DRIFT

$$\text{Story Drift Ratio} = \frac{\text{Story Drift}}{\text{Story Height.}}$$

ΔM Max inelastic response displacement (New codes place Limit on

ΔS Design Seismic Forces Displacement

$$\Delta M = 0.7 R \Delta S$$

DRIFT Limits

1- if $T < 0.7s$ $\Delta < 0.025h$

2- if $T > 0.7s$ $\Delta < 0.020h$

* Seismic forces . 100% in one dir + 30% in perp dir.
↳ orthogonal effects in irreg bldg

* Section Stiffness $EI = \frac{M'}{\phi}$ ϕ - Rotation /unit Le
M = Moment
EI stiffness.

$$\omega = \sqrt{\frac{k}{m}} \quad \text{rad/s}$$

k = stiffness in kip/in

m = mass in kip.sec²/in

$$T = \frac{2\pi}{\omega}$$

Damping Ratio (0.05) $\Rightarrow \xi = \frac{c}{2m\omega}$ c is in kip. sec/in

Spectral velocity for this time period & damp ratio
is S_v = ... in ft/s
↳ taken from avg velocity response spectr

max displacement $y_{max} = \frac{S_v}{\omega}$ in ft.

max base shear $V_{omax} = K . Y_{max}$ in kips.
$= m . S_a$

ELASTIC DESIGN RESPONSE SPECTRUM

$g = 32.2\ lb/sec^2$

ZONE = 0, 1, 2A, 2B, 3, 4

Na, Nv } Near Source Factors Ca, Cv } Seismic Coefficients.

PGA or ZPA — Spectral Acceleration @ T = 0 } Ca of UBC 97 = Ca × g
(ZERO PERIOD ACCEL)

PEAK OF RESP SPECTRUM FOR 5% DAMPING = 2.5 Ca

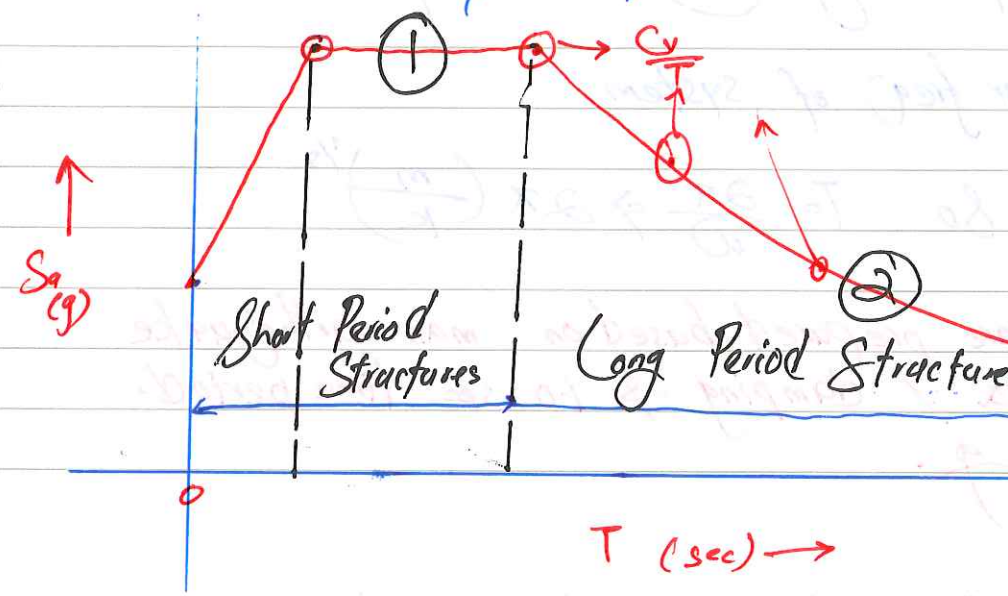
CONTROL PERIODS To & Ts

$$Ts = \frac{Cv}{2.5\,Ca} \qquad To = 0.2\,Ts$$

→ if value of damping other than 5% is used then values of To & Ts & Cv/T are scaled but Ca remain unchanged

Cv = acceleration @ 1.0 sec period

Cv > Z for soft soils.



1997 UBC Fig
Design Response Spectra

① $V_{max} = \frac{2.5Ca}{R}$

② $V = \frac{Cv\,I}{RT}$

③ $V_{min} = 0.11$

* All structures & buildings exceeding 10 stories in height shall be analyzed by employing RESPONSE SPECTRUM ANALYSIS
Sec 1630.4.3 UBC '97

4 building system is : BEARING WALL SYSTEM.

Shear walls : ONLY IN 1 DIRECTION

SEISMIC ZONE : III or IV

then

Value of R in orthogonal direction must not be greater than ($\leq$) value of R along walls dire

SDF

Pg 712 Chapt. 16
RC Edward Navy
5th edition.

Time req for a phase angle (ωt) to travel from $0 - 2\pi$

ω = angular freq of system

$\omega t = 2\pi$ so $T = \frac{2\pi}{\omega} \Rightarrow 2\pi \left(\frac{m}{k}\right)^{1/2}$

Resp. Spect. graphs are prepared based on max earthquake ground motion @ xx % damping & 1.0 sec time period. as a percent of g.

15. Jan.

max for short period = 1.50g

" " long period = 0.60g

* If the time in which load increases from 0 — max is double t NATURAL PERIOD. the load may be treated as STATIC.

IBC 2000 EARTHQUAKE DESIGN

SEISMIC USE GROUP ⇒ I , II , III

General Hazard Post-Earthquake

OCCUPANCY IMP. FACTOR ⇒ 1.00 1.25 1.50

SITE CLASS ⇒ A, B, C, D, E, F

SPECTRAL RES ACCEL ⇒ MAX SPECT RESP ACCEL @ 5% damping

@short period S_s on class B.

@1-s period S_1

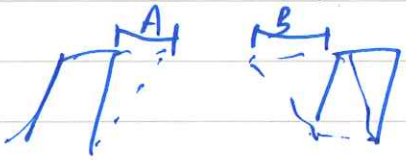
DUCTILITY FACTOR ⇒ R is higher for higher ductility.

SEISMIC DESIGN CATEGORY → GROUP I & II with $S_1 \geq 0.75g$

GROUP III " "

Should not be in the zone of active faults

* In C2.10 "DEFLECTION & DRIFT LIMITS" AS 1170.4 Supple 1993 Minimum design loads on structures Part (no max limit on total disp) & build se pa



Sep = A+B