

Myanmar Earthquake

7.72 **Richter Scale**
Severe damage to most buildings.

Time
Mar 28 2025, 12:50:53PM

Distance
358 miles

Location
22.074°N, 96.119°E

Depth
6.2 miles



SEISMIC RESILIENCE OF BUILDING AND STRUCTURAL VULNERABILITY

28th August 2025

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BEHAVIOR OF EARTHQUAKE

Earthquake Behaviour of Buildings

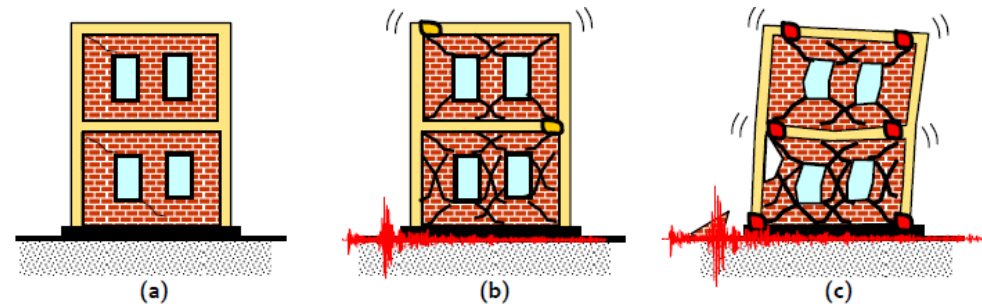
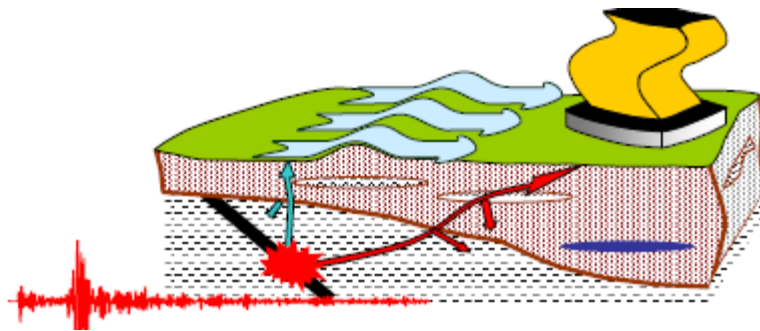
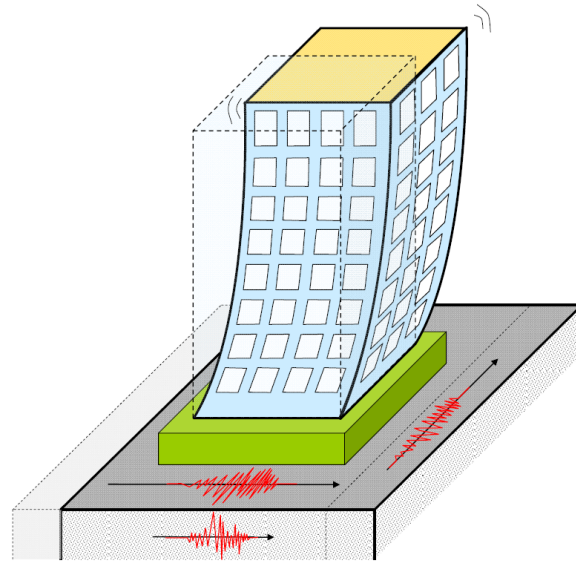


Figure 1.3: Earthquake-Resistant Design Philosophy for buildings: (a) Minor (Frequent) Shaking - No/Hardly any damage, (b) Moderate Shaking - Minor structural damage, and some non-structural damage, and (c) Severe (Infrequent) Shaking - Structural damage, but NO collapse

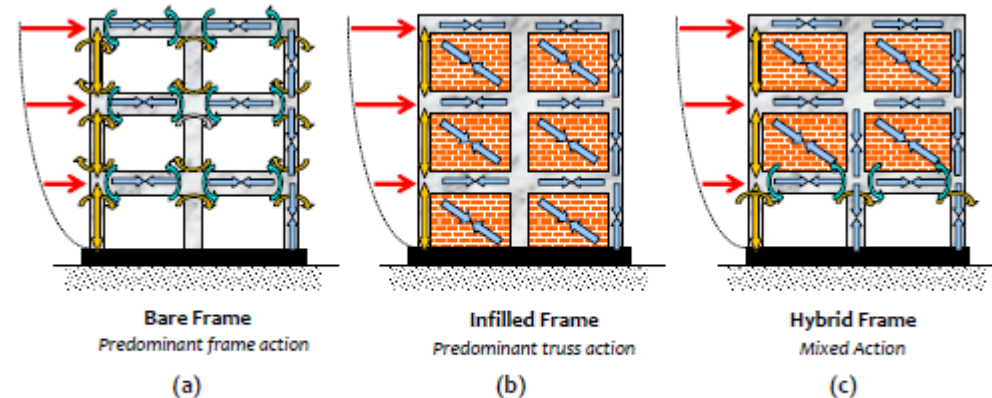
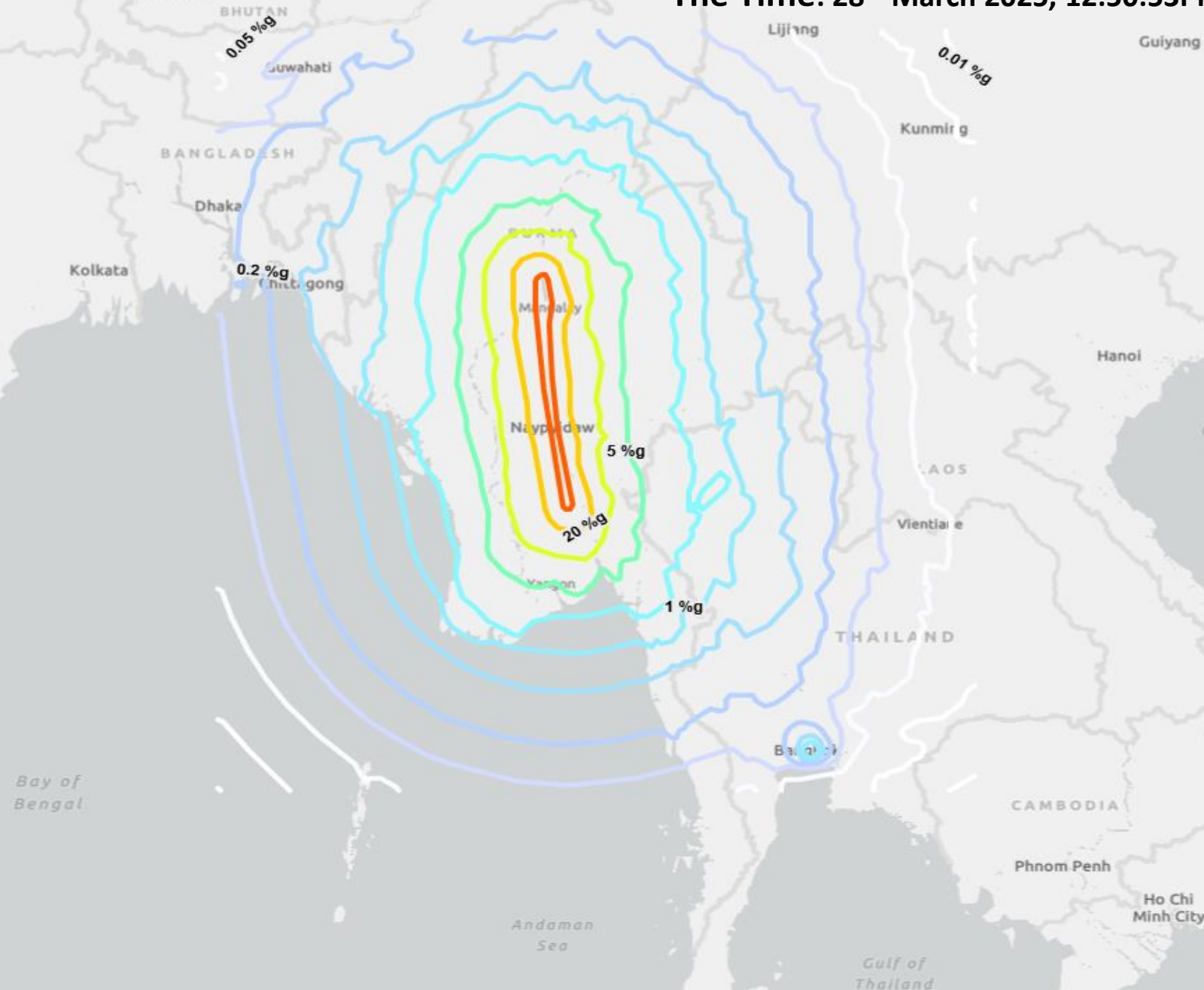


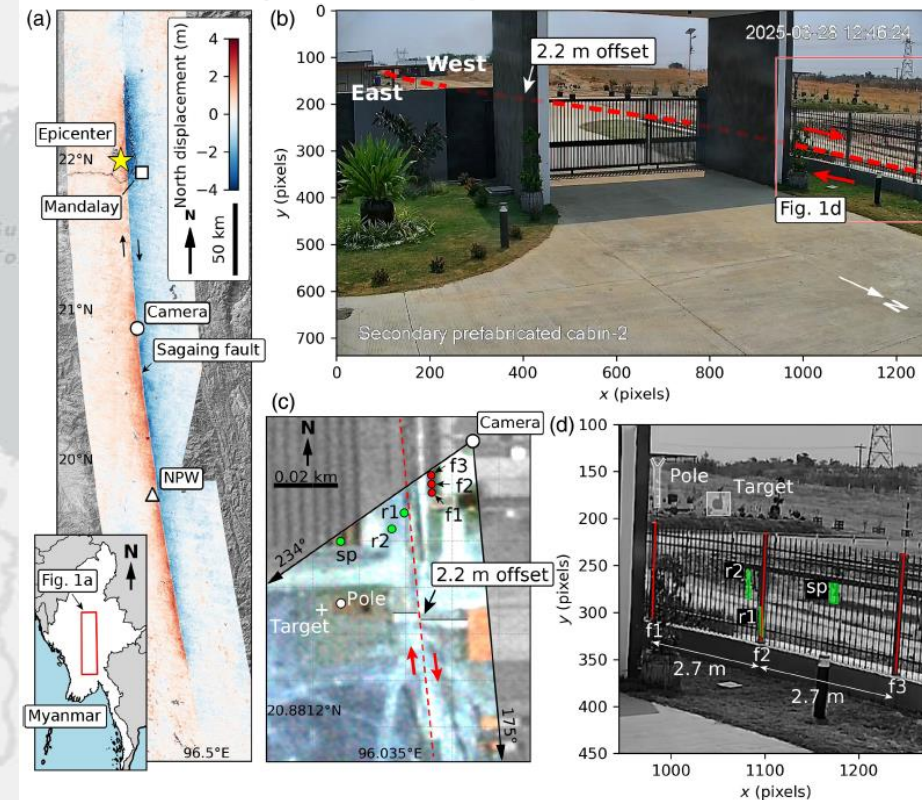
Figure 2.25: Lateral Force Transfer Mechanism in RC Frame Buildings - (a) Bare Frame, (b) Frame with URM Infill Walls in all storeys, and (c) Frame with no URM Infill Walls in ground storey.

M7.7- Sagging, Myanmar Earthquake (USGS)

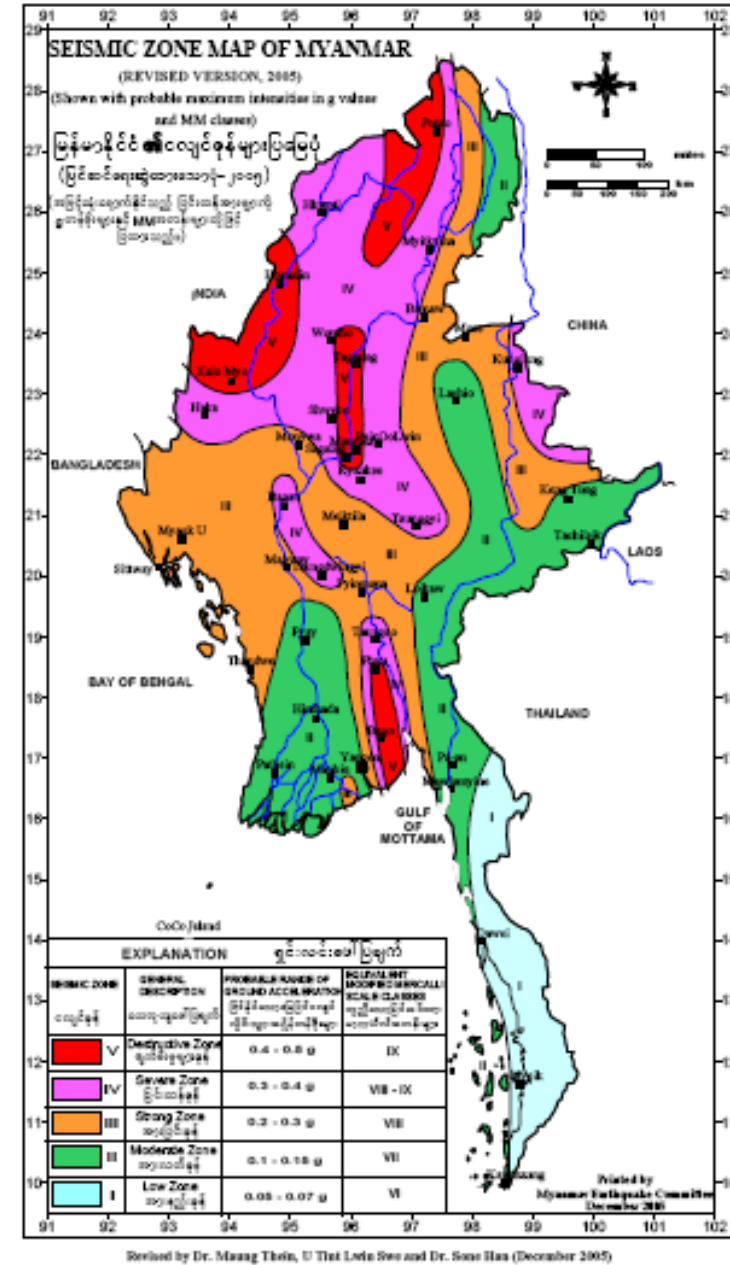
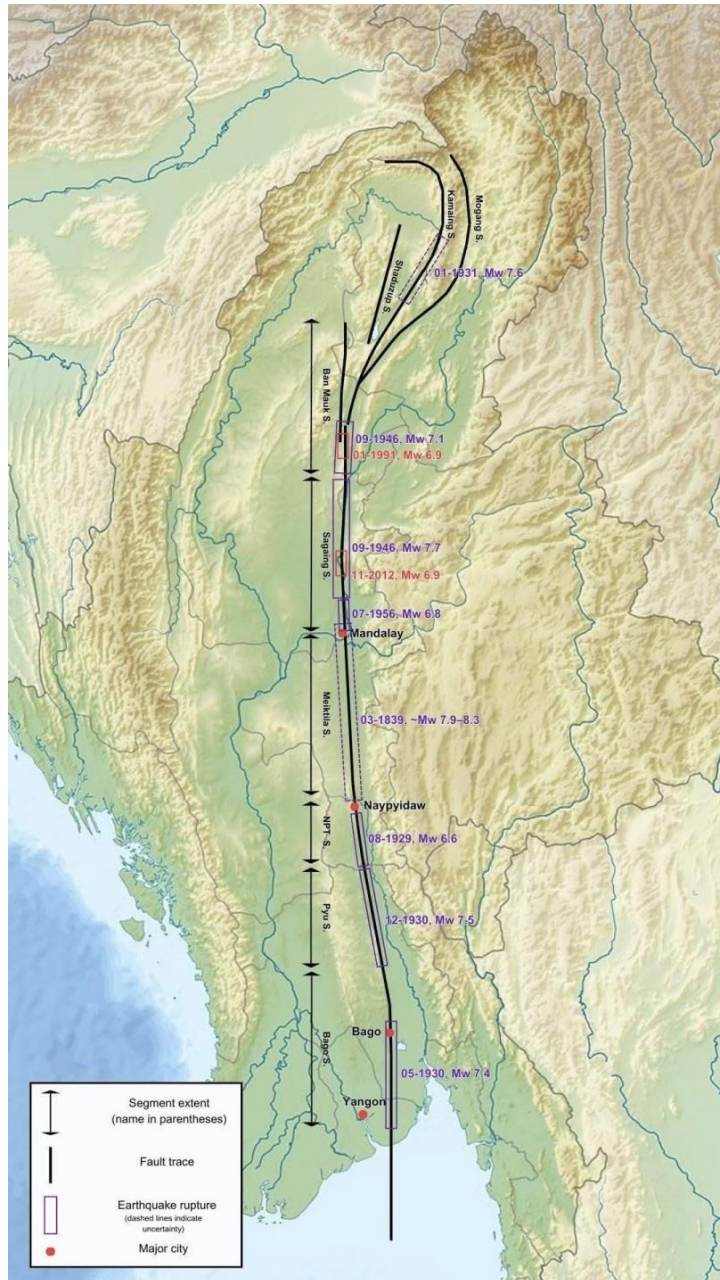
The Time: 28th March 2025, 12:50:53PM



Curved Fault Slip Captured by CCTV Video During the 2025 M_w 7.7 Myanmar Earthquake

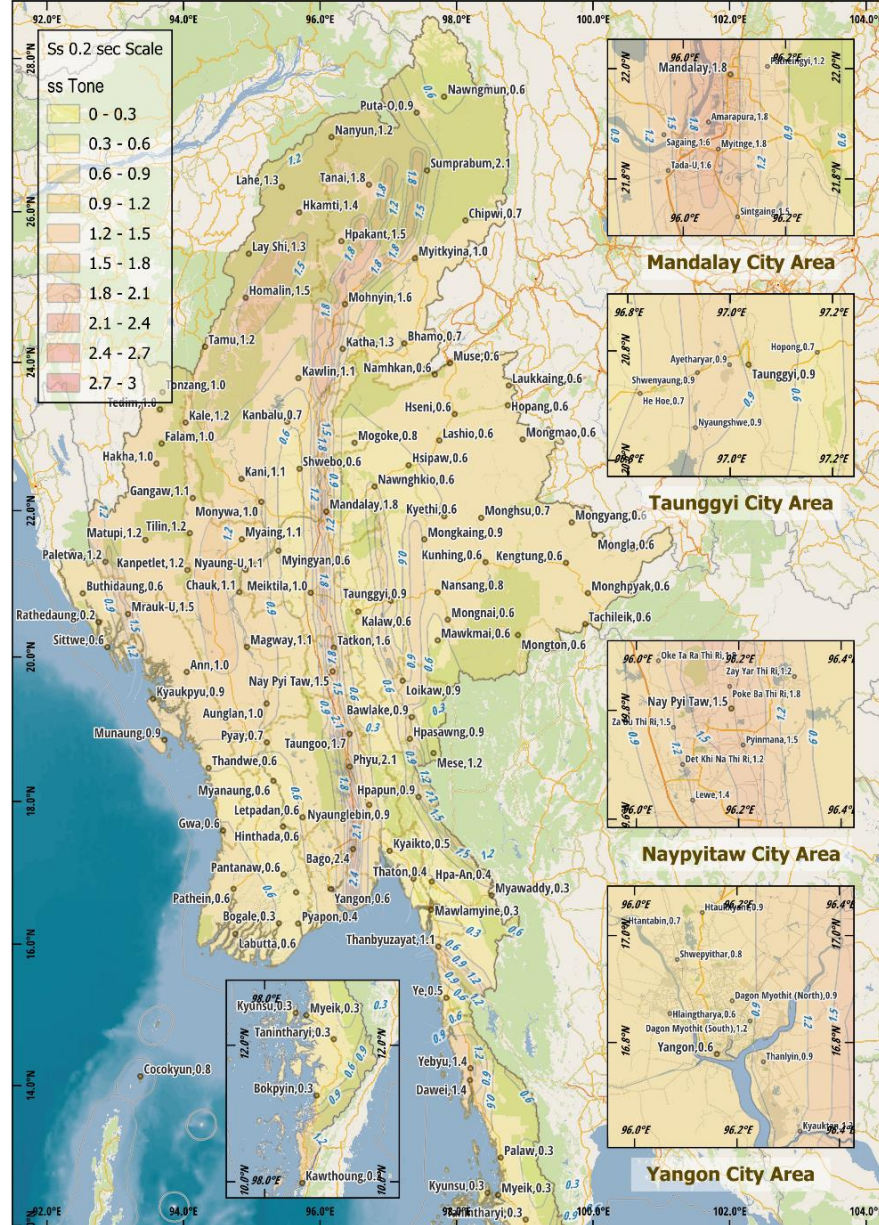


HISTORICAL EQs & DETERMINISTIC SEISMIC ZONE MAP

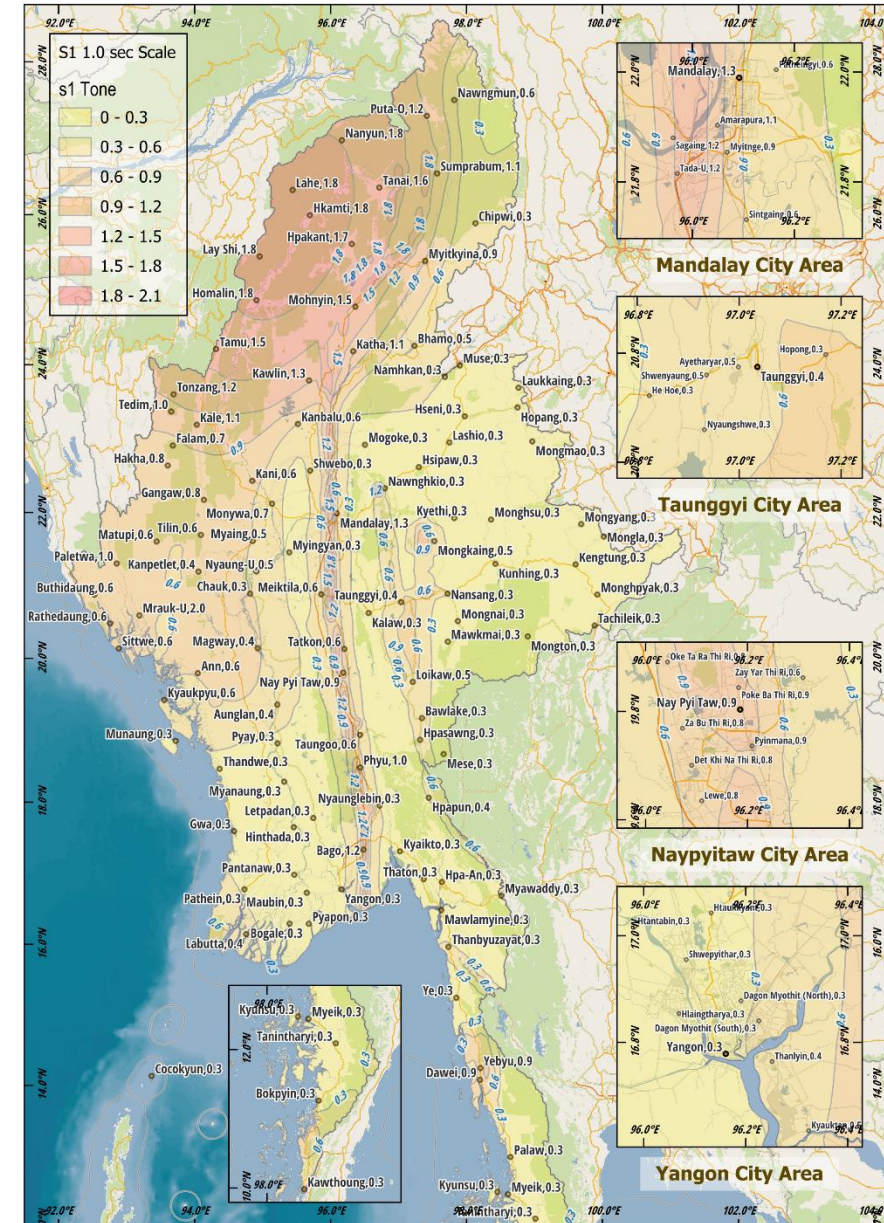


PROBABILISTIC SEISMIC ZONE MAP (MNBC 2025)

Maximum Considered Earthquake Ground Motion for 0.2 Sec Spectral Response Acceleration at 2% in 50 Years with 5% Critical Damping for Site Class B (Myo Thant et al., 2016)



Maximum Considered Earthquake Ground Motion for 1.0 Sec Spectral Response Acceleration at 2% in 50 Years with 5% Critical Damping for Site Class B (Myo Thant et al., 2016)



SEISMIC RESILIENT DESIGN

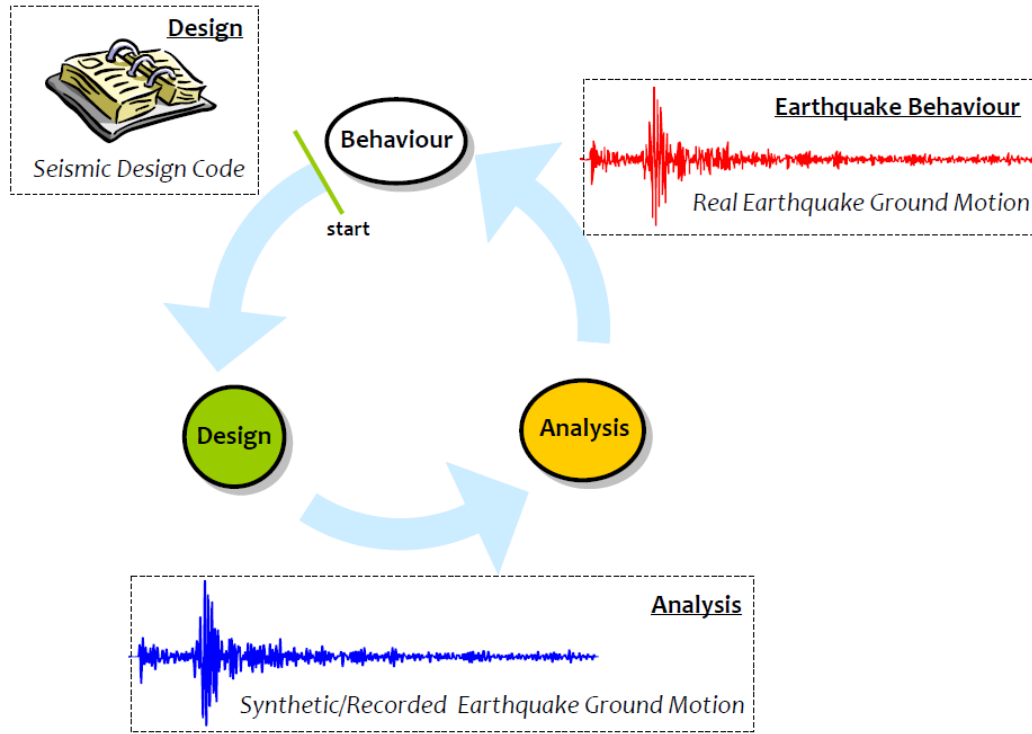
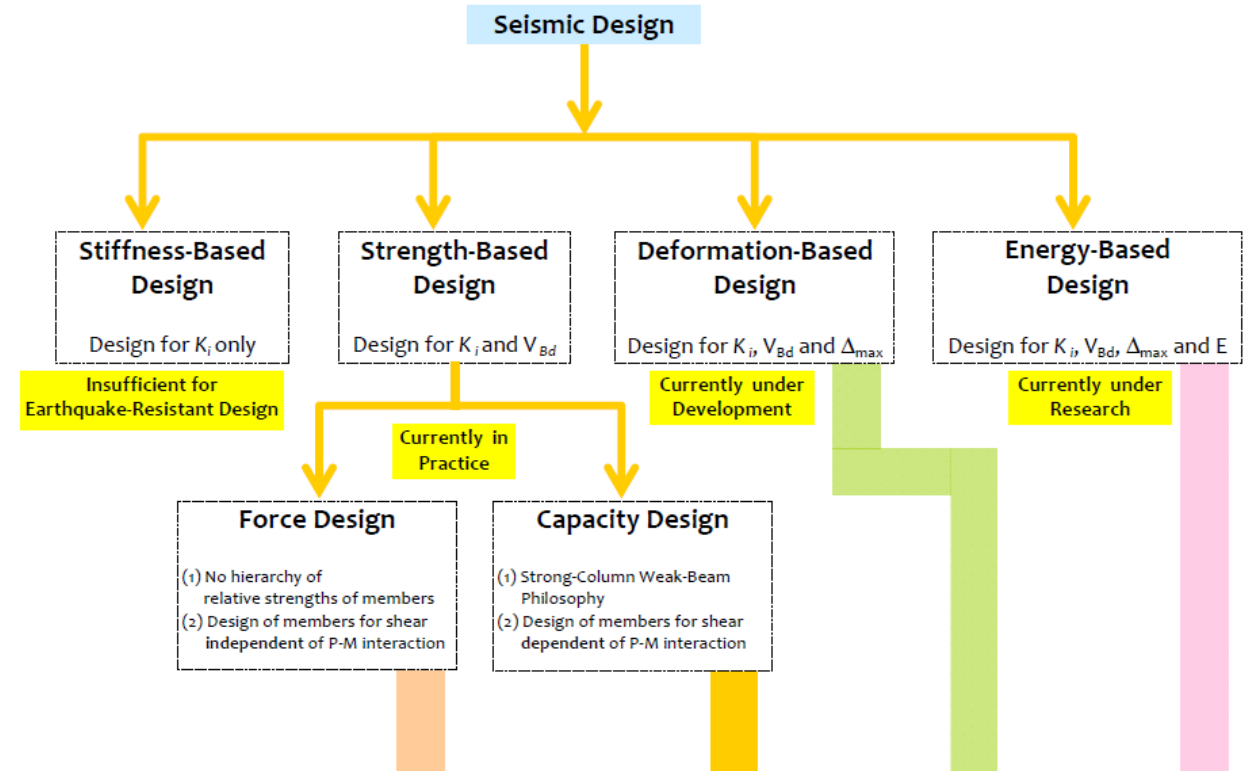
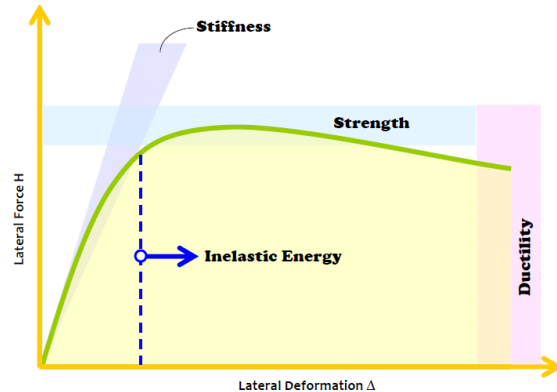


Figure 5.2: Earthquake Performance Assessment of NEW Buildings



Levels of EQRD	1	2	3
Mandatory for	Normal buildings in low seismic zones	Normal buildings in moderate/high seismic zones	Critical and Lifeline buildings
Optional for	-	Normal buildings in low seismic zones	Normal buildings in moderate/high seismic zones

CURRENT Earthquake Resistant Design Philosophies

Figure 5.5: Four broad methods available for Earthquake-Resistant Design: Rigour increases in each higher level method

RESPONSE SPECTRUM OF GROUND MOTION

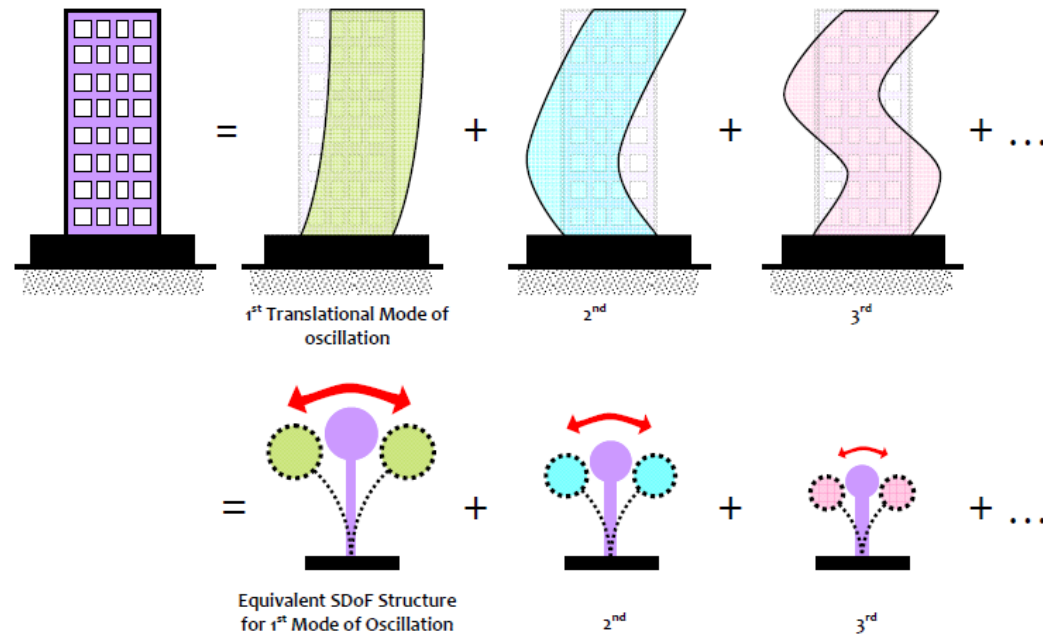


Figure 2.32: Equivalent SDoF structures corresponding to each mode of oscillation of the building: Decomposing the response of the building for purposes of understanding behaviour and of undertaking design calculations

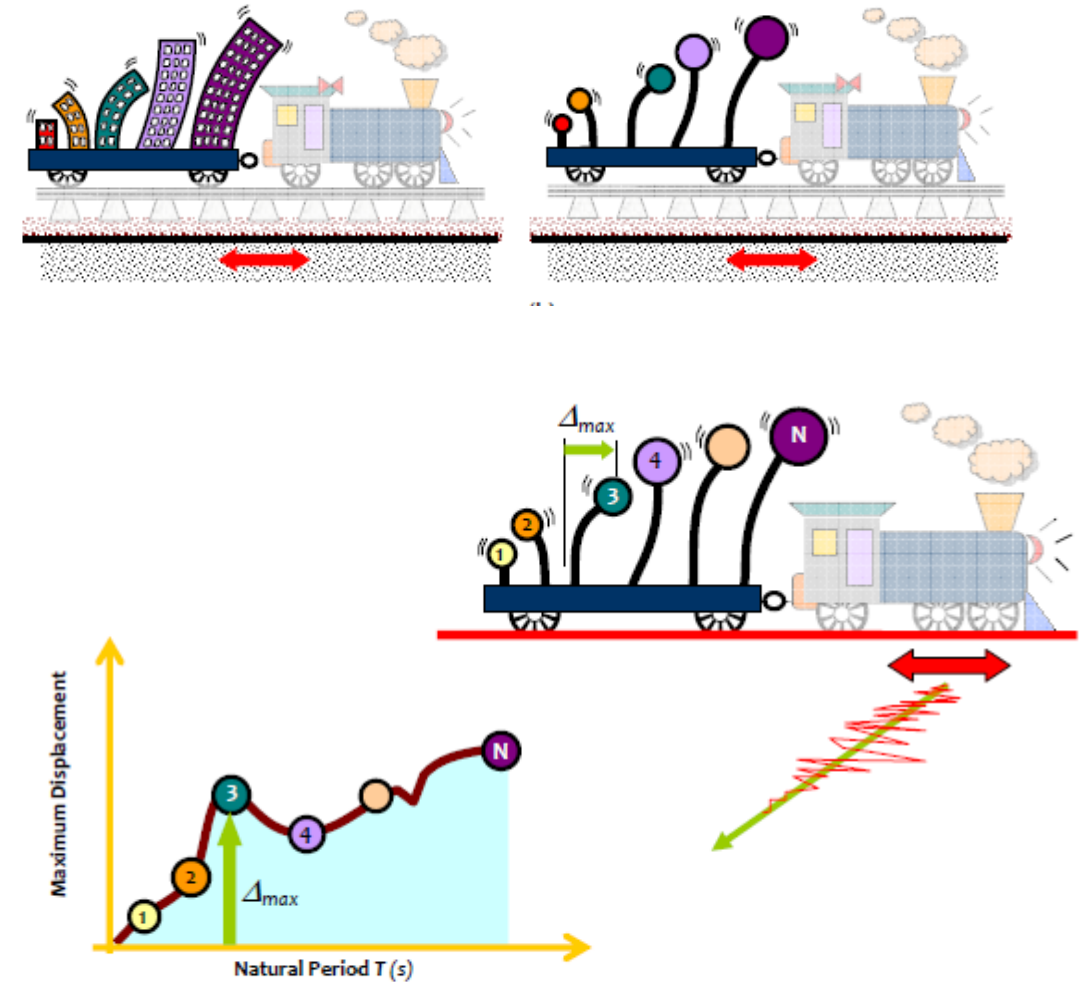


Figure 2.35: Influence of same ground motion on buildings with different fundamental translational Natural Period: When the energy content in the earthquake is higher corresponding to the fundamental translational natural period of a building, it shows higher response

STRUCTURAL VULNERABILITY OF BUILDING SHAPE

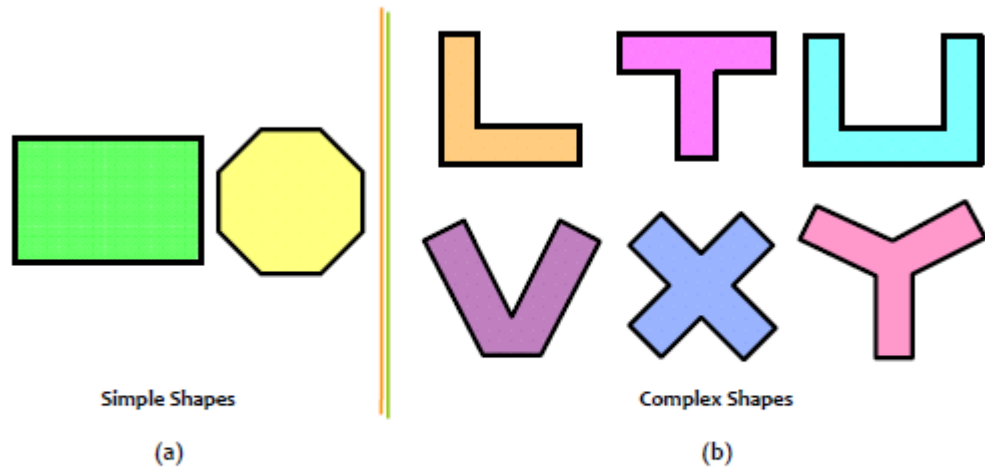


Figure 3.1: Plan shapes of buildings: Buildings with (a) simple shapes undergo simple acceptable structural seismic behaviour, while (b) those with complex shapes undergo complex unacceptable structural seismic behaviour

Table 3.1: Modes of oscillation: The first six modes include undesirable oscillations, like *diagonal translation*, *torsion*, *opening-closing*, and *dog-tail-wagging*, in buildings with complex plan shape

Mode	Type of oscillation in first six modes in buildings with different plan shapes					
						
1	Y-translation	Y-translation with torsion	X-translation	Torsion	X-translation with torsion	Torsion
2	X-translation	X-translation with torsion	Y-translation	Y-translation	Y-translation with torsion	X-translation
3	Torsion	Torsion	Torsion	X-translation	Torsional	Y-translation
4	Opening-closing	Opening-closing	Opening-closing	Opening-closing	Opening-closing	Dog tail wagging
5	Mixed	Dog tail wagging	Mixed	Mixed	Dog tail wagging	Opening-closing
6	Mixed	Mixed	2 nd X-translation	Mixed	Mixed	Mixed

Note:
Diagonal translation, torsion, opening-closing, and dog-tail-wagging are not acceptable as initial modes of oscillation in buildings

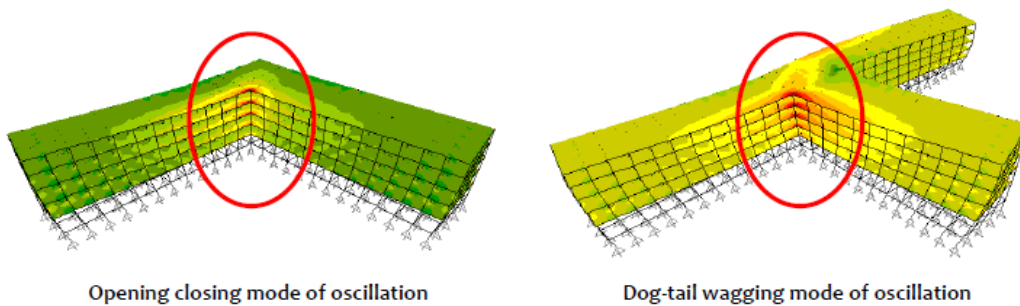
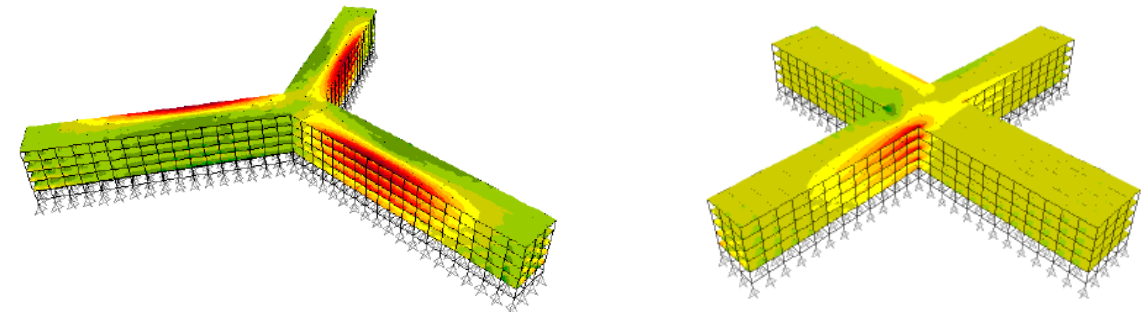


Figure 3.12: Stress concentration at re-entrant corners: Stress concentration at re-entrant corners in buildings with complex shapes can cause significant damage during earthquake shaking



STRUCTURAL VULNERABILITY OF BUILDING

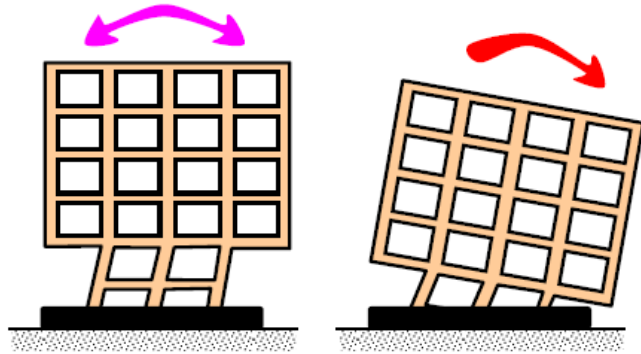
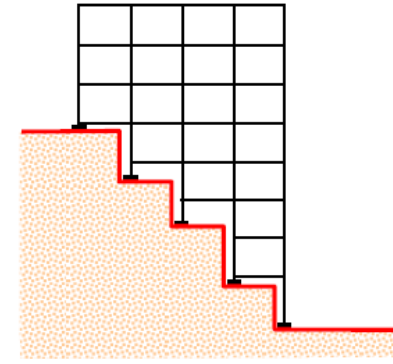
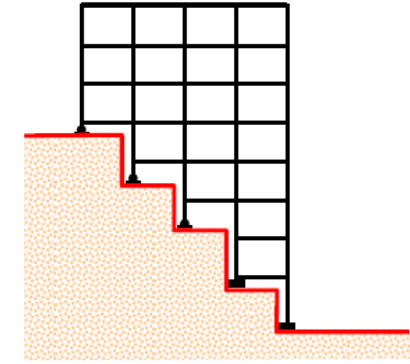


Figure 3.72: Buildings with floating columns: Overloading of columns in ground storey cause failure of buildings with floating columns during strong earthquake shaking



Building Condition A



Building Condition B

Figure 3.98: Buildings on slope: Stiffness irregularity in elevation due to unequal length of columns and degree of fixity at column base

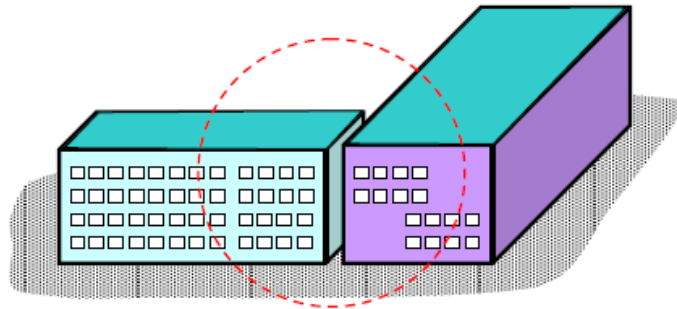
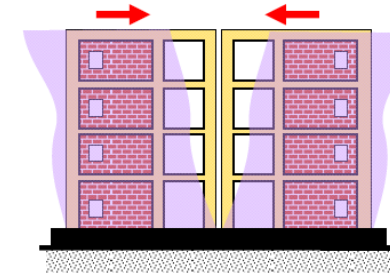
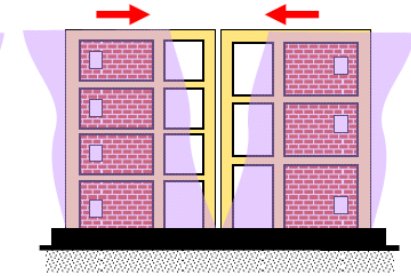


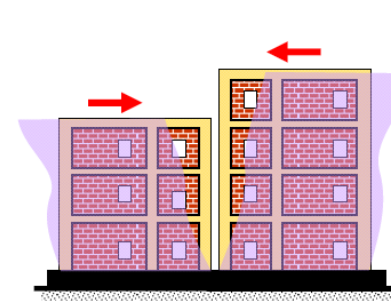
Figure 3.105: Separation joints: Separation between two parts of the same building or two adjoining buildings



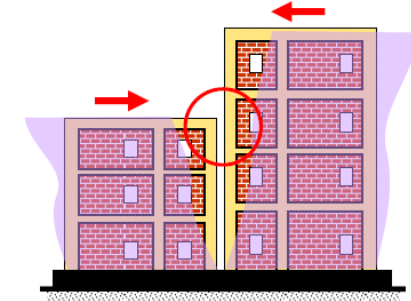
(a)



(b)



(c)



(d)

STRUCTURAL VULNERABILITY OF BUILDING STIFFNESS

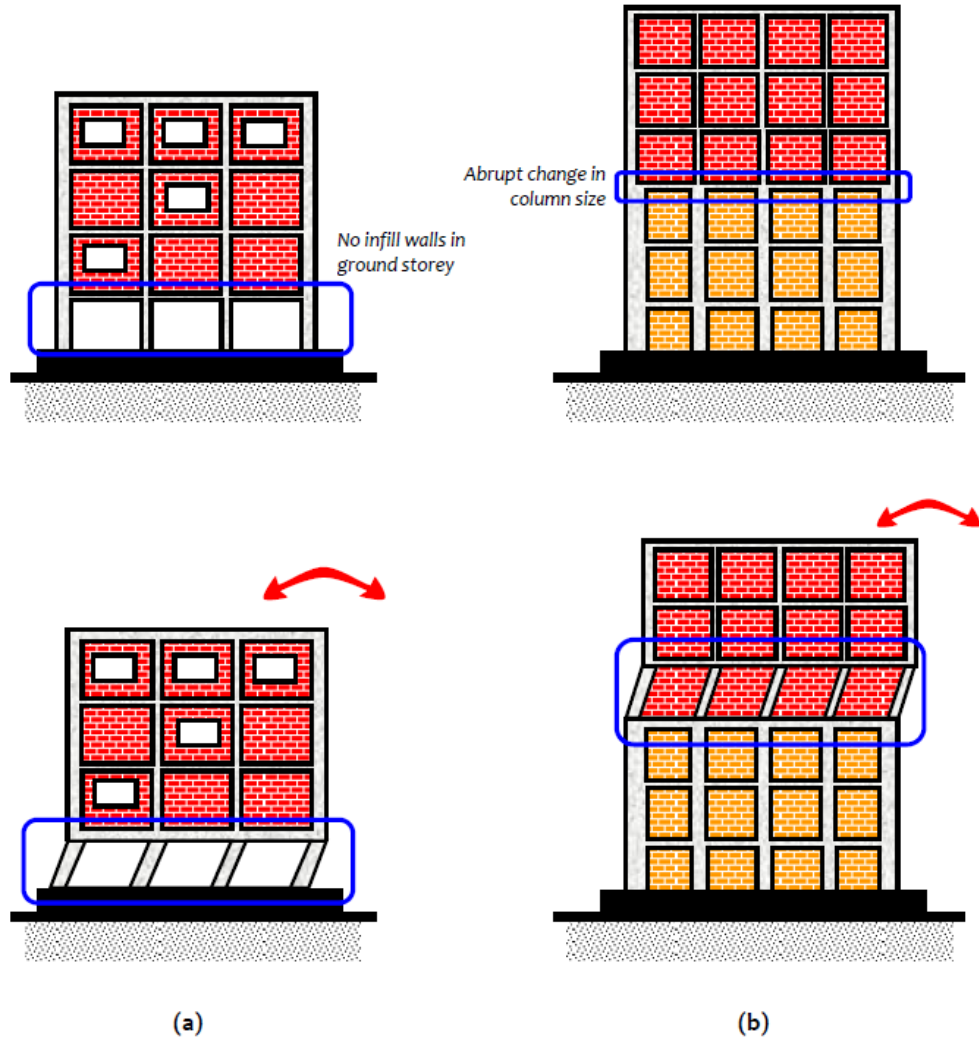


Figure 4.22: Lateral strength discontinuity or reduction of lateral strength along height of building: Strength reduction affects inertia force transfer – (a) open storey, and (b) change in member sizes

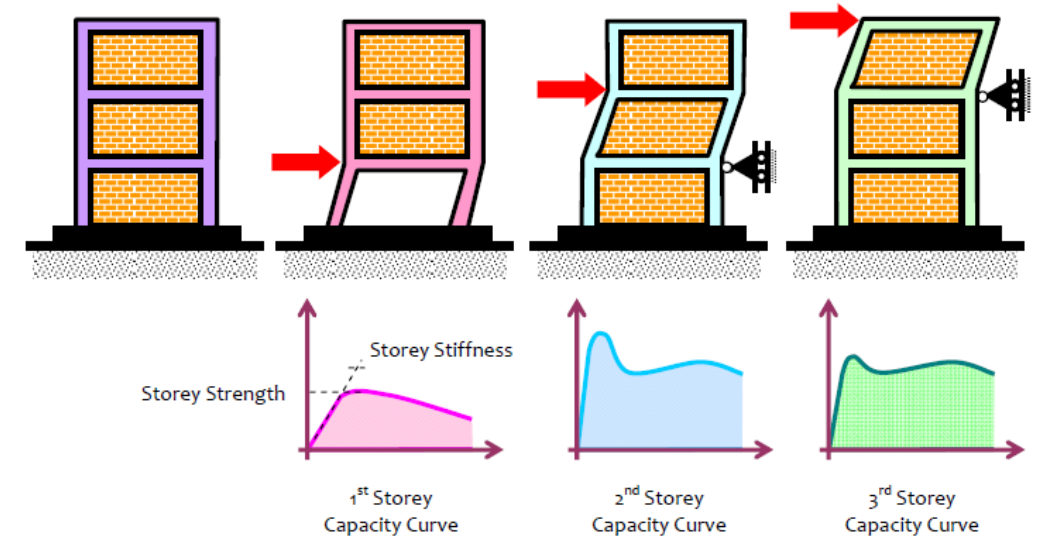


Figure 4.23: Method of estimating Storey Lateral Stiffness and Strength : Individual storey of building to be subjected to storey pushover analysis

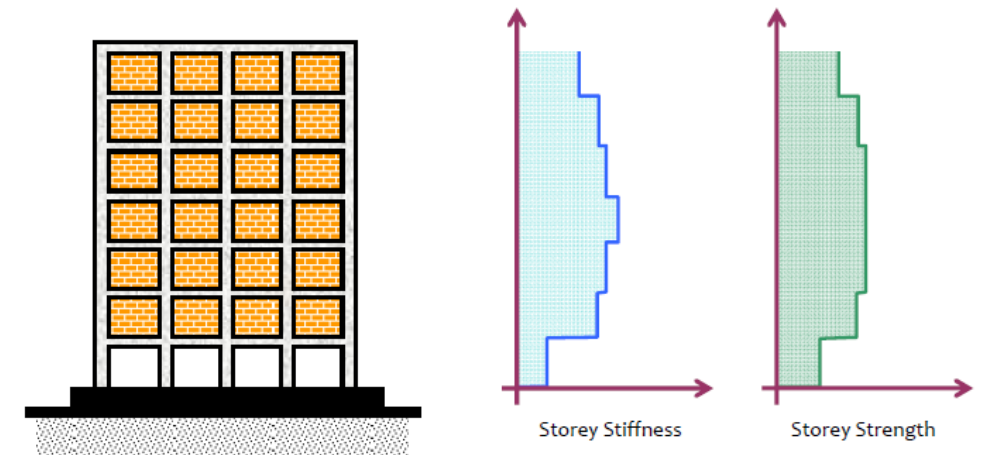


Figure 4.24: Variation of Lateral Stiffness and Strength of an OGS building: Large drop in both stiffness and strength at the open storey

STRUCTURAL VULNERABILITY OF BUILDING SYSTEM

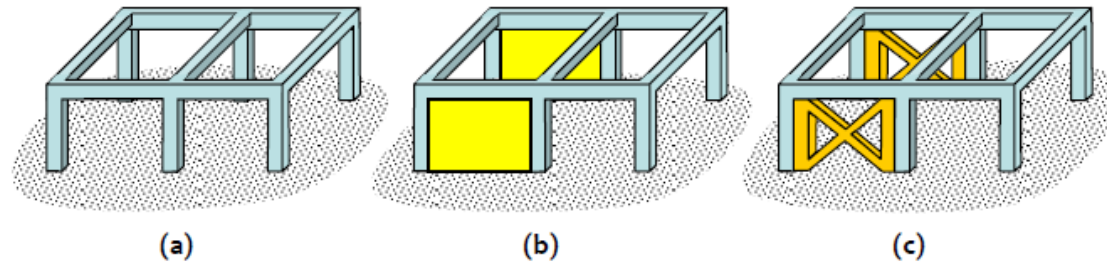
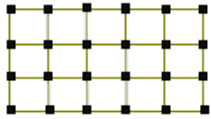
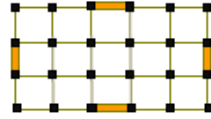
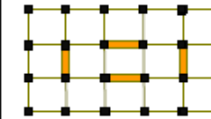
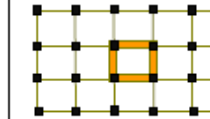


Figure 3.29: Common structural systems employed in buildings: (a) Moment frames, (b) Moment frames with structural walls, and (c) Braced moment frames. Walls and braces shown are shown only along one direction in plan; but designers can choose to provide them along both directions.

Table 3.8: Modes of oscillation in buildings with structural walls: structural walls at center of buildings are less efficient

Case				
Mode 1	Y translation (0.74s)	Y translation (0.48s)	X translation (0.48s)	Torsion (0.37s)
Mode 2	X translation (0.72s)	X translation (0.47s)	Y translation (0.47s)	Y translation (0.34s)
Mode 3	Torsion (0.65s)	Torsion (0.33s)	Torsion (0.47s)	X translation (0.33s)
Roof displacement in X direction	21.6 mm	11.9 mm	11.5 mm	5.9 mm
Roof displacement in Y direction	23.4 mm	12.4 mm	10.9 mm	6.0 mm

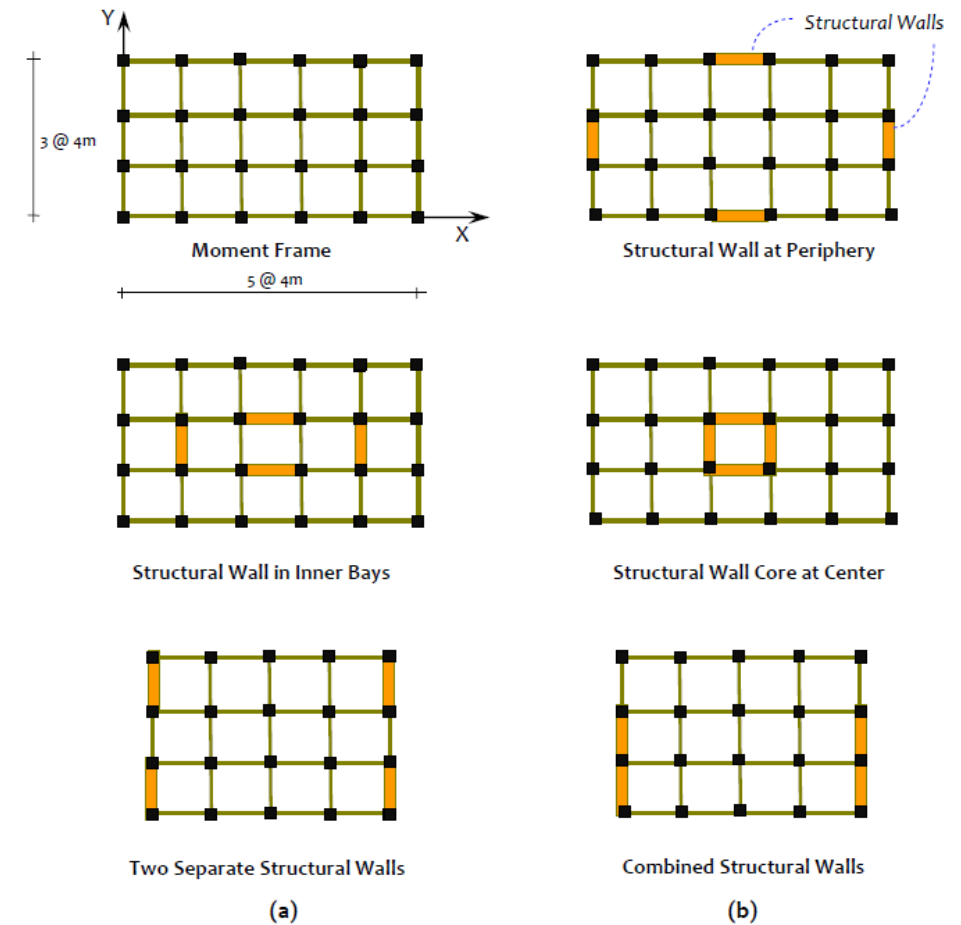
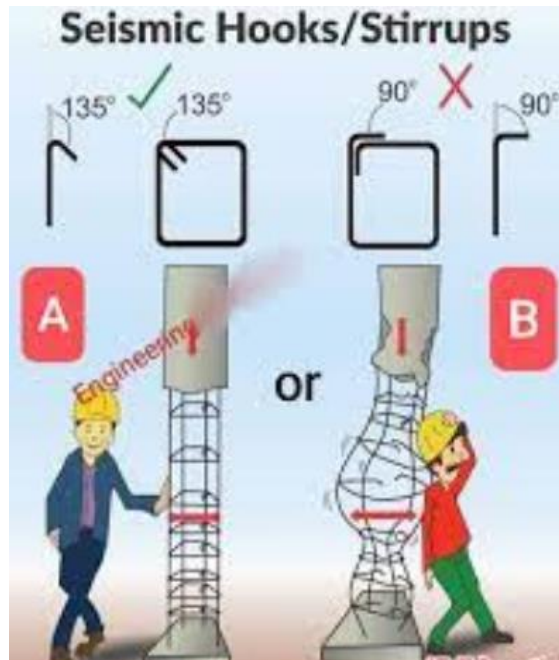
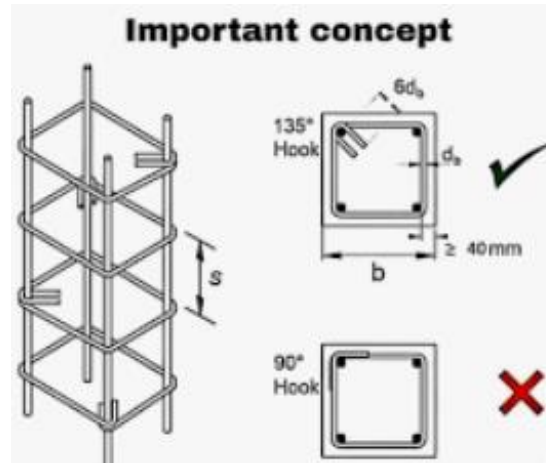


Figure 3.42: Buildings with structural wall: Location of structural wall is important for seismic performance of buildings

SEISMIC RESILIENT IN DETAILING



✗ Ordinary Moment Resisting Concrete Frame	✓ Intermediate Moment Resisting Concrete Frame	✓ Special Moment Resisting Concrete Frame

Thank you For Your kind Attention!!

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