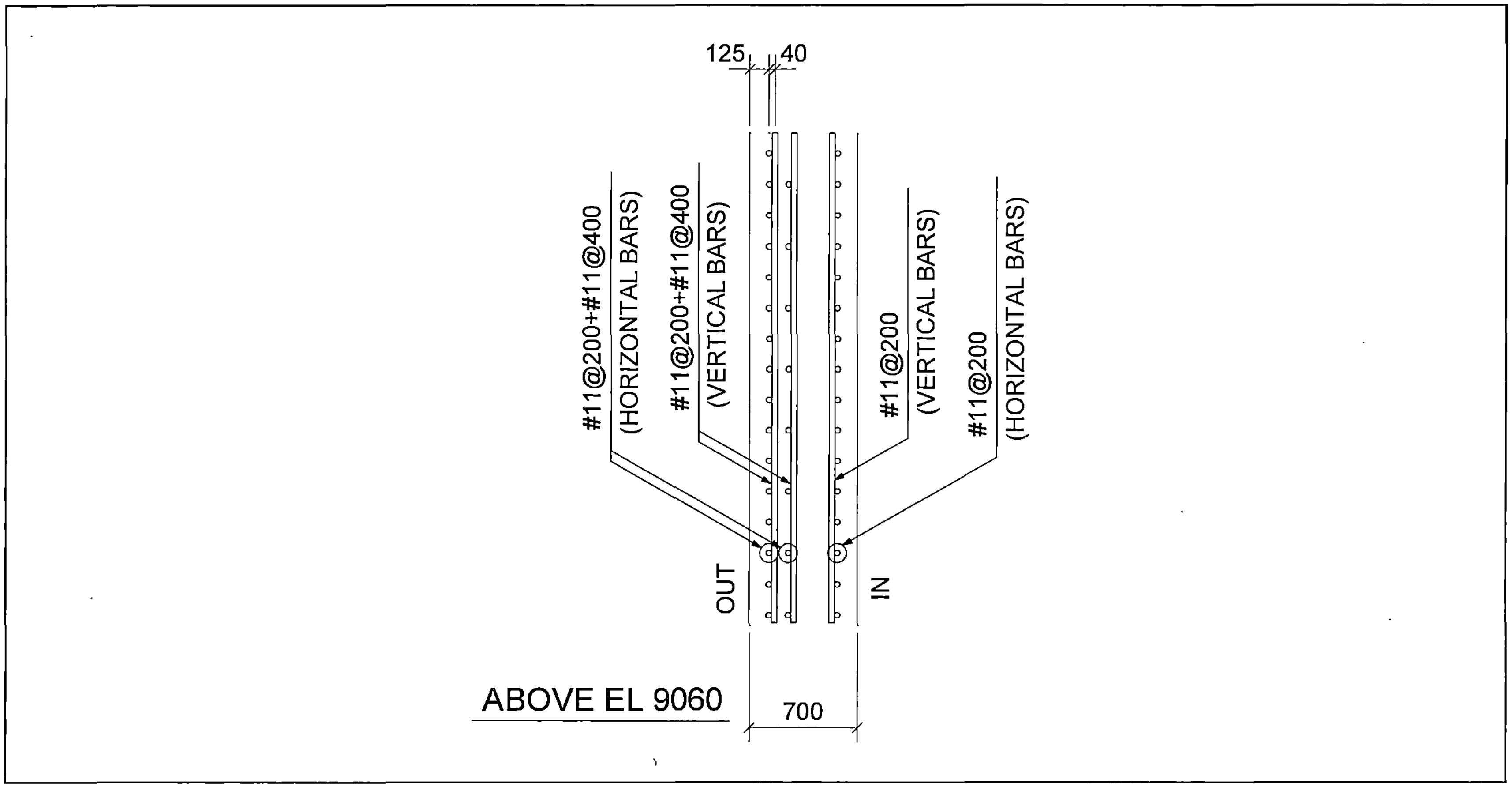


Figure 7.1-3 Assumed Walls Rebar Arrangement (Continued)

STRUCTURAL STEEL MEMBER SCHEDULE			
ID. NO.	MEMBER	WELDED PL MEMBER	
		FLG PL	WEB PL
STEEL GIRDERS			
SG11	–	400 × 36	628 × 28
SG12	–	300 × 28	644 × 19
SG21	–	400 × 40	720 × 28
SG22	–	300 × 28	644 × 19
SG23	–	400 × 40	920 × 28
SG31	–	300 × 36	928 × 28
SG32	–	300 × 28	944 × 19
SG33	–	400 × 40	1220 × 28
SG41	–	400 × 40	920 × 28
SG42	–	300 × 28	944 × 19
SG43	–	500 × 40	1220 × 28
STEEL COLUMNS			
SC11	D=800, t=70	–	–
SC12	D=700, t=30	–	–
SC21	D=800, t=70	–	–
SC31	D=800, t=60	–	–
SC41	D=800, t=60	–	–

Note: "SG23" is revised from the standard design.

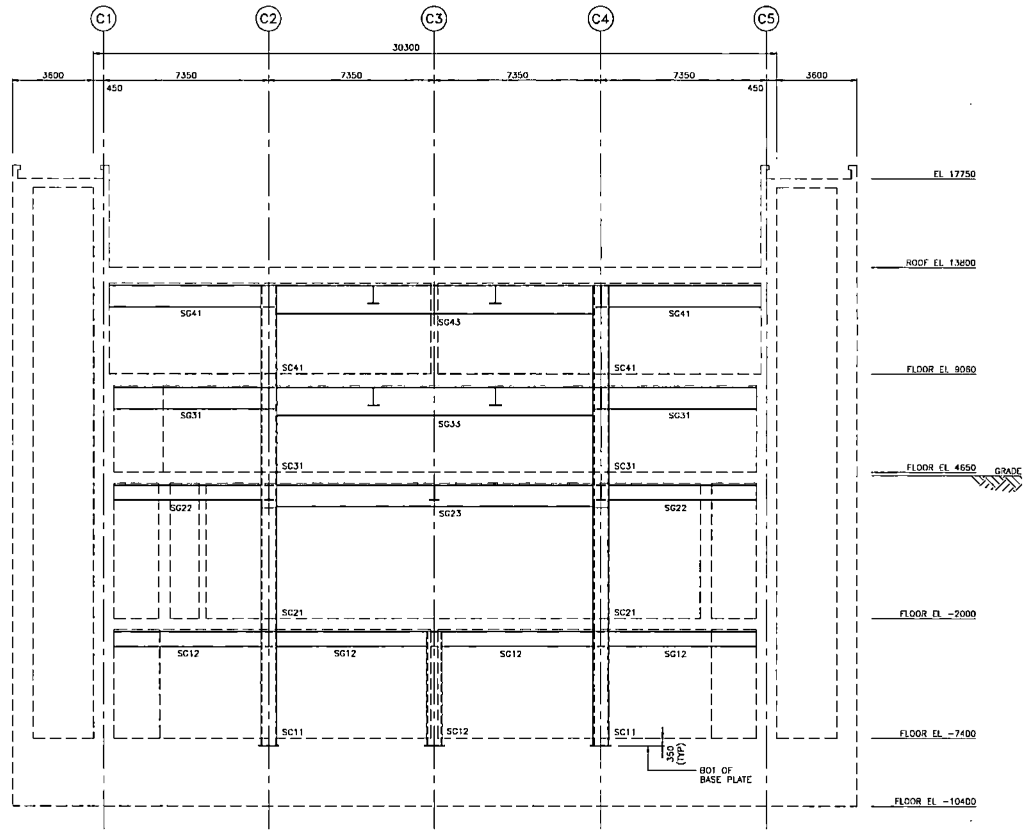


Figure 7.1-4 Structural Steel Member, Elevation on Col-Row CB

STRUCTURAL STEEL MEMBER SCHEDULE			
ID. NO.	MEMBER	WELDED PL MEMBER	
		FLG PL	WEB PL
STEEL GIRDERS			
SG11	–	400×36	628×28
SG12	–	300×28	644×19
SG21	–	400×40	720×28
SG22	–	300×28	644×19
SG23	–	400×40	920×28
SG31	–	300×36	928×28
SG32	–	300×28	944×19
SG33	–	400×40	1220×28
SG41	–	400×40	920×28
SG42	–	300×28	944×19
SG43	–	500×40	1220×28
STEEL COLUMNS			
SC11	D=800, t=70	–	–
SC12	D=700, t=30	–	–
SC21	D=800, t=70	–	–
SC31	D=800, t=60	–	–
SC41	D=800, t=60	–	–

Note: "SG23" is revised from the standard design.

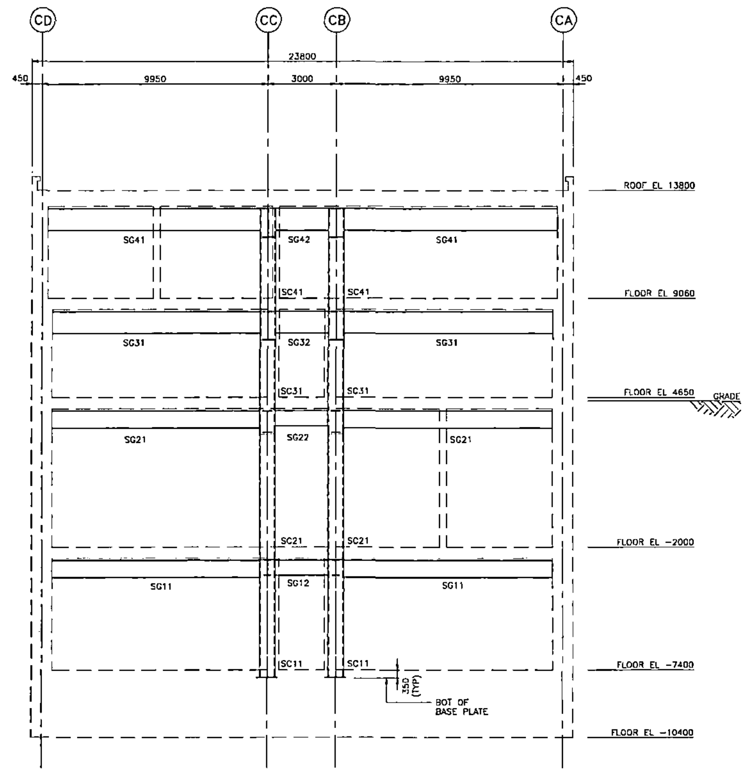


Figure 7.1-5 Structural Steel Member, Elevation on Col-Row C2

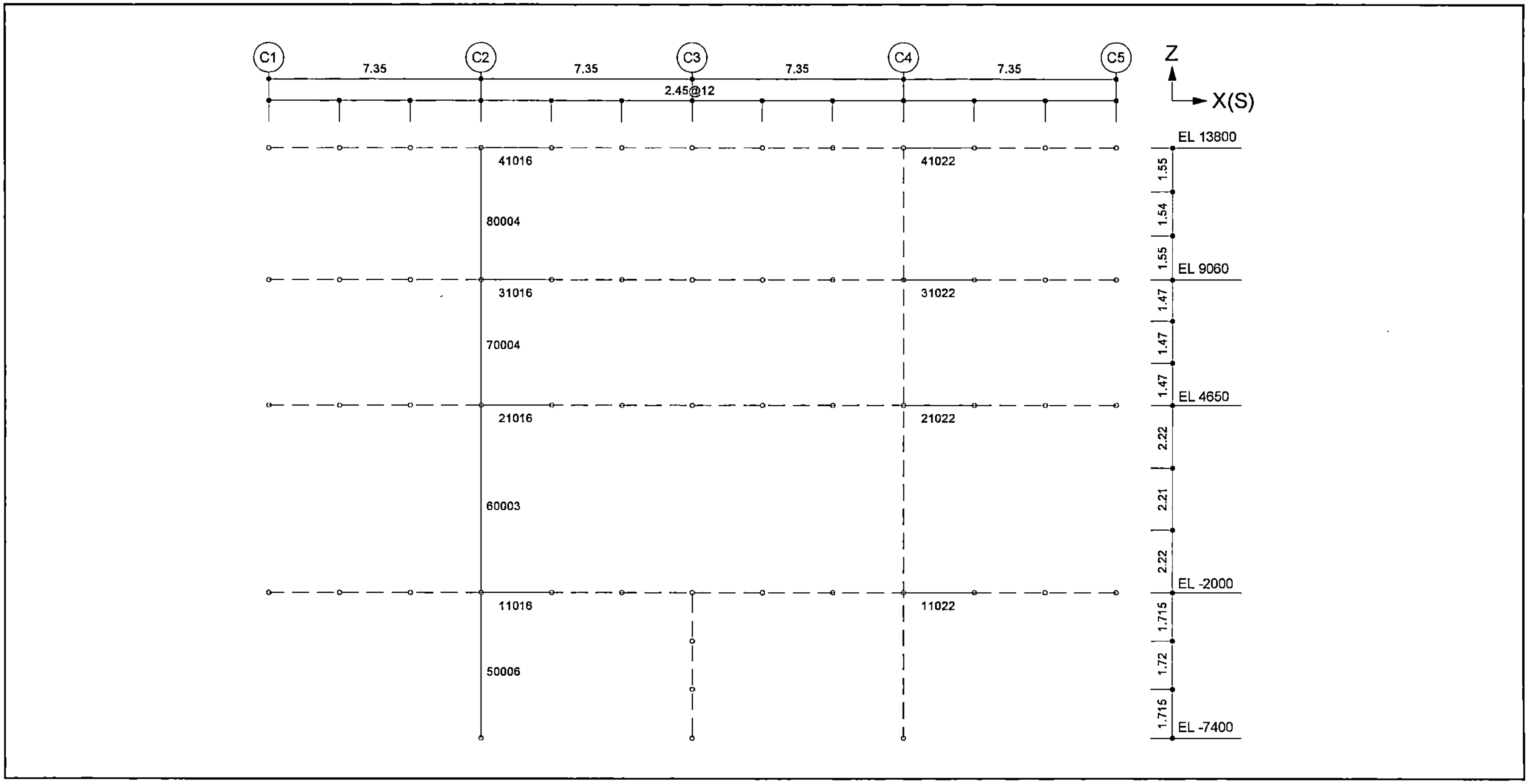


Figure 7.3-1 Elements Selected for Tabulation, Elevation on Col-Row CB

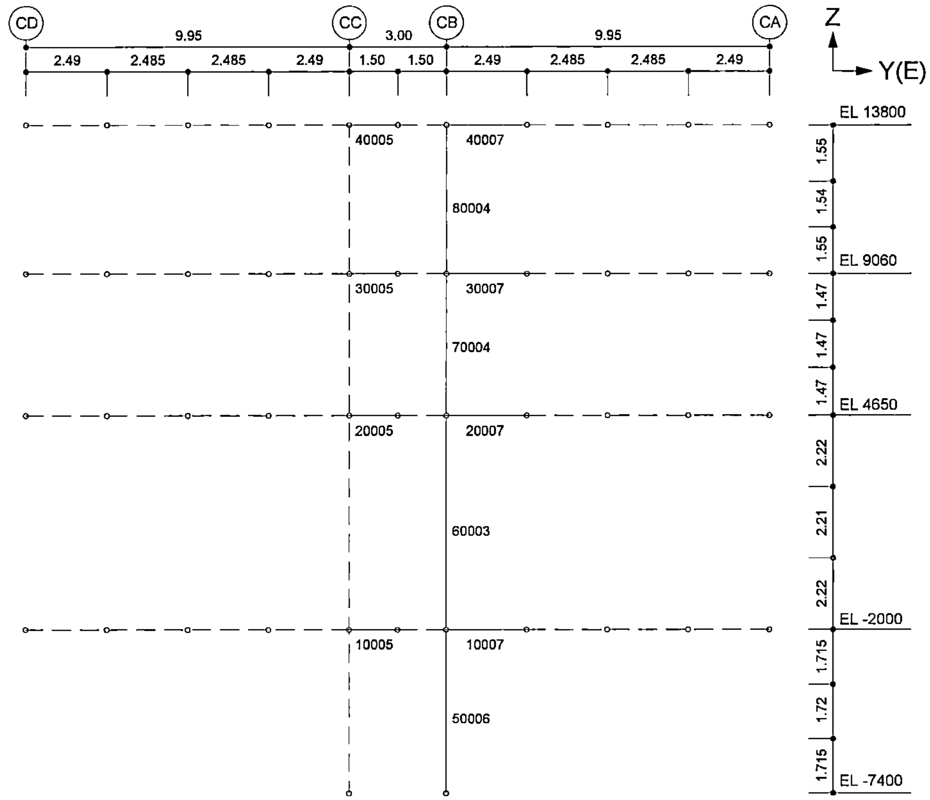


Figure 7.3-2 Elements Selected for Tabulation, Elevation on Col-Row C2

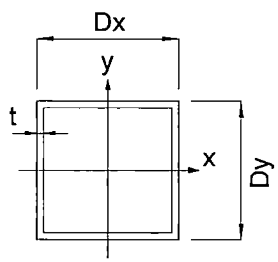
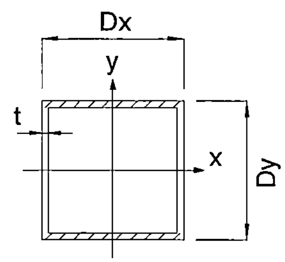
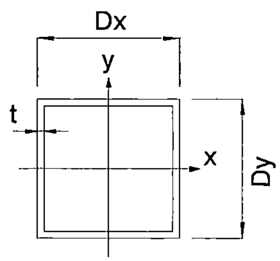
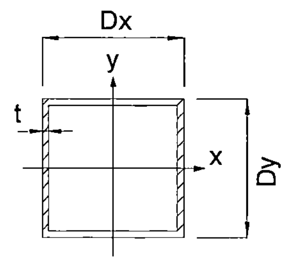
SC	N, Mx, My		Vx, Vy	
X (NS) direction		A, Zx: full section fa = N/A fbx = Mx / Zx		Ax: shaded area fvx = Vx / Ax
Y (EW) direction		A, Zy: full section fa = N/A fby = My / Zy		Ay: shaded area fvy = Vy / Ay
Check	combine by Equation 6.4.2-11		check for each direction	

Figure 7.3-3 Stress Check of Members Subject to Two Direction Forces

APPENDIX A
COMPARISON WITH DCD DATA

LIST OF TABLES

LIST OF FIGURES

NONE

Table A-1 Design Seismic Shear Loads for Horizontal

EL (m)	Node No.	NS-direction NA3 (MN)	NS-direction DCD (MN)	NS-direction Ratio (NA3/DCD)	EW-direction NA3 (MN)	EW-direction DCD (MN)	EW-direction Ratio (NA3/DCD)
13.80	6	42.68	33.10	1.29	40.16	29.14	1.38
9.06	5	42.68	33.10	1.29	40.16	29.14	1.38
9.06	5	77.90	53.35	1.46	70.07	54.75	1.28
4.65	4	77.90	53.35	1.46	70.07	54.75	1.28
4.65	4	101.02	75.57	1.34	91.19	80.11	1.14
-2.00	3	101.02	75.57	1.34	91.19	80.11	1.14
-2.00	3	40.98	124.35	0.33	44.77	99.44	0.45
-7.40	2	40.98	124.35	0.33	44.77	99.44	0.45
-7.40	2	26.86	111.89	0.24	20.86	112.78	0.18
-10.40	1	26.86	111.89	0.24	20.86	112.78	0.18

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

Table A-2 Design Seismic Moment Loads for Horizontal

EL (m)	Node No.	NS-direction NA3 (MN-m)	NS-direction DCD (MN-m)	NS-direction Ratio (NA3/DCD)	EW-direction NA3 (MN-m)	EW-direction DCD (MN-m)	EW-direction Ratio (NA3/DCD)
13.80	6	109.76	160.05	0.69	86.07	124.05	0.69
9.06	5	276.32	250.07	1.10	226.02	196.72	1.15
9.06	5	359.79	359.61	1.00	292.54	274.88	1.06
4.65	4	684.74	572.61	1.20	561.86	443.07	1.27
4.65	4	381.88	723.05	0.53	204.46	540.35	0.38
-2.00	3	1053.35	1135.62	0.93	736.10	987.53	0.75
-2.00	3	566.89	1231.72	0.46	510.74	1035.59	0.49
-7.40	2	770.80	1570.05	0.49	693.16	1524.94	0.45
-7.40	2	338.05	1601.43	0.21	198.89	1560.25	0.13
-10.40	1	257.43	1839.74	0.14	136.22	1855.43	0.07

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

Table A-3 Design Seismic Torsion Loads

EL (m)	Node No.	Calculated Torsion			Accidental Torsion			Design Torsion		
		NA3 (MN-m)	DCD (MN-m)	Ratio (NA3/DCD)	NA3 (MN-m)	DCD (MN-m)	Ratio (NA3/DCD)	NA3 (MN-m)	DCD (MN-m)	Ratio (NA3/DCD)
13.80	6	27.53	23.09	1.19	64.67	50.14	1.29	92.20	73.24	1.26
9.06	5	27.53	23.09	1.19	64.67	50.14	1.29	92.20	73.24	1.26
9.06	5	57.73	44.86	1.29	118.02	82.95	1.42	175.75	127.80	1.38
4.65	4	57.73	44.86	1.29	118.02	82.95	1.42	175.75	127.80	1.38
4.65	4	51.22	56.88	0.90	153.04	121.37	1.26	204.26	178.25	1.15
-2.00	3	51.22	56.88	0.90	153.04	121.37	1.26	204.26	178.25	1.15
-2.00	3	26.91	59.85	0.45	67.83	188.39	0.36	94.74	248.24	0.38
-7.40	2	26.91	59.85	0.45	67.83	188.39	0.36	94.74	248.24	0.38
-7.40	2	0.00	54.79	0.00	40.70	170.86	0.24	40.70	225.65	0.18
-10.40	1	0.00	54.79	0.00	40.70	170.86	0.24	40.70	225.65	0.18

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

Table A-4 Vertical Acceleration

EL (m)	Node No.	NA3 (g)	DCD (g)	Ratio (NA3/DCD)
13.80	6	1.05	1.00	1.05
9.06	5	0.95	0.86	1.11
4.65	4	0.82	0.74	1.10
-2.00	3	0.60	0.56	1.06
-7.40	2	0.64	0.51	1.26
-10.40	1	0.63	0.51	1.25
13.80	9001	2.20	2.19	1.00
	9002	2.09	1.34	1.56
	9003	2.00	1.43	1.40
	9004	2.08	–	–
9.06	9101	2.08	2.00	1.04
	9102	1.62	1.26	1.28
	9103	2.00	1.43	1.40
	9104	1.93	–	–
4.65	9201	1.53	1.30	1.18
	9202	1.73	1.43	1.21
	9203	1.75	–	–
-2.00	9301	1.32	1.39	0.95
	9302	1.28	–	–

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

The node numbers in this table are described in Figure 5.6-1.

Table A-5 Dynamic Soil Pressures

Pressure on C1 and C5 Walls

EL (m)	H (m)	NA3 (MN/m²)	DCD (MN/m²)	Ratio (NA3/DCD)
4.650				
	0.350			
4.300				
	0.350			
3.950				
	1.830			
2.120		0.12	0.22	0.54
	2.190			
-0.070				
	1.930			
-2.000				
	0.250			
-2.250				
	0.250			
-2.500				
	1.465			
-3.965				
	1.720	0.28	0.18	1.51
-5.685				
	1.715			
-7.400				
	2.500			
-9.900		0.31	0.19	1.63
	0.500			
-10.400				

Pressures on CA and CD Walls

EL (m)	H (m)	NA3 (MN/m²)	DCD (MN/m²)	Ratio (NA3/DCD)
4.650				
	0.350			
4.300				
	0.350			
3.950				
	1.830			
2.120		0.12	0.22	0.52
	2.190			
-0.070				
	1.930			
-2.000				
	0.250			
-2.250				
	0.250			
-2.500				
	1.465			
-3.965		0.23	0.18	1.24
	1.720			
-5.685				
	1.715			
-7.400				
	2.500			
-9.900		0.28	0.19	1.48
	0.500			
-10.400				

Note: Obtained from Reference 2.1.2-l, based on site-specific Seismic Analysis of Control Building in Reference 2.1.2-k

Table A-6 Maximum Stress Ratios (Basemat and Slabs) for Flexure and Membrane Forces

Location	Element	Concrete				
		NA3		DCD		Ratio (NA3/DCD)
	ID	σ/σ_a	Load ID	σ/σ_a	Load ID	
Basemat EL-7.4m	67	0.228	7011	0.281	7011	0.81
	72	0.367	7011	0.512	7011	0.72
	115	0.234	7011	0.310	7011	0.76
	120	0.254	7011	0.250	7011	1.02
SlabB1F EL-2.0m	567	0.340	7021	0.493	7011	0.69
	572	0.217	7021	0.265	7001	0.82
	615	0.345	7021	0.356	7011	0.97
	620	0.337	7001	0.355	7021	0.95
Slab 1F EL4.65m	1067	0.751	7001	0.635	7001	1.18
	1072	0.361	7001	0.325	7001	1.11
	1115	0.606	7001	0.587	7001	1.03
	1120	0.335	7021	0.364	7021	0.92
Slab 2F EL9.06m	1567	0.417	7001	0.396	7001	1.05
	1572	0.278	7021	0.266	7021	1.05
	1615	0.413	7001	0.439	7001	0.94
	1620	0.643	7021	0.611	7021	1.05
Slab RF EL13.8m	1867	0.465	7021	0.550	7021	0.84
	1872	0.154	4023	0.154	4023	1.00
	1915	0.336	7011	0.305	7011	1.10
	1920	0.523	7021	0.512	7021	1.02

Table A-6 Maximum Stress Ratios (Basemat and Slabs) for Flexure and Membrane Forces (Continued)

Location	Element	Primary Reinforcement																			
		NS direction										EW direction									
		Top					Bottom					Top					Bottom				
		NA3		DCD		Ratio	NA3		DCD		Ratio	NA3		DCD		Ratio	NA3		DCD		Ratio
	ID	σ/σ_a	Load ID	σ/σ_a	Load ID	(NA3/DCD)	σ/σ_a	Load ID	σ/σ_a	Load ID	(NA3/DCD)	σ/σ_a	Load ID	σ/σ_a	Load ID	(NA3/DCD)	σ/σ_a	Load ID	σ/σ_a	Load ID	(NA3/DCD)
Basemat EL-7.4m	67	0.058	7011	0.060	7011	0.98	0.095	7021	0.088	7501	1.08	0.087	7011	0.111	7011	0.78	0.078	7021	0.256	7501	0.30
	72	0.084	7011	0.106	7011	0.79	0.370	7021	0.568	7521	0.65	0.207	7501	0.575	7501	0.36	0.434	7521	0.795	7521	0.55
	115	0.129	7501	0.549	7501	0.24	0.292	7521	0.398	7521	0.74	0.063	7501	0.655	7501	0.10	0.041	7501	0.047	7501	0.87
	120	0.062	7021	0.072	7501	0.86	0.078	7021	0.053	7011	1.48	0.048	7021	0.195	7501	0.25	0.096	7021	0.053	7021	1.83
SlabB1F EL-2.0m	567	0.041	7021	0.109	7501	0.38	0.091	7011	0.282	7501	0.32	0.374	7011	0.669	7011	0.56	0.221	7501	0.599	7501	0.37
	572	0.080	3004	0.092	7521	0.87	0.084	3002	0.119	7511	0.70	0.025	7021	0.054	7501	0.45	0.067	7011	0.080	7501	0.84
	615	0.185	7011	0.282	7501	0.66	0.075	7501	0.292	7501	0.26	0.216	7011	0.310	7501	0.70	0.100	7501	0.488	7501	0.20
	620	0.418	7001	0.303	7001	1.38	0.089	7001	0.091	7021	0.98	0.480	7001	0.382	3004	1.26	0.082	7001	0.105	7501	0.78
Slab 1F EL4.65m	1067	0.078	4022	0.113	7021	0.69	0.527	7011	0.332	7011	1.59	0.024	4024	0.155	7501	0.16	0.185	7011	0.221	7511	0.84
	1072	0.131	7001	0.192	7501	0.68	0.074	3002	0.238	7511	0.31	0.084	7021	0.142	7501	0.59	0.063	4022	0.120	7511	0.52
	1115	0.155	4014	0.155	4014	1.00	0.052	4014	0.145	7501	0.36	0.581	7001	0.421	3002	1.38	0.092	7011	0.212	7521	0.44
	1120	0.211	4013	0.211	4013	1.00	0.071	7501	0.125	7511	0.57	0.224	4012	0.224	4012	1.00	0.113	7501	0.132	7501	0.85
Slab 2F EL9.06m	1567	0.119	7021	0.114	7021	1.04	0.368	7001	0.350	7001	1.05	0.037	4012	0.039	7511	0.95	0.130	4014	0.130	4014	1.00
	1572	0.371	7001	0.331	7001	1.12	0.083	7501	0.073	7501	1.14	0.160	7501	0.156	7501	1.02	0.166	7501	0.156	7501	1.06
	1615	0.325	7001	0.330	7001	0.99	0.179	7001	0.165	7001	1.08	0.572	7001	0.539	7001	1.06	0.107	7521	0.076	7521	1.40
	1620	0.270	7021	0.259	7021	1.04	0.170	7021	0.171	7021	0.99	0.276	7021	0.263	7021	1.05	0.167	7021	0.165	7021	1.02
Slab RF EL13.8m	1867	0.215	7521	0.201	7521	1.07	0.369	7021	0.348	7021	1.06	0.213	7021	0.204	7021	1.05	0.091	7021	0.082	4012	1.11
	1872	0.428	7021	0.390	7021	1.10	0.174	7021	0.134	7021	1.30	0.529	7021	0.490	7021	1.08	0.238	7011	0.204	7011	1.17
	1915	0.533	7021	0.474	7021	1.12	0.311	7501	0.257	7501	1.21	0.528	7021	0.458	7021	1.15	0.188	7501	0.146	7501	1.29
	1920	0.373	7021	0.370	7021	1.01	0.087	7511	0.079	7511	1.11	0.413	7021	0.407	7021	1.02	0.076	7511	0.073	4014	1.04

Table A-7 Maximum Stress Ratios (Walls) for Flexure and Membrane Forces

Location	Element ID	Concrete				
		NA3		DCD		Ratio (NA3/DCD)
		σ/σ_a	Load ID	σ/σ_a	Load ID	
Wall EL-7.4m ~EL-2.0m	6007	0.339	7021	0.397	7021	0.85
	4006	0.506	7011	0.512	7011	0.99
	4010	0.402	7011	0.423	7011	0.95
Wall EL-2.0m ~EL4.65m	6043	0.315	7021	0.429	7011	0.73
	4036	0.282	7001	0.227	7001	1.24
	4040	0.317	7011	0.320	7011	0.99
Wall EL4.65m ~EL9.06m	6081	0.267	7021	0.395	7021	0.68
	4066	0.538	7021	0.581	7021	0.93
	4070	0.320	4023	0.320	4023	1.00
Wall EL9.06m ~EL13.8m	6117	0.600	7021	0.605	7021	0.99
	4096	0.517	7021	0.484	7021	1.07
	4100	0.436	7021	0.376	7021	1.16

Table A-7 Maximum Stress Ratios (Walls) for Flexure and Membrane Forces (Continued)

Location	Element ID	Primary Reinforcement																			
		Horizontal direction										Vertical direction									
		Inside					Outside					Inside					Outside				
		NA3		DCD		Ratio (NA3/DCD)	NA3		DCD		Ratio (NA3/DCD)	NA3		DCD		Ratio (NA3/DCD)	NA3		DCD		Ratio (NA3/DCD)
		σ/σ_a	Load ID	σ/σ_a	Load ID		σ/σ_a	Load ID	σ/σ_a	Load ID		σ/σ_a	Load ID	σ/σ_a	Load ID		σ/σ_a	Load ID	σ/σ_a	Load ID	
Wall EL-7.4m ~EL-2.0m	6007	0.092	7501	0.327	7501	0.28	0.315	7521	0.585	7521	0.54	0.075	7501	0.372	7501	0.20	0.370	7021	0.664	7521	0.56
	4006	0.213	7501	0.399	7501	0.53	0.348	7511	0.551	7511	0.63	0.189	7501	0.425	7501	0.44	0.457	7511	0.783	7511	0.58
	4010	0.170	7501	0.226	7501	0.75	0.478	7021	0.540	7021	0.89	0.166	7501	0.286	7501	0.58	0.609	7021	0.728	7021	0.84
Wall EL-2.0m ~EL4.65m	6043	0.290	7501	0.256	7501	1.13	0.590	7011	0.538	7011	1.10	0.421	7501	0.337	7501	1.25	0.445	7011	0.342	7011	1.30
	4036	0.286	7501	0.304	7501	0.94	0.408	7011	0.348	7011	1.17	0.484	7511	0.486	7511	1.00	0.462	7501	0.452	7501	1.02
	4040	0.239	7511	0.266	7521	0.90	0.380	7011	0.405	7011	0.94	0.510	7521	0.411	7521	1.24	0.399	7521	0.307	7521	1.30
Wall EL4.65m ~EL9.06m	6081	0.295	7501	0.249	7501	1.18	0.532	7021	0.486	7021	1.10	0.385	7511	0.372	7511	1.03	0.421	7501	0.423	7501	1.00
	4066	0.235	7521	0.202	7501	1.16	0.540	7021	0.530	7021	1.02	0.221	7501	0.274	7501	0.81	0.508	7521	0.494	7021	1.03
	4070	0.320	7021	0.302	7021	1.06	0.505	7021	0.493	7021	1.02	0.233	7501	0.204	7501	1.14	0.611	7021	0.569	7021	1.07
Wall EL9.06m ~EL13.8m	6117	0.366	7501	0.328	7501	1.12	0.642	7021	0.591	7021	1.09	0.345	7511	0.295	7511	1.17	0.395	7021	0.377	7521	1.05
	4096	0.322	7501	0.246	7501	1.31	0.489	7021	0.435	7021	1.13	0.331	7511	0.250	7511	1.32	0.486	7021	0.385	7021	1.26
	4100	0.281	7011	0.234	7011	1.20	0.485	7021	0.450	7021	1.08	0.278	7011	0.248	7011	1.12	0.685	7021	0.630	7021	1.09

Table A-8 Maximum Stress Ratios for Membrane Compressive Forces

Location	Element ID	Thickness h (m)	NA3					DCD					Ratio (NA3/DCD)			
			Load ID	Calculated Concrete Stress (MPa)				Load ID	Calculated Concrete Stress (MPa)							
				σ_x	σ_y	τ_{xy}	σ_c		σ_x	σ_y	τ_{xy}	σ_c	σ_x	σ_y	τ_{xy}	σ_c
Basemat EL-7.4m	67	3.0	3004	1.0	1.1	0.0	1.1	7011	0.9	1.4	0.2	1.5	1.20	0.81	-0.11	0.76
	72	3.0	3001	1.3	0.3	0.0	1.3	7001	0.8	1.4	-0.7	1.9	1.57	0.23	0.03	0.70
	115	3.0	7001	1.9	0.6	-0.5	2.0	7001	1.9	0.6	-1.0	2.5	0.97	0.97	0.51	0.83
	120	3.0	3004	1.0	0.5	-0.1	1.0	3004	1.0	0.5	-0.1	1.0	1.00	1.00	1.00	1.00
SlabB1F EL-2.0m	567	0.5	3002	3.4	0.7	0.0	3.4	3002	3.4	0.7	0.0	3.4	1.00	1.00	1.00	1.00
	572	0.5	3004	5.2	2.1	0.4	5.2	3004	5.2	2.1	0.4	5.2	1.00	1.00	1.00	1.00
	615	0.5	7021	3.5	1.1	-2.2	4.8	7021	3.3	1.4	-2.2	4.8	1.07	0.78	0.99	1.01
	620	0.5	3004	2.4	1.2	3.1	5.0	3004	2.4	1.2	3.1	5.0	1.00	1.00	1.00	1.00
Slab 1F EL4.65m	1067	0.5	4022	2.6	1.1	0.0	2.6	4022	2.6	1.1	0.0	2.6	1.00	1.00	1.00	1.00
	1072	0.5	7021	2.1	4.4	-0.5	4.5	7021	2.2	4.7	-0.6	4.8	0.94	0.94	0.73	0.93
	1115	0.5	7021	3.8	0.5	0.9	4.0	7021	3.9	0.6	1.0	4.2	0.96	0.84	0.94	0.96
	1120	0.5	7021	4.8	4.3	-4.1	8.6	7021	4.8	4.3	-4.1	8.7	1.00	0.99	0.98	0.99
Slab 2F EL9.06m	1567	0.5	7021	5.2	2.2	-0.1	5.2	7021	5.2	2.2	-0.1	5.2	1.00	1.01	1.03	1.00
	1572	0.5	7021	1.8	7.6	-1.1	7.8	7021	1.5	7.6	-1.0	7.7	1.16	1.00	1.12	1.01
	1615	0.5	7021	6.6	-1.0	-0.4	6.6	7021	6.4	-1.0	-0.4	6.4	1.03	1.08	0.97	1.03
	1620	0.5	7021	6.6	6.6	-8.2	14.8	7021	6.5	6.5	-8.0	14.5	1.02	1.01	1.03	1.02
Slab RF EL13.8m	1867	0.7	7001	0.3	0.3	-0.1	0.4	7001	0.3	0.2	-0.1	0.4	1.08	1.08	1.23	1.12
	1872	0.7	7001	0.7	1.4	-0.9	2.0	7001	0.6	1.2	-0.7	1.7	1.19	1.12	1.32	1.21
	1915	0.7	7001	2.0	0.8	-0.7	2.3	7001	1.8	0.6	-0.5	2.0	1.14	1.20	1.35	1.18
	1920	0.7	7021	0.5	0.7	0.7	1.3	7021	0.4	0.6	0.6	1.1	1.25	1.13	1.14	1.15
Wall EL-7.4m ~EL-2.0m	6007	0.9	7001	2.3	1.9	-2.3	4.4	7001	2.6	2.6	-4.0	6.6	0.91	0.72	0.56	0.66
	4006	0.9	7001	1.3	2.2	-1.3	3.2	7001	1.6	3.6	-2.4	5.3	0.83	0.60	0.55	0.60
	4010	0.9	7001	0.9	1.6	-1.0	2.3	7001	0.9	2.1	-1.4	3.0	1.00	0.78	0.73	0.78
Wall EL-2.0m ~EL4.65m	6043	0.9	7001	1.6	2.8	-3.1	5.4	7001	1.6	3.1	-2.8	5.2	0.98	0.91	1.14	1.04
	4036	0.9	7001	1.5	1.7	2.4	3.9	7001	1.5	2.5	2.2	4.3	1.01	0.66	1.06	0.92
	4040	0.9	7001	1.0	3.2	2.6	4.9	7001	0.9	2.5	2.5	4.3	1.08	1.24	1.04	1.13
Wall EL4.65m ~EL9.06m	6081	0.9	7011	3.1	1.6	2.1	4.6	7011	3.2	1.6	1.6	4.2	0.99	1.01	1.34	1.11
	4066	0.9	7011	2.9	1.0	2.0	4.2	7011	3.3	1.1	1.6	4.1	0.89	0.93	1.26	1.02
	4070	0.9	7011	1.9	1.8	3.2	5.0	7011	2.0	1.4	3.0	4.7	0.95	1.24	1.06	1.06
Wall EL9.06m ~EL13.8m	6117	0.7	7001	1.3	1.4	1.3	2.6	7001	1.2	1.4	1.1	2.4	1.10	0.99	1.19	1.11
	4096	0.7	7001	1.1	0.8	1.4	2.4	4012	2.7	0.1	0.1	2.7	0.39	6.03	10.89	0.87
	4100	0.7	7001	0.2	0.7	1.5	2.0	7001	0.2	0.6	1.3	1.7	1.29	1.03	1.18	1.15

Note: Compressive forces are positive.

Table A-8 Maximum Stress Ratios for Membrane Compressive Forces (Continued)

Location	Element ID	NA3			DCD			σ_c/σ_a		
		Load ID	σ_c (MPa)	σ_a (MPa)	Load ID	σ_c (MPa)	σ_a (MPa)	NA3	DCD	Ratio (NA3/DCD)
Basemat EL-7.4m	67	3004	1.1	16.6	7011	1.5	20.7	0.07	0.07	0.95
	72	3001	1.3	16.6	7001	1.9	16.6	0.08	0.11	0.70
	115	7001	2.0	16.6	7001	2.5	16.6	0.12	0.15	0.83
	120	3004	1.0	16.6	3004	1.0	16.6	0.06	0.06	1.00
SlabB1F EL-2.0m	567	3002	3.4	20.7	3002	3.4	20.7	0.16	0.16	1.00
	572	3004	5.2	20.7	3004	5.2	20.7	0.25	0.25	1.00
	615	7021	4.8	25.9	7021	4.8	25.9	0.19	0.18	1.01
	620	3004	5.0	20.7	3004	5.0	20.7	0.24	0.24	1.00
Slab 1F EL4.65m	1067	4022	2.6	25.9	4022	2.6	25.9	0.10	0.10	1.00
	1072	7021	4.5	25.9	7021	4.8	25.9	0.17	0.19	0.93
	1115	7021	4.0	25.9	7021	4.2	25.9	0.15	0.16	0.96
	1120	7021	8.6	25.9	7021	8.7	25.9	0.33	0.34	0.99
Slab 2F EL9.06m	1567	7021	5.2	25.9	7021	5.2	25.9	0.20	0.20	1.00
	1572	7021	7.8	25.9	7021	7.7	25.9	0.30	0.30	1.01
	1615	7021	6.6	25.9	7021	6.4	25.9	0.25	0.25	1.03
	1620	7021	14.8	25.9	7021	14.5	25.9	0.57	0.56	1.02
Slab RF EL13.8m	1867	7001	0.4	20.7	7001	0.4	20.7	0.02	0.02	1.12
	1872	7001	2.0	20.7	7001	1.7	20.7	0.10	0.08	1.21
	1915	7001	2.3	20.7	7001	2.0	20.7	0.11	0.10	1.18
	1920	7021	1.3	25.9	7021	1.1	25.9	0.05	0.04	1.15
Wall EL-7.4m ~EL-2.0m	6007	7001	4.4	20.7	7001	6.6	20.7	0.21	0.32	0.66
	4006	7001	3.2	20.7	7001	5.3	20.7	0.15	0.25	0.60
	4010	7001	2.3	20.7	7001	3.0	20.7	0.11	0.14	0.78
Wall EL-2.0m ~EL4.65m	6043	7001	5.4	20.7	7001	5.2	20.7	0.26	0.25	1.04
	4036	7001	3.9	20.7	7001	4.3	20.7	0.19	0.21	0.92
	4040	7001	4.9	20.7	7001	4.3	20.7	0.23	0.21	1.13
Wall EL4.65m ~EL9.06m	6081	7011	4.6	25.9	7011	4.2	25.9	0.18	0.16	1.11
	4066	7011	4.2	25.9	7011	4.1	25.9	0.16	0.16	1.02
	4070	7011	5.0	25.9	7011	4.7	25.9	0.19	0.18	1.06
Wall EL9.06m ~EL13.8m	6117	7001	2.6	20.7	7001	2.4	20.7	0.13	0.11	1.11
	4096	7001	2.4	20.7	4012	2.7	25.9	0.12	0.11	1.09
	4100	7001	2.0	20.7	7001	1.7	20.7	0.10	0.08	1.15

Note: Compressive forces are positive.

Table A-9 Calculation Results for Maximum Transverse Shear

Location	Element ID	NA3				DCD			
		Load ID	d (m)	ρ_w (%)	ρ_v (%)	Load ID	d (m)	ρ_w (%)	ρ_v (%)
Basemat EL-7.4m	67	7011	2.744	0.366	0.177	7001	2.818	0.357	0.177
	72	7011	2.719	0.370	0.000	7011	2.721	0.369	0.177
	115	7521	2.743	0.366	0.177	7521	2.799	0.359	0.177
	120	7021	2.734	0.368	0.177	7021	2.734	0.368	0.177
Slab B1F EL-2.0m	567	7001	0.372	1.359	0.000	7501	0.407	1.242	0.000
	572	7001	0.360	1.402	0.000	7001	0.360	1.402	0.000
	615	7011	0.363	1.390	0.000	7011	0.368	1.373	0.000
	620	7001	0.393	1.286	0.000	7001	0.392	1.288	0.000
Slab 1F EL4.65m	1067	7011	0.379	1.332	0.000	7011	0.379	1.333	0.000
	1072	7001	0.360	1.402	0.000	7001	0.360	1.402	0.000
	1115	7011	0.410	1.232	0.000	7011	0.410	1.232	0.000
	1120	7001	0.382	1.322	0.000	7001	0.382	1.321	0.000
Slab 2F EL9.06m	1567	7011	0.373	1.352	0.000	7011	0.373	1.356	0.000
	1572	7001	0.360	1.403	0.000	7001	0.360	1.403	0.000
	1615	7011	0.410	1.233	0.081	7011	0.410	1.232	0.081
	1620	7001	0.389	1.298	0.000	7001	0.389	1.297	0.000
Slab RF EL13.8m	1867	7021	0.511	1.479	0.000	7021	0.511	1.479	0.000
	1872	7021	0.500	1.511	0.000	7021	0.501	1.510	0.000
	1915	7021	0.550	1.375	0.323	7021	0.550	1.375	0.000
	1920	7011	0.529	1.428	0.000	7011	0.529	1.429	0.000
Wall EL-7.4m ~EL-2.0m	6007	7021	0.676	1.491	0.355	7021	0.677	1.489	0.355
	4006	7021	0.672	1.500	0.355	7521	0.672	1.500	0.355
	4010	7021	0.673	1.498	0.355	7021	0.673	1.497	0.355
Wall EL-2.0m ~EL4.65m	6043	7011	0.674	1.495	0.355	7501	0.673	1.499	0.355
	4036	4013	0.672	1.500	0.710	4013	0.672	1.500	0.710
	4040	7011	0.682	1.478	0.355	7011	0.683	1.476	0.355
Wall EL4.65m ~EL9.06m	6081	7021	0.673	1.497	0.000	7021	0.673	1.497	0.000
	4066	7021	0.672	1.500	0.000	7021	0.672	1.499	0.000
	4070	7521	0.694	1.452	0.000	7521	0.699	1.442	0.000
Wall EL9.06m ~EL13.8m	6117	7021	0.493	1.533	0.000	7021	0.493	1.533	0.000
	4096	7021	0.493	1.533	0.000	7021	0.493	1.533	0.000
	4100	7521	0.507	1.492	0.000	7521	0.507	1.490	0.000

Table A-9 Calculation Results for Maximum Transverse Shear (Continued)

Location	Element ID	NA3						DCD						Ratio (NA3/DCD)				
		Load ID	Shear Forces (MN/m)				$V_u/\phi V_n$	Load ID	Shear Forces (MN/m)				$V_u/\phi V_n$					
			V_u	V_c	V_s	ϕV_n			V_u	V_c	V_s	ϕV_n		V_u	V_c	V_s	ϕV_n	$V_u/\phi V_n$
Basemat EL-7.4m	67	7011	1.594	4.868	2.011	5.847	0.273	7001	3.159	3.751	2.065	4.943	0.639	0.50	1.30	0.97	1.18	0.43
	72	7011	1.520	2.499	1.992	3.818	0.398	7011	2.419	2.460	1.994	3.786	0.639	0.63	1.02	1.00	1.01	0.62
	115	7521	0.905	2.370	2.010	3.723	0.243	7521	1.654	1.917	2.051	3.373	0.490	0.55	1.24	0.98	1.10	0.50
	120	7021	1.974	3.505	2.003	4.682	0.422	7021	2.441	4.552	2.003	5.572	0.438	0.81	0.77	1.00	0.84	0.96
Slab B1F EL-2.0m	567	7001	0.179	0.746	0.000	0.634	0.282	7501	0.118	0.236	0.000	0.200	0.587	1.52	3.17	-	3.17	0.48
	572	7001	0.187	0.891	0.000	0.757	0.247	7001	0.185	0.884	0.000	0.752	0.246	1.01	1.01	-	1.01	1.00
	615	7011	0.128	0.764	0.000	0.649	0.197	7011	0.152	0.438	0.000	0.372	0.409	0.84	1.74	-	1.74	0.48
	620	7001	0.111	0.178	0.000	0.151	0.735	7001	0.125	0.262	0.000	0.223	0.559	0.89	0.68	-	0.68	1.31
Slab 1F EL4.65m	1067	7011	0.082	0.360	0.000	0.306	0.269	7011	0.077	0.360	0.000	0.306	0.250	1.07	1.00	-	1.00	1.08
	1072	7001	0.216	0.593	0.000	0.504	0.428	7001	0.207	0.688	0.000	0.584	0.355	1.04	0.86	-	0.86	1.21
	1115	7011	0.340	0.415	0.000	0.353	0.965	7011	0.318	0.416	0.000	0.353	0.899	1.07	1.00	-	1.00	1.07
	1120	7001	0.107	0.330	0.000	0.280	0.383	7001	0.108	0.323	0.000	0.275	0.394	0.99	1.02	-	1.02	0.97
Slab 2F EL9.06m	1567	7011	0.046	0.355	0.000	0.302	0.153	7011	0.045	0.354	0.000	0.301	0.150	1.02	1.00	-	1.00	1.02
	1572	7001	0.180	0.276	0.000	0.234	0.769	7001	0.172	0.300	0.000	0.255	0.676	1.05	0.92	-	0.92	1.14
	1615	7011	0.321	0.300	0.137	0.372	0.865	7011	0.303	0.308	0.137	0.379	0.799	1.06	0.97	1.00	0.98	1.08
	1620	7001	0.082	0.418	0.000	0.355	0.231	7001	0.076	0.405	0.000	0.345	0.220	1.08	1.03	-	1.03	1.05
Slab RF EL13.8m	1867	7021	0.064	0.409	0.000	0.347	0.185	7021	0.065	0.411	0.000	0.350	0.186	0.99	0.99	-	0.99	1.00
	1872	7021	0.125	0.318	0.000	0.270	0.463	7021	0.121	0.329	0.000	0.280	0.433	1.03	0.96	-	0.96	1.07
	1915	7021	0.339	0.388	0.184	0.486	0.698	7021	0.317	0.411	0.000	0.350	0.908	1.07	0.94	-	1.39	0.77
	1920	7011	0.078	0.519	0.000	0.441	0.177	7011	0.072	0.518	0.000	0.441	0.164	1.08	1.00	-	1.00	1.08
Wall EL-7.4m ~EL-2.0m	6007	7021	0.512	1.489	0.994	2.110	0.242	7021	0.464	1.722	0.995	2.309	0.201	1.10	0.87	1.00	0.91	1.21
	4006	7021	1.481	1.225	0.988	1.881	0.787	7521	0.546	0.247	0.988	1.050	0.520	2.71	4.95	1.00	1.79	1.51
	4010	7021	0.702	0.479	0.989	1.247	0.563	7021	0.629	0.427	0.989	1.203	0.523	1.12	1.12	1.00	1.04	1.08
Wall EL-2.0m ~EL4.65m	6043	7011	0.745	1.744	0.991	2.324	0.321	7501	0.407	0.461	0.989	1.233	0.330	1.83	3.78	1.00	1.89	0.97
	4036	4013	0.791	0.654	1.975	2.235	0.354	4013	0.791	0.654	1.975	2.235	0.354	1.00	1.00	1.00	1.00	1.00
	4040	7011	0.593	1.202	1.002	1.874	0.317	7011	0.635	0.873	1.004	1.595	0.398	0.94	1.38	1.00	1.17	0.80
Wall EL4.65m ~EL9.06m	6081	7021	0.291	1.494	0.000	1.270	0.229	7021	0.316	1.047	0.000	0.890	0.355	0.92	1.43	-	1.43	0.65
	4066	7021	0.191	0.681	0.000	0.579	0.330	7021	0.222	0.679	0.000	0.577	0.384	0.86	1.00	-	1.00	0.86
	4070	7521	0.117	0.300	0.000	0.255	0.458	7521	0.111	0.294	0.000	0.250	0.445	1.05	1.02	-	1.02	1.03
Wall EL9.06m ~EL13.8m	6117	7021	0.412	0.562	0.000	0.478	0.863	7021	0.401	0.564	0.000	0.480	0.835	1.03	1.00	-	1.00	1.03
	4096	7021	0.472	0.623	0.000	0.530	0.892	7021	0.470	0.626	0.000	0.532	0.883	1.01	1.00	-	1.00	1.01
	4100	7521	0.127	0.284	0.000	0.242	0.526	7521	0.139	0.309	0.000	0.262	0.529	0.92	0.92	-	0.92	0.99

Table A-10 Maximum Stress Ratio of Selected Columns at the rows CB and C2, X-direction

Member Name :C2-CB-Column-B2F (top)

Section ID :5002 Section Type :BOX CBAR ID :50006

Flange PL :800 x 70 Web PL :660 x 70 j- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-20.42	-0.54		-99.9	-11.8		315.4	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.513	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.517	0.99
0.16	0.18		0.8	4.0		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.013	---	$f_{at}/F_{at}+f_{bt}/F_{bt}$	---	---
		0.12			1.1			193.1	8101	f_v/F_v	0.006	8101	f_v/F_v	0.009	0.63

Member Name :C2-CB-Column-B2F (bot)

Section ID :5002 Section Type :BOX CBAR ID :50006

Flange PL :800 x 70 Web PL :660 x 70 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-20.42	0.00		-99.9	0.0		315.4	386.8		8201	$-f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.483	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.465	1.04
0.16	0.00		0.8	0.0		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.002	---	$f_{at}/F_{at}+f_{bt}/F_{bt}$	---	---
		0.12			1.1			193.1	8101	f_v/F_v	0.006	8101	f_v/F_v	0.009	0.63

Member Name :C2-CB-Column-B1F (top)

Section ID :6002 Section Type :BOX CBAR ID :60003

Flange PL :800 x 70 Web PL :660 x 70 j- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-17.37	1.60		-85.0	34.8		309.6	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.501	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.472	1.06
1.03	0.10		5.0	2.1		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.021	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.022	0.97
		-0.37			-3.3			193.1	5001	f_v/F_v	0.017	5001	f_v/F_v	0.014	1.25

Table A-10 Maximum Stress Ratio of Selected Columns at the rows CB and C2, X-direction (Continued)

Member Name :C2-CB-Column-B1F (bot)
Section ID :6002 Section Type :BOX CBAR ID :60003
Flange PL :800 x 70 Web PL :660 x 70 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-17.37	0.59		-85.0	12.8		309.6	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.444	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.405	1.10
1.03	0.39		5.0	8.4		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.038	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.005	7.76
		-0.37			-3.3			193.1	5001	f_v/F_v	0.017	5001	f_v/F_v	0.014	1.25

Member Name :C2-CB-Column-1F (top)
Section ID :7002 Section Type :BOX CBAR ID :70004
Flange PL :800 x 60 Web PL :680 x 60 j- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-11.90	2.38		-67.0	58.4		318.2	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.475	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.454	1.05
1.18	-0.06		6.7	-1.5		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.024	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.019	1.27
		-1.13			-11.7			193.1	8101	f_v/F_v	0.061	8101	f_v/F_v	0.057	1.07

Member Name :C2-CB-Column-1F (bot)
Section ID :7002 Section Type :BOX CBAR ID :70004
Flange PL :800 x 60 Web PL :680 x 60 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-11.90	-2.54		-67.0	-62.3		318.2	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.485	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.464	1.05
1.18	-0.21		6.7	-5.1		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.034	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.038	0.90
		-1.13			-11.7			193.1	8101	f_v/F_v	0.061	8101	f_v/F_v	0.057	1.07

Table A-10 Maximum Stress Ratio of Selected Columns at the rows CB and C2, X-direction (Continued)

Member Name :C2-CB-Column-2F (top)

Section ID :8002 Section Type :BOX CBAR ID :80004

Flange PL :800 x 60 Web PL :680 x 60 j- edge

NA3													DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio			Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v								
-4.49	3.24		-25.3	79.3		277.7	364.0		5101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.340		5101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.325	1.05
1.14	0.33		6.4	8.1		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.042		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.047	0.88
		-1.29			-13.5			193.1	5101	f_v/F_v	0.070		5101	f_v/F_v	0.067	1.04

Member Name :C2-CB-Column-2F (bot)

Section ID :8002 Section Type :BOX CBAR ID :80004

Flange PL :800 x 60 Web PL :680 x 60 i- edge

NA3													DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio			Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v								
-4.49	-2.37		-25.3	-58.2		277.7	364.0		5101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.282		5101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.270	1.05
1.14	-0.16		6.4	-4.0		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.030		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.033	0.91
		-1.29			-13.5			193.1	5101	f_v/F_v	0.070		5101	f_v/F_v	0.067	1.04

Table A-11 Maximum Stress Ratio of Selected Columns at the rows CB and C2, Y-direction

Member Name :C2-CB-Column-B2F (top)

Section ID :5002 Section Type :BOX CBAR ID :50006

Flange PL :800 x 70 Web PL :660 x 70 j- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-20.42	0.80		-99.9	17.5		315.4	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.528	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.521	1.01
0.16	0.42		0.8	9.2		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.028	—	$f_{at}/F_{at}+f_{bt}/F_{bt}$	—	—
		-0.17			-1.5			193.1	8101	f_v/F_v	0.008	8101	f_v/F_v	0.009	0.82

Member Name :C2-CB-Column-B2F (bot)

Section ID :5002 Section Type :BOX CBAR ID :50006

Flange PL :800 x 70 Web PL :660 x 70 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-20.42	0.00		-99.9	0.0		315.4	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.483	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.465	1.04
0.16	0.00		0.8	0.0		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.002	—	$f_{at}/F_{at}+f_{bt}/F_{bt}$	—	—
		-0.17			-1.5			193.1	8101	f_v/F_v	0.008	8101	f_v/F_v	0.009	0.82

Member Name :C2-CB-Column-B1F (top)

Section ID :6002 Section Type :BOX CBAR ID :60003

Flange PL :800 x 70 Web PL :660 x 70 j- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-17.37	1.57		-85.0	34.2		309.6	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.499	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.479	1.04
1.03	0.01		5.0	0.3		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.016	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.007	2.40
		-0.49			-4.4			193.1	8201	f_v/F_v	0.023	8201	f_v/F_v	0.022	1.04

Table A-11 Maximum Stress Ratio of Selected Columns at the rows CB and C2, Y-direction (Continued)

Member Name :C2-CB-Column-B1F (bot)

Section ID :6002 Section Type :BOX CBAR ID :60003

Flange PL :800 x 70 Web PL :660 x 70 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-17.37	-1.68		-85.0	-36.6		309.6	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.506	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.483	1.05
1.03	-0.09		5.0	-1.9		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.020	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.014	1.41
		-0.49			-4.4			193.1	8201	f_v/F_v	0.023	8201	f_v/F_v	0.022	1.04

Member Name :C2-CB-Column-1F (top)

Section ID :7002 Section Type :BOX CBAR ID :70004

Flange PL :800 x 60 Web PL :680 x 60 j- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-11.90	1.24		-67.0	30.3		318.2	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.402	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.388	1.04
1.18	-0.04		6.7	-0.9		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.023	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.013	1.72
		-0.60			-6.3			193.1	8201	f_v/F_v	0.032	8201	f_v/F_v	0.032	1.03

Member Name :C2-CB-Column-1F (bot)

Section ID :7002 Section Type :BOX CBAR ID :70004

Flange PL :800 x 60 Web PL :680 x 60 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-11.90	-1.42		-67.0	-34.8		318.2	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.414	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.400	1.03
1.18	-0.03		6.7	-0.8		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.022	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.018	1.27
		-0.60			-6.3			193.1	8201	f_v/F_v	0.032	8201	f_v/F_v	0.032	1.03

Table A-11 Maximum Stress Ratio of Selected Columns at the rows CB and C2, Y-direction (Continued)

Member Name :C2-CB-Column-2F (top)

Section ID :8002 Section Type :BOX CBAR ID :80004
Flange PL :800 x 60 Web PL :680 x 60 j- edge

NA3													DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio			Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v								
-7.08	2.77		-39.9	67.9		317.4	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.368		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.359	1.02
0.16	0.56		0.9	13.7		351.6	386.8		8601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.038		5501	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.024	1.62
		-1.05			-11.0			193.1	8201	f_v/F_v	0.057		8201	f_v/F_v	0.056	1.02

Member Name :C2-CB-Column-2F (bot)

Section ID :8002 Section Type :BOX CBAR ID :80004
Flange PL :800 x 60 Web PL :680 x 60 i- edge

NA3													DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio			Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v								
-7.08	-1.80		-39.9	-44.1		317.4	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.307		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.300	1.02
0.16	-0.34		0.9	-8.3		351.6	386.8		8601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.024		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.017	1.46
		-1.05			-11.0			193.1	8201	f_v/F_v	0.057		8201	f_v/F_v	0.056	1.02

Table A-12 Maximum Stress Ratio of Selected Girders at the row CB

Member Name : CB-B1F-Girder-23 (2end)

Section ID :1002 Section Type : H CBAR ID :11016

Flange PL :300 x28 Web PL :644 x 19 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-1.64	-0.43		-56.6	-64.7		328.7	229.6		8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.555	8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.637	0.87
0.36	-0.23		12.4	-34.6		330.9	330.9		5501	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.142	5501	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.103	1.38
		-0.20			-14.8			137.9	3002	f_v/F_v	0.107	3002	f_v/F_v	0.107	1.00

Member Name : CB-B1F-Girder-45 (4end)

Section ID :1002 Section Type : H CBAR ID : 11022

Flange PL :300 x28 Web PL :644 x 19 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-1.96	-0.68		-67.6	-103.0		328.7	229.6		8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.775	8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.788	0.98
0.06	-0.33		2.2	-49.2		330.9	330.9		5501	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.155	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.167	0.93
		-0.26			-19.7			137.9	3004	f_v/F_v	0.143	3004	f_v/F_v	0.143	1.00

Member Name : CB-1F-Girder-23 (2end)

Section ID : 2004 Section Type : H CBAR ID : 21016

Flange PL : 400 x 40 Web PL : 920 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-0.80	-4.11		-13.9	-223.2		288.1	288.2		5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.842	5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.966	0.87
0.52	-4.10		9.0	-223.1		330.9	330.9		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.701	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.726	0.97
		-1.31			-46.8			193.1	8201	f_v/F_v	0.242	8201	f_v/F_v	0.229	1.06

Note: In DCD, Flange PL: 400x 36, Web PL : 928 x 28

Table A-12 Maximum Stress Ratio of Selected Girders at the rows CB (Continued)

Member Name : CB-1F-Girder-45 (4end)

Section ID : 2002 Section Type : H CBAR ID : 21022

Flange PL : 300 x 28 Web PL : 644 x 19 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-0.73	-0.69		-25.3	-104.7		287.6	216.1		5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.607	5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.618	0.98
0.36	-0.73		12.3	-110.0		351.6	351.6		8101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.348	8101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.354	0.98
		-0.36			-27.1			193.1	8201	f_v/F_v	0.140	8201	f_v/F_v	0.136	1.03

Member Name : CB-2F-Girder-23 (2end)

Section ID : 3003 Section Type : H CBAR ID : 31016

Flange PL : 400 x40 Web PL :1220 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-3.40	-4.38		-51.4	-168.0		329.1	351.6		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.726	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.705	1.03
1.07	-4.34		16.2	-166.6		330.9	330.9		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.552	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.531	1.04
		-1.41			-38.6			193.1	8201	f_v/F_v	0.200	8201	f_v/F_v	0.192	1.04

Member Name : CB-B1F-Girder-45 (4end)

Section ID : 3001 Section Type : H CBAR ID : 31022

Flange PL : 300 x 36 Web PL :928 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-2.23	-1.31		-46.8	-95.0		328.4	206.7		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.686	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.690	0.99
0.73	-0.53		15.4	-38.6		330.9	330.9		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.163	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.165	0.99
		-0.50			-17.8			193.1	8201	f_v/F_v	0.092	8201	f_v/F_v	0.091	1.02

Table A-12 Maximum Stress Ratio of Selected Girders at the rows CB (Continued)

Member Name : CB-RF-Girder-23 (2end)

Section ID : 4003 Section Type : H CBAR ID : 41016

Flange PL : 500 x40 Web PL :1220 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-7.13	-4.10		-96.2	-132.3		329.6	351.6		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.841	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.833	1.01
0.58	-3.46		7.8	-111.9		330.9	364.0		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.331	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.324	1.02
		-1.35			-37.0			193.1	8201	f_v/F_v	0.192	8201	f_v/F_v	0.187	1.03

Member Name : CB-RF-Girder-45 (4end)

Section ID : 4001 Section Type : H CBAR ID : 41022

Flange PL : 400 x40 Web PL :920 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-5.59	-2.30		-96.7	-125.1		329.3	306.2		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.876	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.877	1.00
0.87	-0.91		15.0	-49.5		330.9	330.9		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.195	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.197	0.99
		-0.74			-26.4			193.1	8201	f_v/F_v	0.137	8201	f_v/F_v	0.135	1.01

Table A-13 Maximum Stress Ratio of Selected Girders at the row C2

Member Name : C2-B1F-Girder-CB (Cend)

Section ID : 1002 Section Type : H CBAR ID : 10005

Flange PL : 300 x28 Web PL : 644 x 19 i- edge

NA3														DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-1.56	-0.30		-53.9	-44.5		328.7	386.8		8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.375	8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.433	0.87
0.39	0.00		13.5	-0.4		330.9	364.0		5501	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.042	5501	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.078	0.54
		-0.10			-7.2			193.1	8101	f_v/F_v	0.037	8101	f_v/F_v	0.046	0.81

Member Name : C2-B1F-Girder-BA (Bend)

Section ID : 1001 Section Type : H CBAR ID : 10007

Flange PL : 400 x 36 Web PL :628 x 28 i- edge

NA3														DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-2.21	-1.69		-47.6	-157.8		329.4	386.8		8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.638	8101	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.649	0.98
0.47	-1.01		10.2	-94.5		330.9	364.0		5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.290	5601	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.289	1.00
		-0.56			-28.6			137.9	3003	f_v/F_v	0.207	3003	f_v/F_v	0.207	1.00

Member Name : C2-1F-Girder-CB (Cend)

Section ID : 2002 Section Type : H CBAR ID : 20005

Flange PL :300 x28 Web PL :644 x 19 i- edge

NA3														DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac}, f_{at}	f_{bc}, f_{bt}	f_v	F_{ac}, F_{at}	F_{bc}, F_{bt}	F_v							
-0.56	-0.33		-19.3	-49.2		287.6	364.0		5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.229	5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.259	0.88
0.56	-0.34		19.2	-50.7		351.6	386.8		8101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.186	8101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.204	0.91
		-0.15			-11.3			193.1	8201	f_v/F_v	0.059	8201	f_v/F_v	0.058	1.01

Table A-13 Maximum Stress Ratio of Selected Girders at the rows CB (Continued)

Member Name : C2-1F-Girder-BA (Bend)

Section ID : 2001 Section Type : H CBAR ID : 20007

Flange PL : 400 x 40 Web PL :720 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-0.82	-1.89		-15.6	-137.4		288.2	364.0		5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.453	5201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.467	0.97
0.91	-1.94		17.4	-141.5		351.6	386.8		8101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.415	8101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.420	0.99
		-0.87			-39.1			193.1	8201	f_v/F_v	0.202	8201	f_v/F_v	0.195	1.04

Member Name : C2-2F-Girder-CB (Cend)

Section ID : 3002 Section Type : H CBAR ID : 30005

Flange PL : 300 x28 Web PL :944 x 19 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-2.02	-0.44		-58.1	-41.8		328.5	351.6		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.400	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.396	1.01
0.46	-0.45		13.2	-42.8		330.9	364.0		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.157	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.154	1.02
		-0.18			-9.5			193.1	8201	f_v/F_v	0.049	8201	f_v/F_v	0.049	1.01

Member Name : C2-2F-Girder-BA (Bend)

Section ID : 3001 Section Type : H CBAR ID : 30007

Flange PL : 300 x36 Web PL :928 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-2.23	-2.02		-46.9	-147.0		328.4	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.607	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.598	1.02
0.67	-1.52		14.0	-110.6		330.9	364.0		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.346	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.337	1.03
		-0.84			-30.1			193.1	8201	f_v/F_v	0.156	8201	f_v/F_v	0.152	1.03

Table A-13 Maximum Stress Ratio of Selected Girders at the rows CB (Continued)

Member Name : C2-RF-Girder-CB (Cend)

Section ID : 4002 Section Type : H CBAR ID : 40005

Flange PL : 300 x28 Web PL :944 x 19 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-3.36	-0.81		-96.7	-76.2		328.5	351.6		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.684	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.683	1.00
0.75	-0.48		21.7	-45.4		330.9	364.0		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.190	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.189	1.00
		-0.17			-8.9			193.1	8201	f_v/F_v	0.046	8201	f_v/F_v	0.046	1.01

Member Name : C2-RF-Girder-BA (Bend)

Section ID : 4001 Section Type : H CBAR ID : 40007

Flange PL : :400 x 40 Web PL :920 x 28 i- edge

NA3												DCD			Ratio(NA3/DCD)
Design Load (MN, MNm)			Stress (MPa)			Allowable Stress (MPa)			Load ID	Maximum Ratio		Load ID	Maximum Ratio		Maximum Ratio
P	M	V	f_{ac},f_{at}	f_{bc},f_{bt}	f_v	F_{ac},F_{at}	F_{bc},F_{bt}	F_v							
-5.56	-2.22		-96.2	-120.6		329.3	386.8		8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.777	8201	$f_{ac}/F_{ac}+f_{bc}/F_{bc}$	0.774	1.00
0.77	-1.25		13.3	-67.8		330.9	364.0		5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.226	5101	$f_{at}/F_{at}+f_{bt}/F_{bt}$	0.224	1.01
		-0.97			-34.7			193.1	8201	f_v/F_v	0.180	8201	f_v/F_v	0.177	1.02

Table A-14 Column Stress Check Results

Member Name :C2-CB-Column-B2F (top)											
Section ID :5002			Section Type :BOX							CBAR ID :50006	
Flange PL :800 x 70			Web PL :660 x 70							j- edge	
NA3								DCD		Ratio(NA3/DCD)	
X-direction			Y-direction			Ratio		Ratio			
Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$
8201	0.513	0.317	8201	0.528	0.317	0.725		0.733		0.99	
5601	0.013	0.002	5601	0.028	0.002	0.039		---		---	
8101	0.006		8101	0.008			0.010		0.013		0.74

Member Name :C2-CB-Column-B2F (bot)											
Section ID :5002			Section Type :BOX							CBAR ID :50006	
Flange PL :800 x 70			Web PL :660 x 70							i- edge	
NA3								DCD		Ratio(NA3/DCD)	
X-direction			Y-direction			Ratio		Ratio			
Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$
8201	0.483	0.317	8201	0.483	0.317	0.649		0.625		1.04	
5601	0.002	0.002	5601	0.002	0.002	0.002		---		---	
8101	0.006		8101	0.008			0.010		0.013		0.74

Member Name : C2-CB-Column-B1F (top)											
Section ID :6002			Section Type :BOX							CBAR ID : 60003	
Flange PL :800 x 70			Web PL :660 x 70							j- edge	
NA3								DCD		Ratio(NA3/DCD)	
X-direction			Y-direction			Ratio		Ratio			
Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$	$R_{NS}+R_{EW}$-Min.$(R_{fa/Fa})$	Max.$(R_{fv/Fv})$
8201	0.501	0.275	8201	0.499	0.275	0.726		0.689		1.05	
5601	0.021	0.015	5601	0.016	0.015	0.022		0.024		0.89	
5001	0.017		8201	0.023			0.028		0.026		1.10

Table A-14 Column Stress Check Results (Continued)

Member Name : C2-CB-Column-B1F (bot)
Section ID :6002 Section Type :BOX CBAR ID : 60003
Flange PL :800 x 70 Web PL :660 x 70 i- edge

NA3								DCD		Ratio(NA3/DCD)	
X-direction			Y-direction			Ratio		Ratio			
Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
8201	0.444	0.275	8201	0.506	0.275	0.675		0.625		1.08	
5601	0.038	0.015	5601	0.020	0.015	0.044		0.015		2.81	
5001	0.017		8201	0.023			0.028		0.026		1.10

Member Name : C2-CB-Column-1F (top)
Section ID :7002 Section Type :BOX CBAR ID : 70004
Flange PL : 800 x 60 Web PL :680 x 60 j- edge

NA3								DCD		Ratio(NA3/DCD)	
X-direction			Y-direction			Ratio		Ratio			
Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
8201	0.475	0.211	8201	0.402	0.211	0.667		0.639		1.04	
5601	0.024	0.020	5601	0.023	0.020	0.027		0.019		1.39	
8101	0.061		8201	0.032			0.069		0.065		1.06

Member Name : C2-CB-Column-1F (bot)
Section ID :7002 Section Type :BOX CBAR ID : 70004
Flange PL : 800 x 60 Web PL :680 x 60 i- edge

NA3								DCD		Ratio(NA3/DCD)	
X-direction			Y-direction			Ratio		Ratio			
Load ID	R_{NS}	$R_{fa/Fa}$	Load ID	R_{EW}	$R_{fa/Fa}$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$	$R_{NS}+R_{EW}-Min.(R_{fa/Fa})$	$Max.(R_{fv/Fv})$
8201	0.485	0.211	8201	0.414	0.211	0.688		0.661		1.04	
5601	0.034	0.020	5601	0.022	0.020	0.036		0.042		0.86	
8101	0.061		8201	0.032			0.069		0.065		1.06

Table A-14 Column Stress Check Results (Continued)

<table>
<tr><td colspan="13">Member Name :C2-CB-Column-2F (top)</td></tr>
<tr><td colspan="5">Section ID :8002
Flange PL :800 x 60</td><td colspan="6">Section Type :BOX
Web PL :680 x 60</td><td colspan="2">CBAR ID :80004
j- edge</td></tr>
<tr><td colspan="12">NA3</td><td colspan="2">DCD</td><td>Ratio(NA3/DCD)</td></tr>
<tr><td colspan="5">X-direction</td><td colspan="5">Y-direction</td><td colspan="2" rowspan="2">Maximum Ratio</td><td colspan="2" rowspan="2">Maximum Ratio</td><td rowspan="2">Maximum Ratio</td></tr>
<tr><td>Load ID</td><td>R_{NS}</td><td>R_{EW}</td><td>$R_{fa/Fa}$</td><td>$R_{NS}+R_{EW}-R_{fa/Fa}$</td><td>Load ID</td><td>R_{NS}</td><td>R_{EW}</td><td>$R_{fa/Fa}$</td><td>$R_{NS}+R_{EW}-R_{fa/Fa}$</td></tr>
<tr><td>5101</td><td>0.340</td><td>0.213</td><td>0.091</td><td>0.462</td><td>8201</td><td>0.298</td><td>0.368</td><td>0.126</td><td>0.541</td><td>$f_{ac}/F_{ac}+f_{bc}/F_{bc}$</td><td>0.541</td><td>$f_{ac}/F_{ac}+f_{bc}/F_{bc}$</td><td>0.521</td><td>1.04</td></tr>
<tr><td>5601</td><td>0.042</td><td>0.020</td><td>0.019</td><td>0.042</td><td>8601</td><td>0.031</td><td>0.038</td><td>0.003</td><td>0.066</td><td>$f_{at}/F_{at}+f_{bt}/F_{bt}$</td><td>0.066</td><td>$f_{at}/F_{at}+f_{bt}/F_{bt}$</td><td>0.050</td><td>1.32</td></tr>
<tr><td>5101</td><td>0.070</td><td>0.029</td><td>-</td><td>0.076</td><td>8201</td><td>0.036</td><td>0.057</td><td>-</td><td>0.067</td><td>f_v/F_v</td><td>0.076</td><td>f_v/F_v</td><td>0.072</td><td>1.04</td></tr>
</table>

<table>
<tr><td colspan="15">Member Name :C2-CB-Column-2F (bot)</td></tr>
<tr><td colspan="5">Section ID :8002
Flange PL :800 x 60</td><td colspan="7">Section Type :BOX
Web PL :680 x 60</td><td colspan="3">CBAR ID :80004
i- edge</td></tr>
<tr><td colspan="12">NA3</td><td colspan="2">DCD</td><td>Ratio(NA3/DCD)</td></tr>
<tr><td colspan="5">X-direction</td><td colspan="5">Y-direction</td><td colspan="2" rowspan="2">Maximum Ratio</td><td colspan="2" rowspan="2">Maximum Ratio</td><td rowspan="2">Maximum Ratio</td></tr>
<tr><td>Load ID</td><td>R_{NS}</td><td>R_{EW}</td><td>$R_{fa/Fa}$</td><td>$R_{NS}+R_{EW}-R_{fa/Fa}$</td><td>Load ID</td><td>R_{NS}</td><td>R_{EW}</td><td>$R_{fa/Fa}$</td><td>$R_{NS}+R_{EW}-R_{fa/Fa}$</td></tr>
<tr><td>5101</td><td>0.282</td><td>0.189</td><td>0.091</td><td>0.380</td><td>8201</td><td>0.271</td><td>0.307</td><td>0.126</td><td>0.452</td><td>$f_{ac}/F_{ac}+f_{bc}/F_{bc}$</td><td>0.452</td><td>$f_{ac}/F_{ac}+f_{bc}/F_{bc}$</td><td>0.437</td><td>1.04</td></tr>
<tr><td>5601</td><td>0.030</td><td>0.020</td><td>0.019</td><td>0.031</td><td>8601</td><td>0.030</td><td>0.024</td><td>0.003</td><td>0.051</td><td>$f_{at}/F_{at}+f_{bt}/F_{bt}$</td><td>0.051</td><td>$f_{at}/F_{at}+f_{bt}/F_{bt}$</td><td>0.034</td><td>1.51</td></tr>
<tr><td>5101</td><td>0.070</td><td>0.029</td><td>-</td><td>0.076</td><td>8201</td><td>0.036</td><td>0.057</td><td>-</td><td>0.067</td><td>f_v/F_v</td><td>0.076</td><td>f_v/F_v</td><td>0.072</td><td>1.04</td></tr>
</table>

Table A-15 Transverse Shear of CB External Walls

Location	Element ID	NA3				DCD			
		Load ID	d (m)	ρ_w (%)	ρ_v (%)	Load ID	d (m)	ρ_w (%)	ρ_v (%)
Wall EL-7.4m ~EL-2.0m	6007	CB-9	0.679	1.485	0.355	CB-9	0.711	1.418	0.355
	4006	CB-9	0.672	1.500	0.355	CB-9	0.673	1.498	0.355
	4010	CB-9	0.675	1.493	0.355	CB-9	0.676	1.491	0.355
Wall EL-2.0m ~EL4.65m	6043	CB-9	0.674	1.495	0.355	CB-9	0.672	1.500	0.355
	4036	CB-9	0.673	1.498	0.710	CB-9	0.672	1.500	0.710
	4040	CB-9	0.677	1.489	0.355	CB-9	0.689	1.463	0.355
Wall EL4.65m ~EL9.06m	6081	CB-9	0.673	1.497	0.000	CB-9	0.673	1.497	0.000
	4066	CB-9	0.672	1.500	0.000	CB-9	0.672	1.499	0.000
	4070	CB-9	0.694	1.452	0.000	CB-9	0.699	1.442	0.000
Wall EL9.06m ~EL13.8m	6117	CB-9	0.493	1.533	0.000	CB-9	0.493	1.533	0.000
	4096	CB-9	0.493	1.533	0.000	CB-9	0.493	1.533	0.000
	4100	CB-9	0.507	1.492	0.000	CB-9	0.507	1.490	0.000

Table A-15 Transverse Shear of CB External Walls(Continued)

Location	Element ID	NA3						DCD						Ratio (NA3/DCD)				
		Load ID	Shear Forces (MN/m)					Load ID	Shear Forces (MN/m)									
			V_u	V_c	V_s	ϕV_n	$V_u/\phi V_n$		V_u	V_c	V_s	ϕV_n	$V_u/\phi V_n$	V_u	V_c	V_s	ϕV_n	$V_u/\phi V_n$
Wall EL-7.4m ~EL-2.0m	6007	CB-9	0.553	0.638	0.998	1.391	0.397	CB-9	0.136	0.071	1.045	0.949	0.143	4.07	8.98	0.95	1.47	2.78
	4006	CB-9	1.160	1.488	0.988	2.104	0.551	CB-9	0.571	0.205	0.989	1.015	0.562	2.03	7.27	1.00	2.07	0.98
	4010	CB-9	0.559	0.539	0.992	1.301	0.430	CB-9	0.683	0.483	0.994	1.255	0.544	0.82	1.11	1.00	1.04	0.79
Wall EL-2.0m ~EL4.65m	6043	CB-9	0.164	0.608	0.991	1.359	0.121	CB-9	0.220	0.506	0.988	1.270	0.173	0.75	1.20	1.00	1.07	0.70
	4036	CB-9	0.135	0.523	1.978	2.126	0.063	CB-9	0.579	0.251	1.975	1.892	0.306	0.23	2.09	1.00	1.12	0.21
	4040	CB-9	0.279	0.532	0.995	1.298	0.215	CB-9	0.276	0.118	1.013	0.961	0.288	1.01	4.52	0.98	1.35	0.75

APPENDIX B
IN-PLANE SHEAR CHECK FOR THE CB ACCORDING TO ACI 349-01

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B.1 SCOPE

This appendix describes In-plane Shear Check for the CB according to ACI 349-01.

B.2 IN-PLANE SHEAR CHECK

According to Section 21.6.5.6 of ACI 349-01, the maximum shear strength of a horizontal wall segment per unit length is calculated as follows:

$$Vn_{\max} = 8\sqrt{f_c^{'}}h \quad \text{(For all wall piers)}$$

$$Vn_{\max} = 10\sqrt{f_c^{'}}h \quad \text{(For individual wall piers)}$$

where,

h is wall thickness.

When f_c'=5000 psi and h=27.56 and 35.43 in (=0.7 m and 0.9 m) are substituted above equation for the typical CB walls,

1) For all wall piers

h=0.7m: $Vn_{\max} = 15590 lb/in = 2.728 MN/m$

h=0.9m: $Vn_{\max} = 20042 lb/in = 3.508 MN/m$

2) For individual wall piers

h=0.7m: $Vn_{\max} = 19488 lb/in = 3.411 MN/m$

h=0.9m: $Vn_{\max} = 25053 lb/in = 4.384 MN/m$

The above values are less than the shear strength defined in Section 21.6.5.2 of ACI 349-01, since Section 21.6.5.2 of ACI 349-01 governs the in-plane shear capacity if the rebar ratio is less than 0.94% as shown below.

The limiting rebar ratio is obtained by calculating rebar ratio when the equations in Section 21.6.5.6 and Section 21.6.5.2 of ACI 349-01 are equal as shown below:

$$8\sqrt{f_c^{'}}h = \left(2\sqrt{f_c^{'}} + \rho_n f_y\right)h \quad \text{(For all wall piers)}$$

$$10\sqrt{f_c^{'}}h = \left(2\sqrt{f_c^{'}} + \rho_n f_y\right)h \quad \text{(For individual wall piers)}$$

When f_y=60000 psi and f_c'=5000 psi, the limiting rebar ratio is evaluated as follows:

$$\rho_n = 8\sqrt{f_c^{'}} / f_y = 0.009428$$

The allowable shear force is evaluated by multiplying strength reduction factor ϕ (=0.85) according to Section 9.3.2.3 of ACI 349-01.

1) For all wall piers
   h=0.7m: $\phi V_n = 13252 lb/in = 2.320 MN/m$
   h=0.9m: $\phi V_n = 17036 lb/in = 2.983 MN/m$
2) For individual wall piers
   h=0.7m: $\phi V_n = 16565 lb/in = 2.900 MN/m$
   h=0.9m: $\phi V_n = 21295\ lb/in = 3.729\ MN/m$

B.3 CONCLUSIONS

The results of in-plane shear check for selected elements are shown in Table B-1. The allowable shear strength for all wall piers is used conservatively. It is confirmed that the in-plane shear of all elements except for Elements 6043, 6117, and 4100 are lower than the allowable shear strength. The in-plane shear check according to Section 21.6.5.6 of ACI 349-01 for the entire East wall including Elements 6043 and 6117, and the entire South wall including Element 4100 are shown in Tables B-2 through B-4. The thermal reduction due to cracking is not considered except for Table B-3 conservatively. It is confirmed that the in-plane shear for all walls are less than the allowable shear forces.

Table B-1 Maximum Stress Ratios for In-Plane Shear Check

Location	Element ID	Load ID	Total In-Plane Shear N_{xy} (MN/m)	Thickness h (m)	Primary Reinforce-ment Ratio	Allowable Shear Strength $\phi V_n = \phi 8hf'_c{}^{0.5}$ (MN/m)	$N_{xy}/\phi V_n$
Wall EL-7.4m ~EL-2.0m	6007	7011	2.244	0.90	2.236%	2.983	0.75
	4006	7021	1.253	0.90	2.236%	2.983	0.42
	4010	7011	1.578	0.90	2.236%	2.983	0.53
Wall EL-2.0m ~EL4.65m	6043	7021	3.502	0.90	2.236%	2.983	1.17
	4036	7001	2.121	0.90	2.236%	2.983	0.71
	4040	7011	2.490	0.90	2.236%	2.983	0.84
Wall EL4.65m ~EL9.06m	6081	7021	2.134	0.90	2.236%	2.983	0.72
	4066	7011	1.829	0.90	2.236%	2.983	0.61
	4070	7021	2.881	0.90	2.236%	2.983	0.97
Wall EL9.06m ~EL13.8m	6117	7021	2.410	0.70	1.797%	2.320	1.04
	4096	7021	1.148	0.70	1.797%	2.320	0.50
	4100	7021	2.465	0.70	1.797%	2.320	1.06

Note: Exceedance is highlighted.

Table B-2 Maximum Stress Ratios for In-Plane Shear Check for East Wall EL-2.0m~EL0.22m

Location	Element ID	Load ID	Total In-Plane Shear N_{xy} (MN/m)	Thickness h (m)	Primary Reinforce-ment Ratio	Allowable Shear Strength for individual wall $\phi V_n=\phi 10hf'^{0.5}_c$ (MN/m)	$N_{xy}/\phi V_n$	Total In-Plane Shear N_{xy_All} (MN/m)	Allowable Shear Strength for all wall $\phi Vn=\phi 8hf'^{0.5}_c$ (MN/m)	$N_{xy\_All}/\phi V_n$
East Wall EL-2.0m ~ EL-0.22m	6037	7011	2.617	0.90	2.236%	3.729	0.70	2.785	2.983	0.93
	6038	7011	2.747	0.90	2.236%		0.74			
	6039	7011	2.358	0.90	2.236%		0.63			
	6040	7011	2.229	0.90	2.236%		0.60			
	6041	7011	2.433	0.90	2.236%		0.65			
	6042	7021	2.847	0.90	2.236%		0.76			
	6043	7021	3.502	0.90	2.236%		0.94			
	6044	7011	3.058	0.90	2.236%		0.82			
	6045	7011	2.777	0.90	2.236%		0.75			
	6046	7011	2.799	0.90	2.236%		0.75			
	6047	7011	3.088	0.90	2.236%		0.83			
	6048	7011	2.962	0.90	2.236%		0.79			

Table B-3 Maximum Stress Ratios for In-Plane Shear Check for East Wall EL9.06m~EL10.61m

Location	Element ID	Load ID	Total In-Plane Shear N_{xy} (MN/m) *	Thickness h (m)	Primary Reinforce-ment Ratio	Allowable Shear Strength for individual wall $\phi V_n = \phi 10 h f_c'^{0.5}$ (MN/m)	$N_{xy}/\phi V_n$	Total In-Plane Shear N_{xy_All} (MN/m) *	Allowable Shear Strength for all wall $\phi V_n = \phi 8 h f_c'^{0.5}$ (MN/m)	$N_{xy\_All}/\phi V_n$
East Wall EL9.06m ~ EL10.61m	6109	7021	1.394	0.70	1.797%	2.900	0.48	1.324	2.320	0.57
	6110	7021	1.577	0.70	1.797%		0.54			
	6111	7021	1.404	0.70	1.797%		0.48			
	6112	7021	1.580	0.70	1.797%		0.55			
	6113	7021	0.677	0.70	1.797%		0.23			
	6114	7011	1.310	0.70	1.797%		0.45			
	6115	7011	1.358	0.70	1.797%		0.47			
	6116	7021	0.716	0.70	1.797%		0.25			
	6117	7021	1.426	0.70	1.797%		0.49			
	6118	7021	1.357	0.70	1.797%		0.47			
	6119	7021	1.591	0.70	1.797%		0.55			
	6120	7021	1.501	0.70	1.797%		0.52			

Note*: The reduction of thermal stress due to cracking is considered.

Table B-4 Maximum Stress Ratios for In-Plane Shear Check for South Wall EL9.06m~EL10.61m

Location	Element ID	Load ID	Total In-Plane Shear N_{xyl} (MN/m)	Thickness h (m)	Primary Reinforce-ment Ratio	Allowable Shear Strength for individual wall $\phi V_n=\phi 10hf'_c{}^{0.5}$ (MN/m)	$N_{xy}/\phi V_n$	Total In-Plane Shear N_{xy_All} (MN/m)	Allowable Shear Strength for all wall $\phi V_n=\phi 8hf'_c{}^{0.5}$ (MN/m)	$N_{xy\_All}/\phi V_n$
South Wall EL9.06m ~ EL10.61m	4091	7021	2.461	0.70	1.797%	2.900	0.85	1.924	2.320	0.83
	4092	7021	2.146	0.70	1.797%		0.74			
	4093	7021	1.948	0.70	1.797%		0.67			
	4094	7021	1.595	0.70	1.797%		0.55			
	4095	7021	1.182	0.70	1.797%		0.41			
	4096	7021	1.148	0.70	1.797%		0.40			
	4097	7021	1.578	0.70	1.797%		0.54			
	4098	7021	1.950	0.70	1.797%		0.67			
	4099	7021	2.162	0.70	1.797%		0.75			
	4100	7021	2.465	0.70	1.797%		0.85			

APPENDIX C
COMPRESSION LIMIT CHECK FOR THE CB ACCORDING TO ACI 349-01

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C.1 SCOPE

Although the CB is not structurally integrated with the containment structure, its section design is conservatively taken to be the more limiting of ACI 349-01 (Reference 2.2-a) and 2004 ASME Section III, Division 2, Subsection CC (Reference 2.2-b) requirements and utilizes the existing code conformance check algorithm of the SSDP-2D computer code. A discussion of the SSDP-2D computer program is provided in Section 6.4.1.1.

The membrane compression check that is described in Section 6.4.1.2 is based on provisions outlined in Subsection CC-3420 of ASME-2004 (Reference 2.2-b). Table 7.3-11 summarizes the results of this ASME membrane compression check. The allowable stresses in Table 7.3-11 are equal to those in Table 6.4-4. In order to demonstrate that the CB design also satisfies the requirements of ACI 349-01 (Reference 2.2-a), this appendix describes the compression limit check for the CB according to ACI 349-01 provisions.

C.2 COMPRESSION LIMIT PER ACI 349-01

According to Section 10.3.5.2 of ACI 349-01 (Reference 2.2-a), the design axial load strength, ϕP_n, of nonprestressed compression members with tie reinforcement shall not be taken greater than the following:

$$\phi P_{n(\max)} = 0.80\phi\left[0.85 f_c'\left(A_g - A_{st}\right) + f_y A_{st}\right] \qquad \text{(C-1)}$$

In the Equation C-1, A_g is defined as the gross area of section and A_{st} as the total area of longitudinal reinforcement. Section 10.0 of ACI 349-01 (Reference 2.2-a) defines the ratio of nonprestressed tension reinforcement, ρ, as follows:

$$\rho = \frac{A_s}{bd} \qquad \text{(C-2)}$$

Where:

A_s = area of nonprestressed tension reinforcement

b = width of compression face of member

d = distance from extreme compression fiber to centroid of tension reinforcement

Assuming that $A_g \approx bd$ and $A_s = A_{st}$, Equation C-2 can be re-written as follows:

$$A_{st} = \rho A_g \qquad \text{(C-3)}$$

Since ACI 349-01 (Reference 2.2-a) provides allowable design strengths and not stresses, an equivalent allowable stress for compression, σ_a, is defined as follows:

$$\sigma_a = \frac{\phi P_{n(\max)}}{A_g} \qquad \text{(C-4)}$$

Combining Equations C-1, C-3, and C-4 results in the following equation for the allowable stress for compression, σ_a, used in the checks performed in this appendix:

$$\sigma_a = 0.80\phi\left[0.85 f_c'(1-\rho) + \rho f_y\right] \quad \text{(C-5)}$$

Where:

ϕ = 0.7 (strength reduction factor for axial compression and axial compression with flexure per Section 9.3.2.2(b) of Reference 2.2-a)

f_c' = specified compressive strength of concrete from Table 6.4-1

ρ = sum of the primary reinforcement ratio at each face (top/inside and bottom/outside) for each Element ID in Table 7.2-1

f_y = specified yield strength of nonprestressed reinforcement from Table 6.4-1

C.3 CONCLUSIONS

The results of the ACI 349-01 compression limit check are shown in Table C-1. The results confirm that the calculated compressive stresses are less than the equivalent allowable stress calculated using Equation C-5. Therefore, the CB design meets the compression limit requirements of ACI 349-01 (Reference 2.2-a), as shown by the results of this appendix, as well as the membrane compression limit requirements of ASME-2004 (Reference 2.2-b), as shown by the results in Table 7.3-11.

Table C-1 Compression Limit Check According to ACI 349-01

Location	Element ID	Load ID	Calculated Concrete Stress[*1] σ_x (MPa)	σ_y (MPa)	τ_{xy} (MPa)	σ_c (MPa)	Total Primary Reinforcement Ratio[*2] ρ (%)	Allowable Stress[*3,*4] σ_a (MPa)	σ_c/σ_a
Basemat EL-7.4m	67	3004	1.0	1.1	0.0	1.1	0.670	14.6	0.08
	72	3001	1.3	0.3	0.0	1.3	0.670	14.6	0.09
	115	7001	1.9	0.6	-0.5	2.0	0.670	14.6	0.14
	120	3004	1.0	0.5	-0.1	1.0	0.670	14.6	0.07
SlabB1F EL-2.0m	567	3002	3.4	0.7	0.0	3.4	2.012	18.6	0.18
	572	3004	5.2	2.1	0.4	5.2	2.012	18.6	0.28
	615	7021	3.5	1.1	-2.2	4.8	2.012	18.6	0.26
	620	3004	2.4	1.2	3.1	5.0	2.012	18.6	0.27
Slab 1F EL4.65m	1067	4022	2.6	1.1	0.0	2.6	2.012	18.6	0.14
	1072	7021	2.1	4.4	-0.5	4.5	2.012	18.6	0.24
	1115	7021	3.8	0.5	0.9	4.0	2.012	18.6	0.22
	1120	7021	4.8	4.3	-4.1	8.6	2.012	18.6	0.46
Slab 2F EL9.06m	1567	7021	5.2	2.2	-0.1	5.2	2.012	18.6	0.28
	1572	7021	1.8	7.6	-1.1	7.8	2.012	18.6	0.42
	1615	7021	6.6	-1.0	-0.4	6.6	2.012	20.8	0.32
	1620	7021	6.6	6.6	-8.2	14.8	2.012	18.6	0.80
Slab RF EL13.8m	1867	7001	0.3	0.3	-0.1	0.4	2.156	18.6	0.02
	1872	7001	0.7	1.4	-0.9	2.0	2.156	18.6	0.11
	1915	7001	2.0	0.8	-0.7	2.3	2.156	18.6	0.12
	1920	7021	0.5	0.7	0.7	1.3	2.156	18.6	0.07
Wall EL-7.4m ~EL-2.0m	6007	7001	2.3	1.9	-2.3	4.4	2.236	21.2	0.21
	4006	7001	1.3	2.2	-1.3	3.2	2.236	21.2	0.15
	4010	7001	0.9	1.6	-1.0	2.3	2.236	21.2	0.11
Wall EL-2.0m ~EL4.65m	6043	7001	1.6	2.8	-3.1	5.4	2.236	21.2	0.25
	4036	7001	1.5	1.7	2.4	3.9	2.236	21.2	0.18
	4040	7001	1.0	3.2	2.6	4.9	2.236	21.2	0.23
Wall EL4.65m ~EL9.06m	6081	7011	3.1	1.6	2.1	4.6	2.236	18.6	0.25
	4066	7011	2.9	1.0	2.0	4.2	2.236	18.6	0.23
	4070	7011	1.9	1.8	3.2	5.0	2.236	18.6	0.27
Wall EL9.06m ~EL13.8m	6117	7001	1.3	1.4	1.3	2.6	1.797	18.6	0.14
	4096	7001	1.1	0.8	1.4	2.4	1.797	18.6	0.13
	4100	7001	0.2	0.7	1.5	2.0	1.797	18.6	0.11

Notes:
*1: Calculated concrete stress values are obtained from Table 7.3-11.
*2: Total primary reinforcement ratio is obtained by summing the primary reinforcement ratio at each face (top/inside and bottom/outside) for each Element ID in Table 7.2-1. As shown in Table 7.2-1, the ratios for Direction 1 and Direction 2 are the same for each Element ID.
*3: The allowable stress is calculated according to Equation C-5 of this appendix.
*4: For the section without shear tie, the reinforcement limit of 1% is applied according to Section 14.3.6 of ACI 349-01.