II. ANALYSIS METHOD

TW. A. Seismic Analysis

1. Mathematical model-general description with sketch.

Fig 4-108 in Amendment 50

or See next page

a. parameters used

(1) concrete modulus

$57000\sqrt{f'_c}$ (psi)

(2) rebar modulus and yield strength.

$f_y = 49,650$ psi or 49.65 ksi (min.)

(3) Poisson's ratio.

1. DDE = 0.25

2. Hosgri = 0.25 page 4-4 / Volume I Hosgri seismic evaluation Amendment 50

(4) damping

7% Table 4-2

II
A-1

Dybox

Mathematical Models

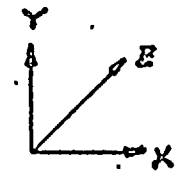
The mathematical models of the Auxiliary Building as shown in Figure 4-108 had five lumped masses each, with two degrees of freedom at each mass point: one translational degree of freedom and one rotational degree of freedom.

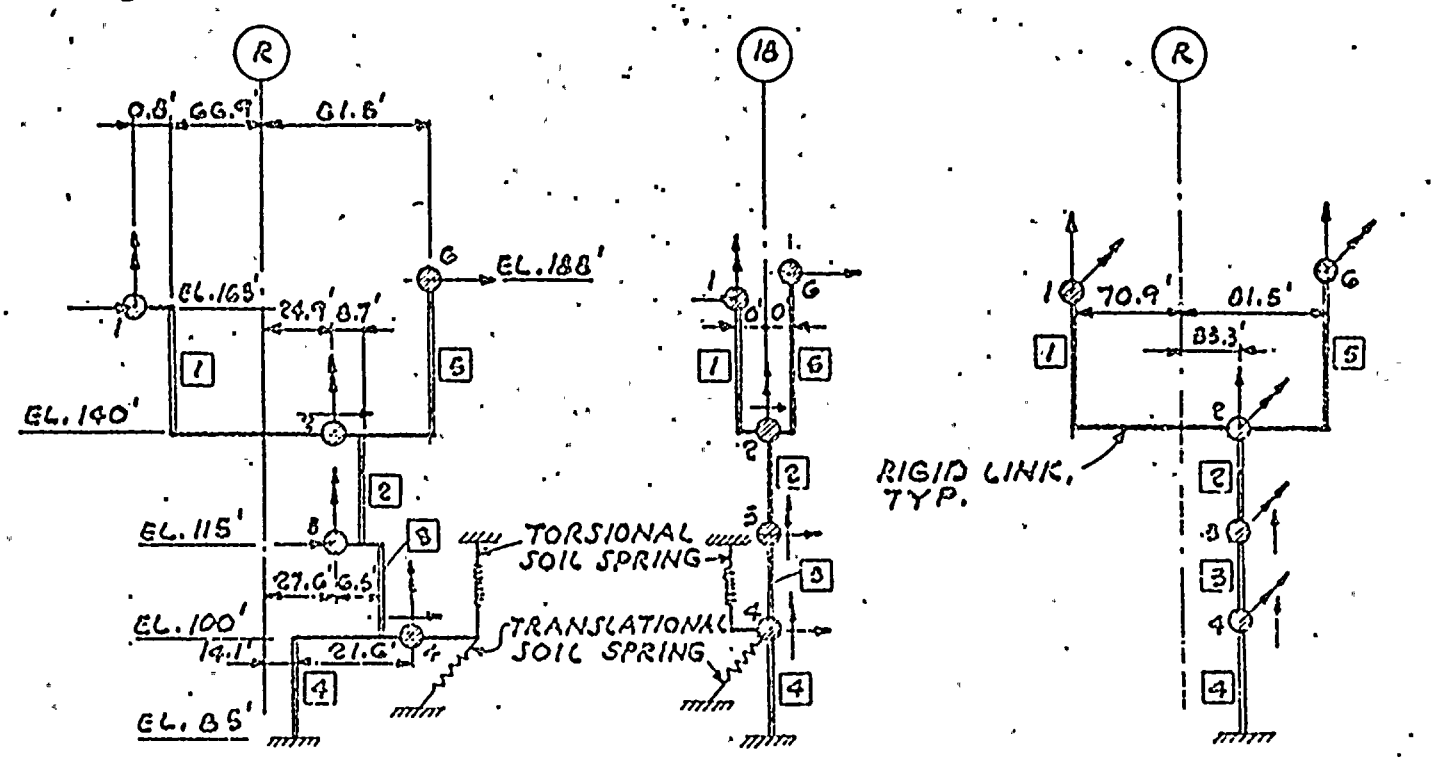
All degrees of freedom are defined at the center of mass. Part of the structure between elevations 60 ft and 85 ft is below grade and therefore is not lumped as a separate mass but is assumed to be part of the foundation soil mass. Masses 1 and 6 represent the control room concrete roof at elevation 163 ft and the fuel-handling area steel roof at elevation 188 ft, respectively. Masses 2, 3, and 4 represent concrete floors of the Auxiliary Building at elevations 140 ft, 115 ft, and 100 ft.

II A-1

LEGEND

2 - NODE NUMBER
[1] - ELEMENT NUMBER
↕ - ROTATIONAL DEGREE OF FREEDOM
→ TRANSLATIONAL DEGREE OF FREEDOM
◎ - MASS POINT





4-108a - N-S MODEL 4-108b - E-W MODEL 4-108c - VERTICAL MODEL

MATHEMATICAL MODELS FOR HORIZONTAL, TORSIONAL, AND VERTICAL ANALYSIS

DIABLO CANYON
AUXILIARY BUILDING FIGURE NO. 4-108

A-1 a. (1) and (3)

Concrete

Values for the concrete compressive strength, modulus of elasticity used in the analysis are given in Table 4-3. Poisson's ratio used is 0.25. (3)

The concrete strength f'_c, was based on the average 28-day (or in some cases 60-day) strength of 6-in. x 12-in. cylinder samples taken from the concrete used in the construction. The modulus of elasticity of the concrete, used in the analyses was taken as $57{,}000\sqrt{f'_c}$ (psi)* according to the recommendations of ACI 318-71.[5] These values still contain considerable reserve factors of safety in that the concrete has been in place for several years and has gained additional strength due to aging, which has not been included in the average strength values used in the analysis. Minimum specified design compressive strength values of 3000 psi and 5000 psi were assumed in the DDE analyses.

* (1).

Steel

Both reinforcing and structural steel yield strengths, f_y, were taken as the average of actual test values. In no case was the yield strength value used in strength computations greater than 70-percent of the corresponding average ultimate strength value.

f_y (average) = 52 ksi

A-1. a. (1) and (4)

TABLE 4-3

Average Concrete Strength and Modulus of Elasticity

Structure and Component	Concrete mix*	Average f'_c (test value) (psi)	E_c (psi)
Auxiliary Building			
Skin Pour	B	3920	3.57×10^6
Walls and Slabs Below Elevation 85'	B	3920	3.57×10^6
Slabs 4 Feet and Thicker at Elevation 85'	B	3920	3.57×10^6
Columns Below Elevation 85'	C	5650	4.28×10^6
Walls and Slabs Above Elevation 85'	C	5650	4.28×10^6
Slabs Less Than 4 Feet Thick at Elevation 85'	C	5650	4.28×10^6
Columns Above Elevation 85'	C	5650	4.28×10^6
East Walls Above Elevation 115'	C	5650	4.28×10^6
Other Exposed Walls	C	5650	4.28×10^6
Exterior Slabs at Elevation 140'	C	5650	4.28×10^6
Other Roof Slabs	C	5650	4.28×10^6

TABLE 4-2

DAMPING AND DUCTILITY[a]

Structure	Damping	Blume Ductility	Newmark Ductility
Auxiliary Bldg.	7%	1.3[b]	1.0[b]

a. Ductilities are on story basis; however, floor response spectra were, in general, computed on an elastic analysis basis.

b. Under normal conditions Newmark ductility is 1.0 maximum; however, NRC will consider special cases where supporting evidence justifies its use. Blume ductility for Class I structures is 1.3, and will be used only in specific situations.

c. Concrete 1.3; steel 3, with up to 6 locally.

d. Or as may be required to demonstrate that function of Design Class I equipment will not be adversely affected.