The Fracture

The Framework

Strengthening Urban Infrastructure and Engineering Governance in Myanmar

Lessons learnt from the M7.7 Mandalay Earthquake.

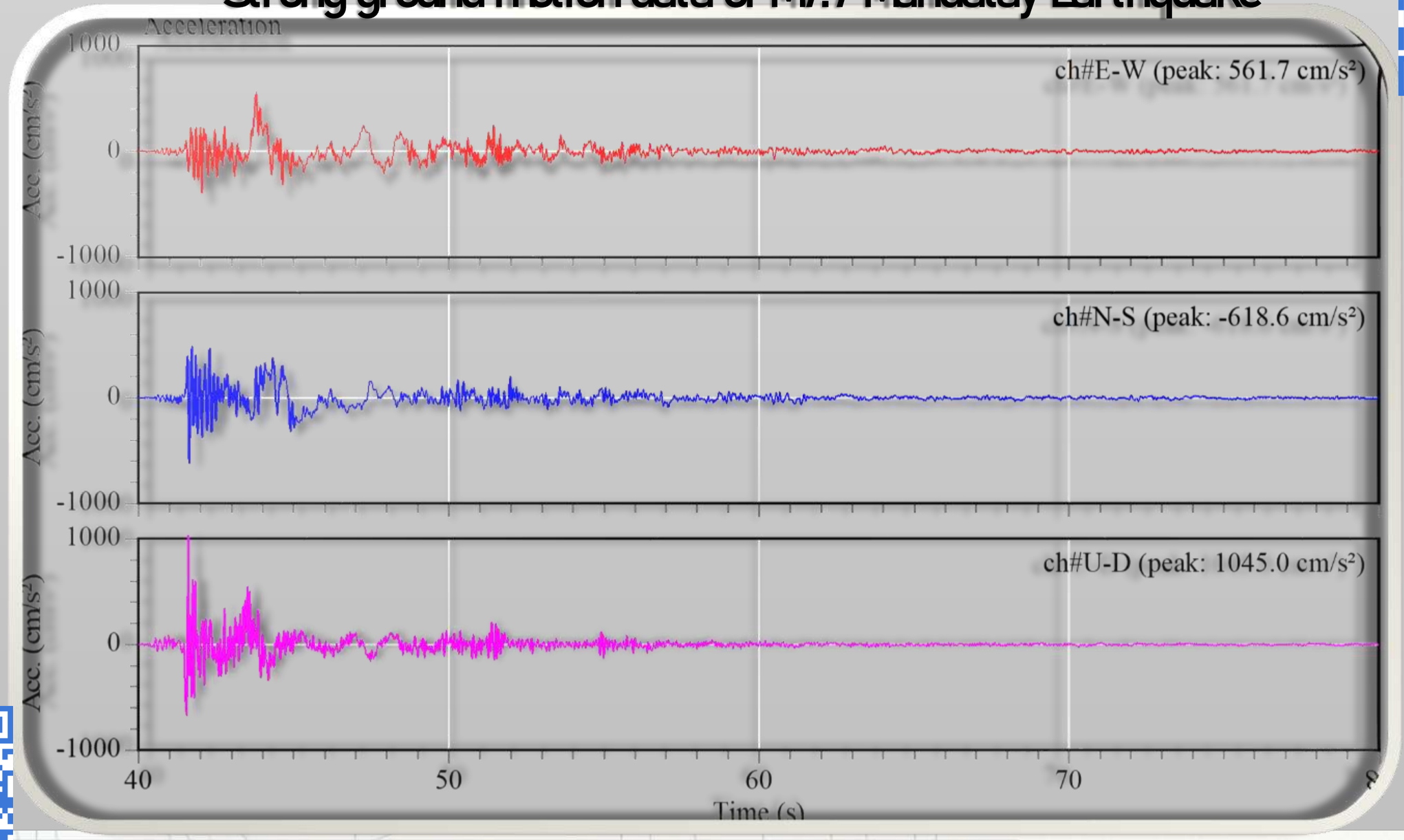
U Wai Phyo Linn | Chief Engineer, Department of Building, Ministry of Construction

Remembering the 28th of March

“We honor the past to strengthen our future.”

The anniversary of the M7.7 Mandalay Earthquake serves as a solemn reminder of our region’s profound seismic vulnerability. It is our collective responsibility to protect the built environment and the lives within it.

Strong ground motion data of M7.7 Mandalay Earthquake



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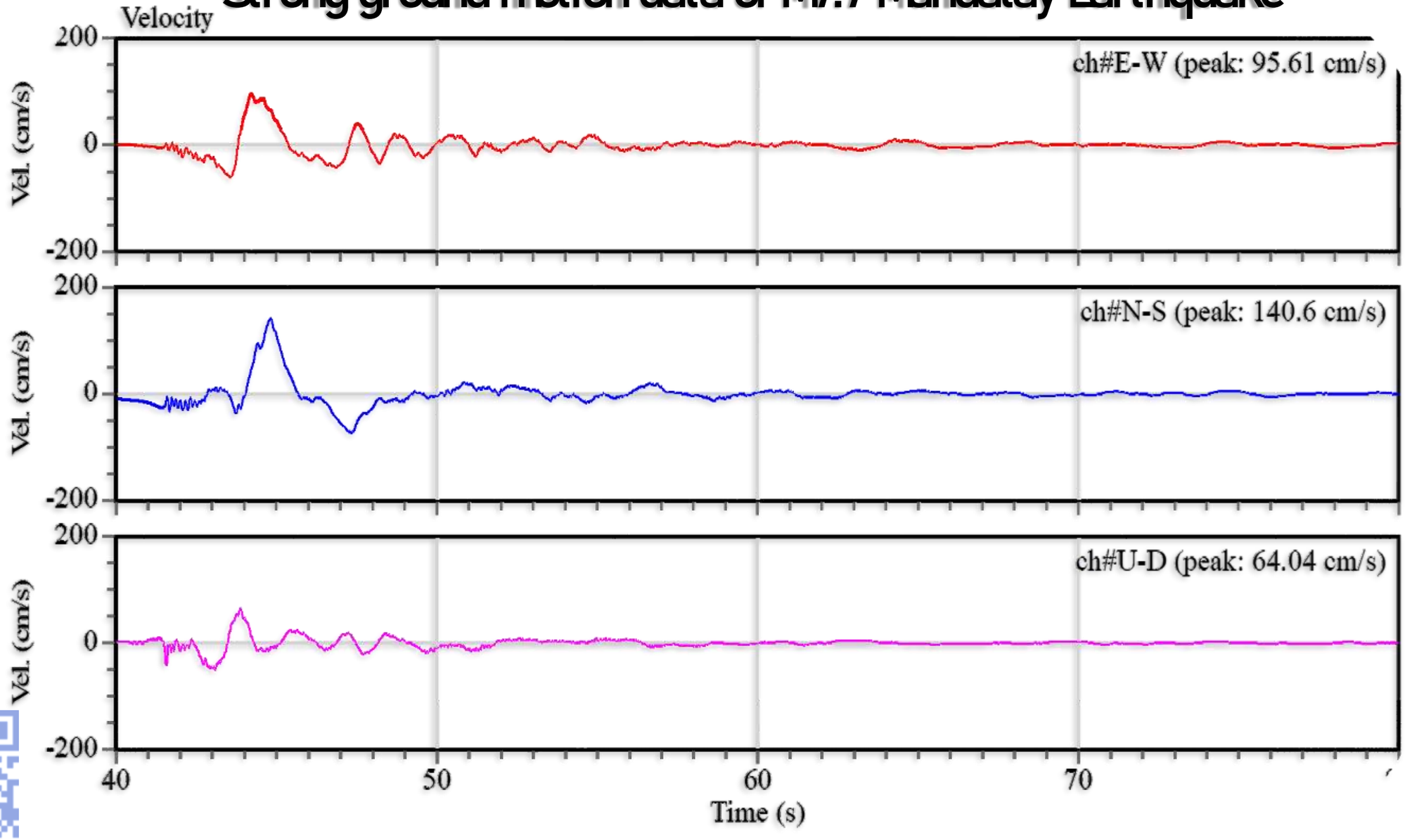

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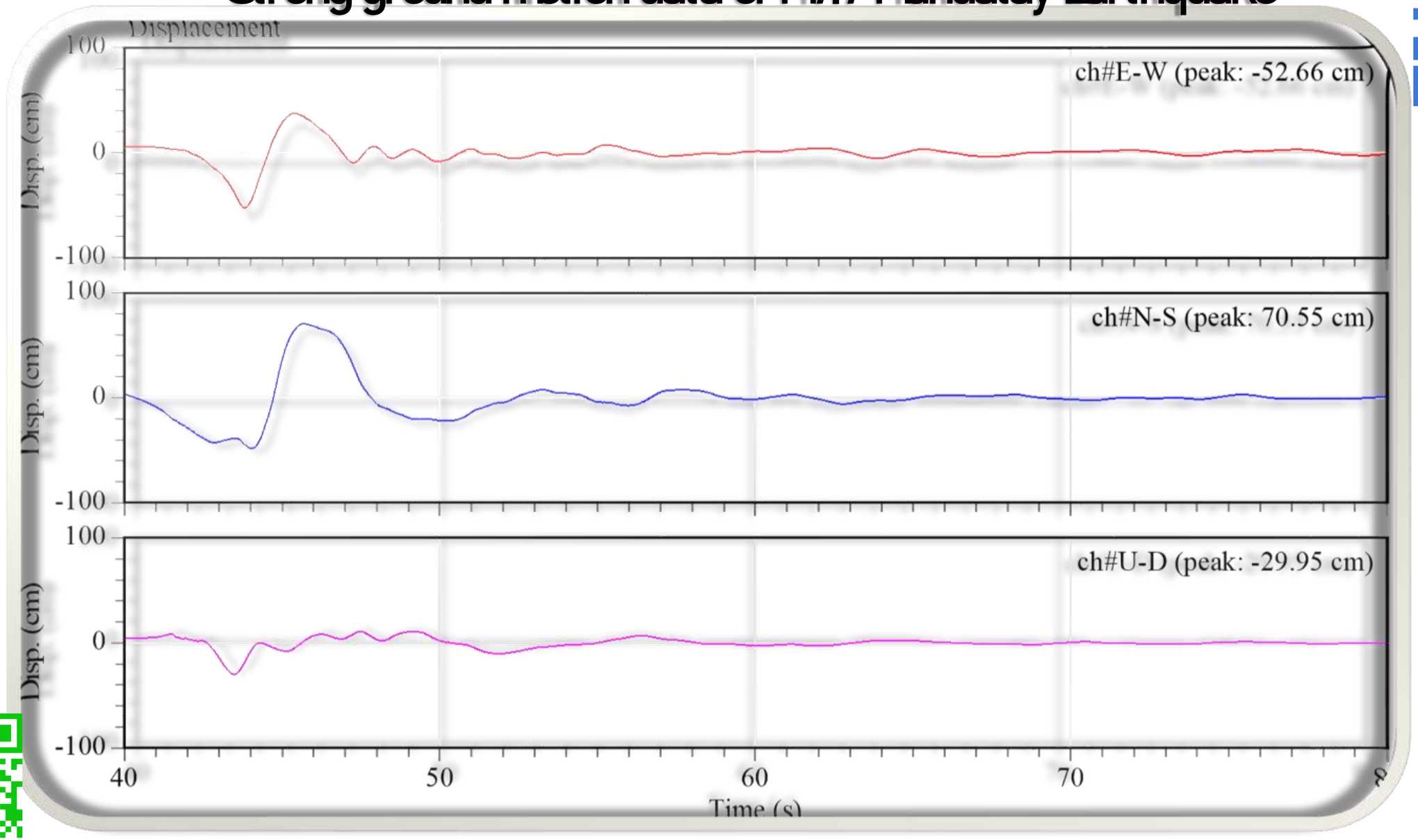


The Forces at Play:
Decoding the M7.7 Ground Motion

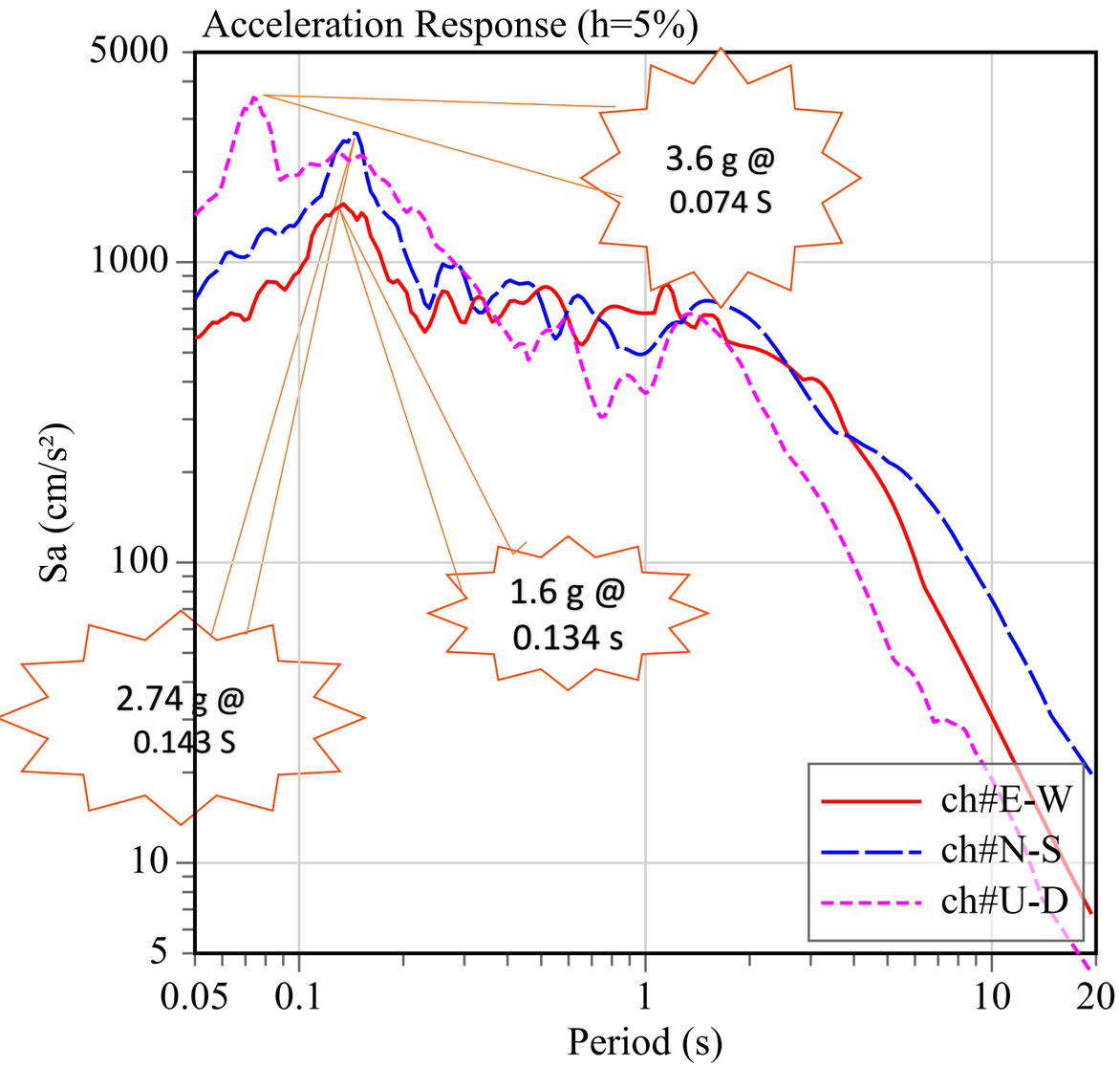
1045.0 cm/s^2
Peak Vertical Acceleration (U-D)

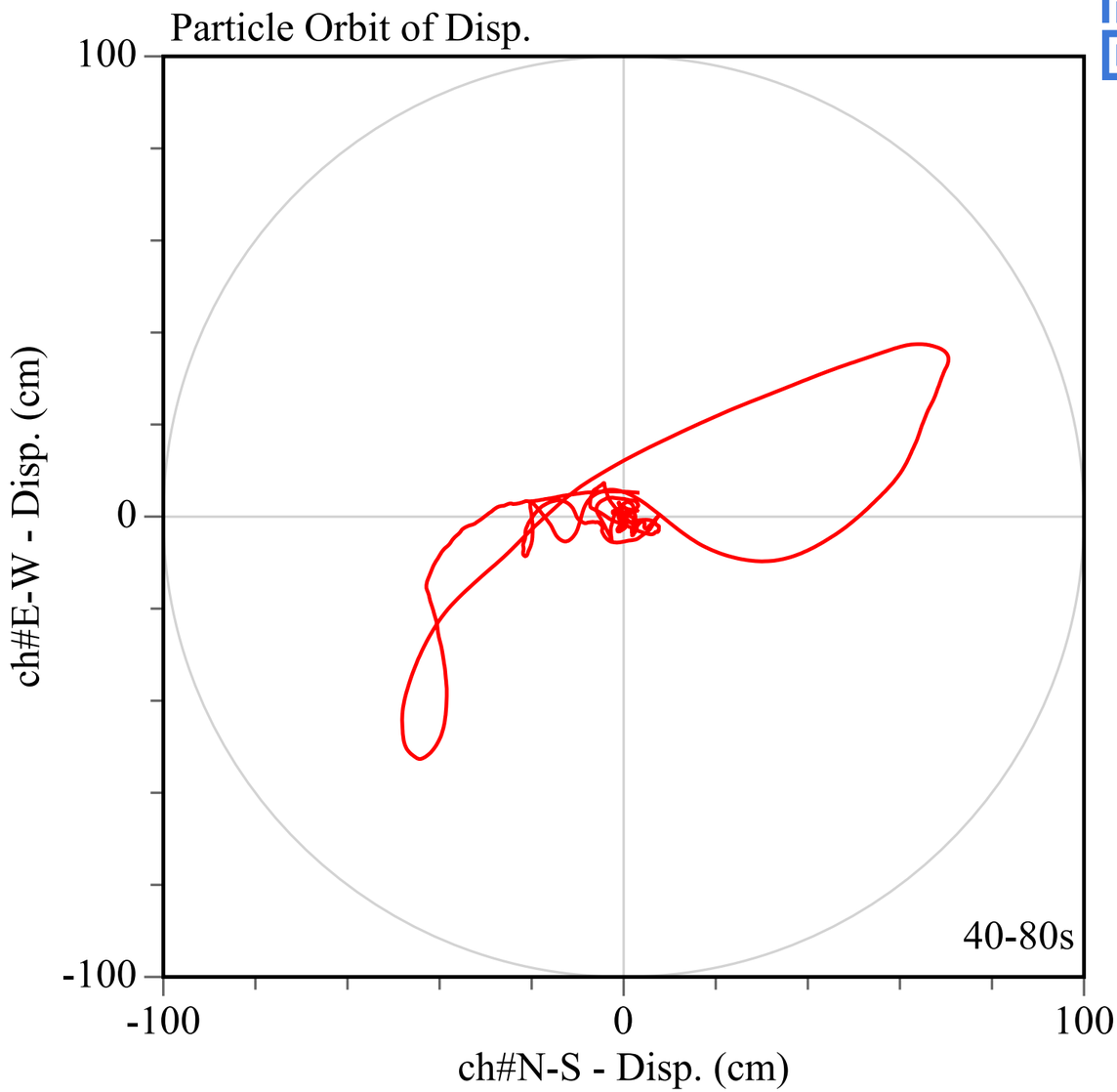
140.6 cm/s
Peak Horizontal Velocity (N-S)

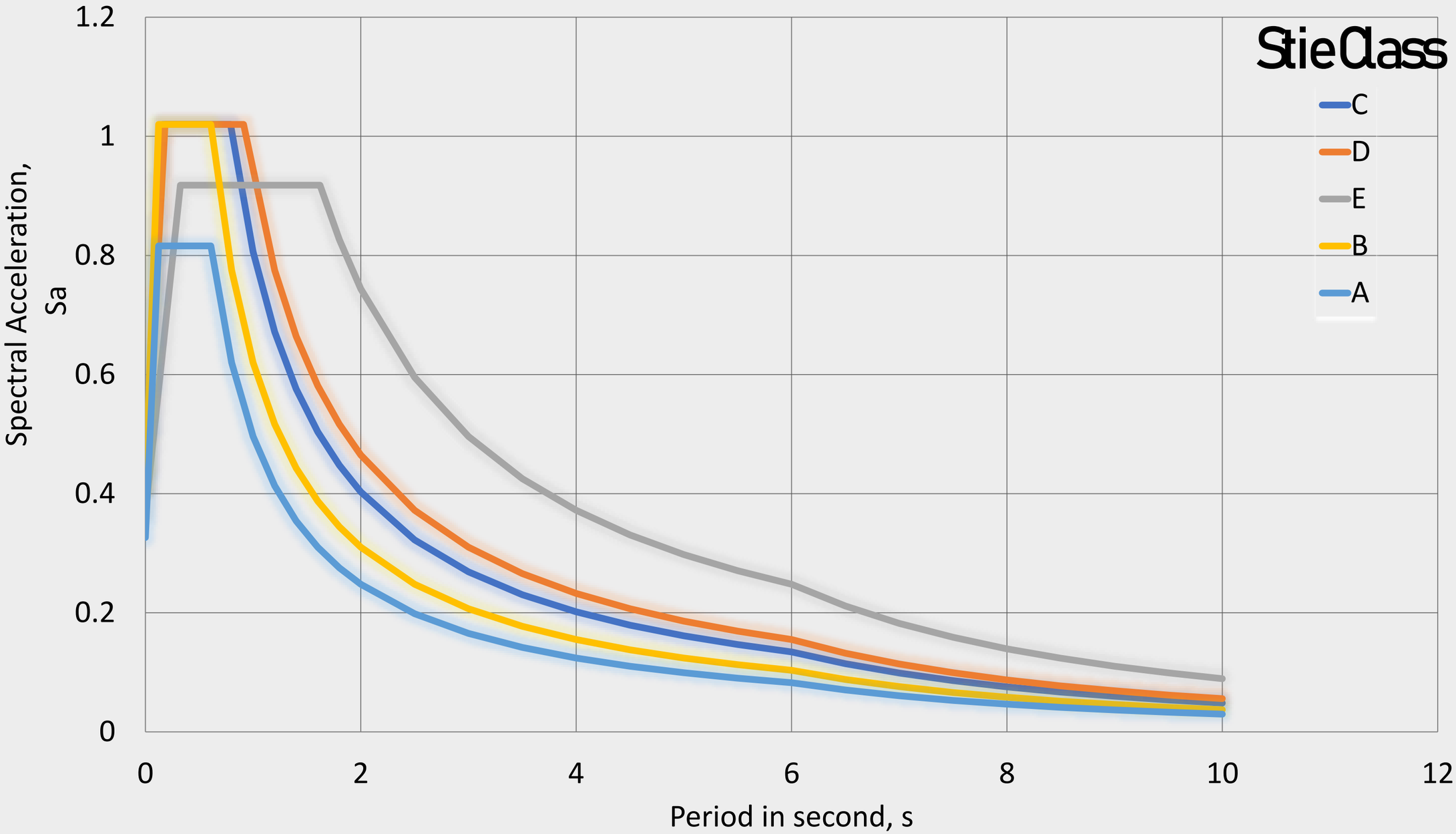
70.55 cm
Peak Displacement (N-S)

The existing building stock was subjected to unique and extreme peak ground accelerations, fundamentally testing the limits of legacy design concepts.

Acceleration Response Spectrum & Particle orbit of Displacement






Response Spectrum, NayPyiTaw
Stie Class
C
D
E
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A
Spectral Acceleration, Sa
1.2
1
0.8
0.6
0.4
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0
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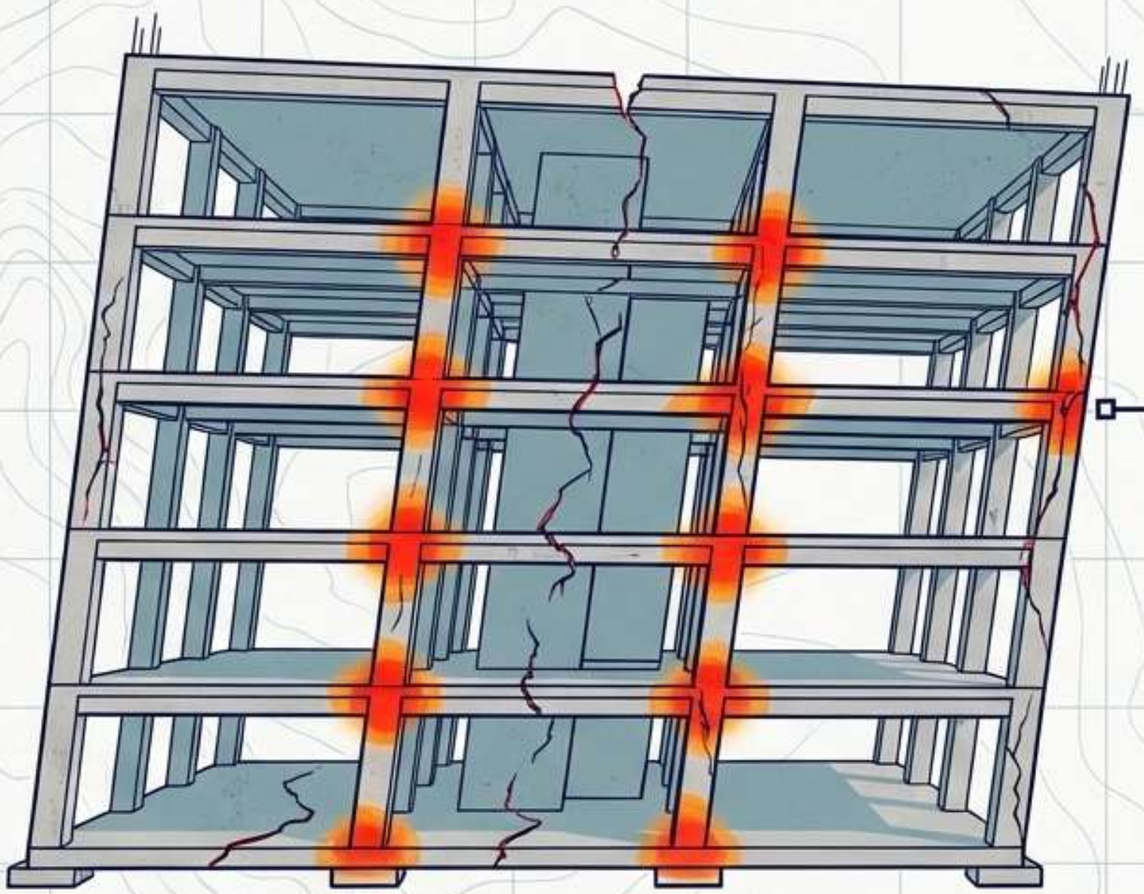
6
8
10
12
Period in second, s

Visualizing the threat of Peak Ground Accelerations (PGA)



Unprecedented PGA values exposed critical flaws in ad-hoc construction.

Without rigorous RC detailing, these high-stress joints experience catastrophic brittle failure during extreme lateral ground motion.

The Trifecta of Structural Vulnerability

Extreme Forces
Unprecedented Peak Ground Accelerations pushing buildings beyond elastic limits.

Execution Gaps
Poor quality control in construction, specifically inadequate reinforced concrete (RC) detailing and unreinforced masonry.

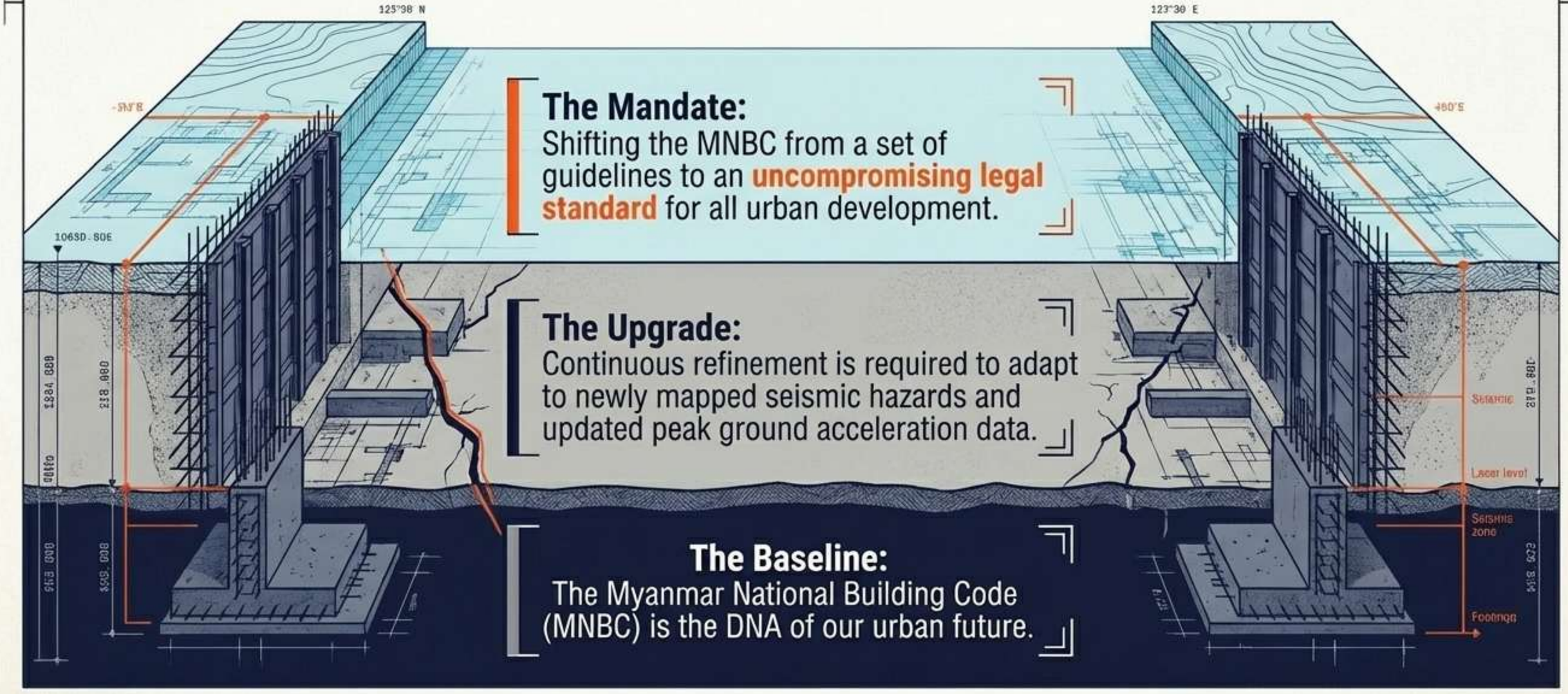
Geotechnical Complexity
Subsurface soil conditions, deep soft sediments, and foundation instability amplifying ground motion.

Structural failures were rarely due to a single factor. They resulted from the deadly combination of intense shaking, complex central Myanmar soil behavior, and legacy construction quality.

Diagnostic Matrix: Transitioning Engineering Governance.

	REACTIVE (Old Paradigm)	**PROACTIVE** (New Strategy)
Approach	Post-Disaster Assessment	Pre-Disaster Mitigation
Code	Ad-hoc building standards	Refined Myanmar National Building Code (MNBC)
Public Buildings	Voluntary checks	Mandatory Vulnerability Assessments
Methodology	Basic visual surveys	Modern Structural Analysis Tools
Execution	Isolated public projects	Integrated Public-Private Partnerships

Pillar 1: The ongoing refinement of the MNBC.

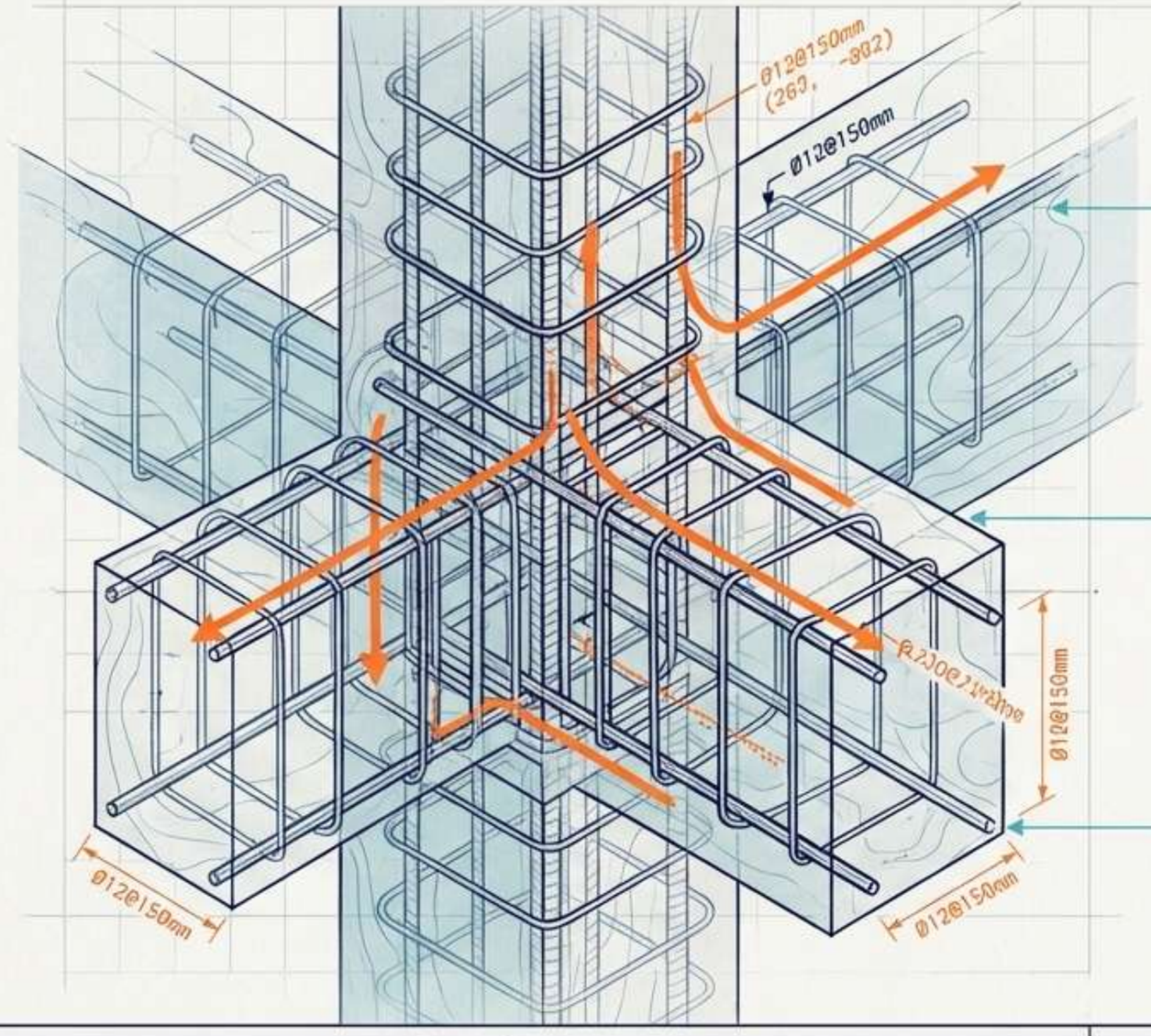


The Mandate:
Shifting the MNBC from a set of guidelines to an **uncompromising legal standard** for all urban development.

The Upgrade:
Continuous refinement is required to adapt to newly mapped seismic hazards and updated peak ground acceleration data.

The Baseline:
The Myanmar National Building Code (MNBC) is the DNA of our urban future.

Pillar 2: Rigorous quality control in RC detailing



The Defense Mechanism:

Proper Reinforced Concrete (RC) detailing transforms brittle structures into ductile, energy-absorbing systems.

Quality Control:

Design on paper means nothing without strict, on-site quality control during pouring and curing.

The Standard:

Eliminating critical shear failures through dense stirrup placement and precise column-beam joint reinforcement.

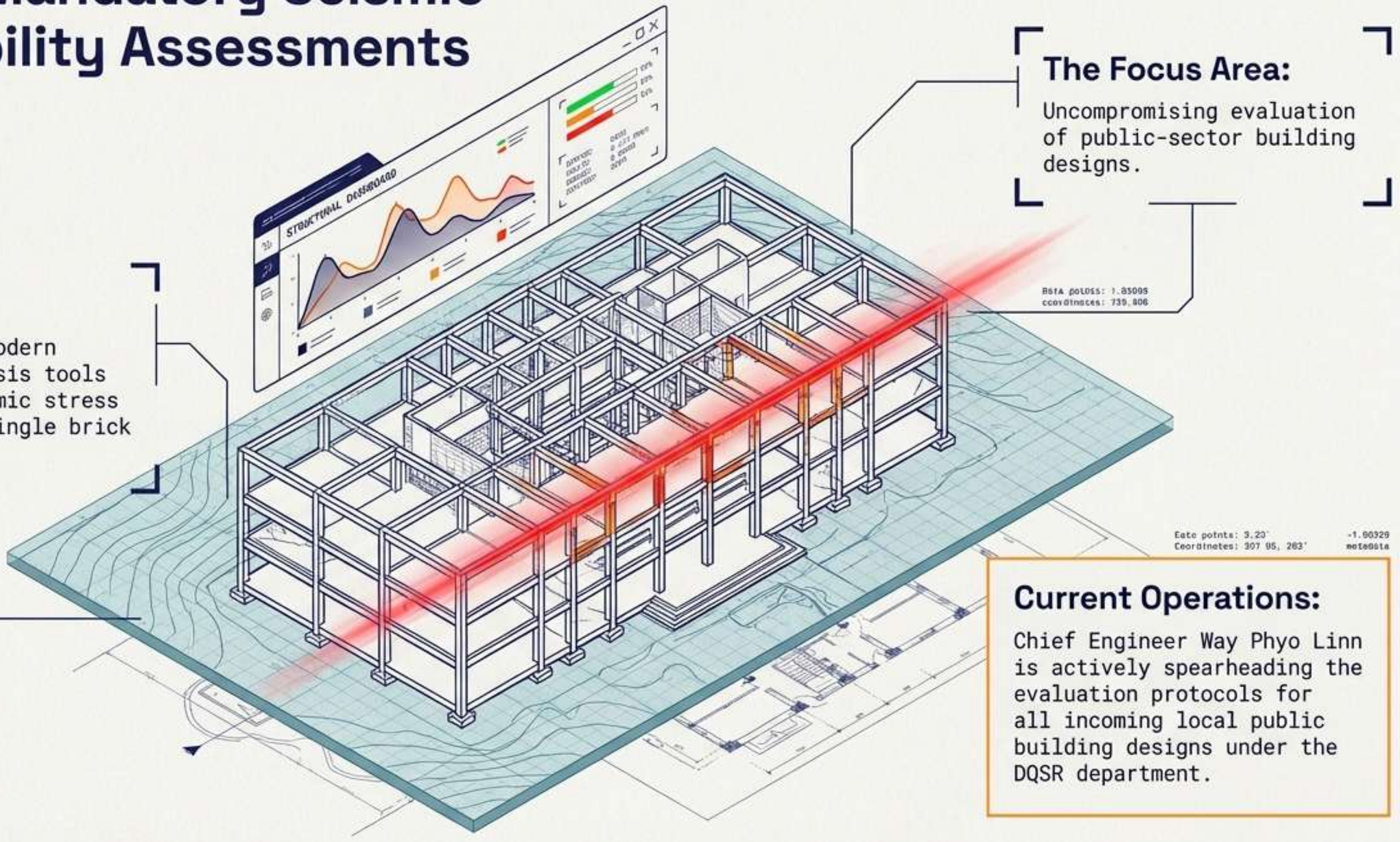
Pillar 3: Mandatory Seismic Vulnerability Assessments

The Focus Area:

Uncompromising evaluation of public-sector building designs.

The Tools:

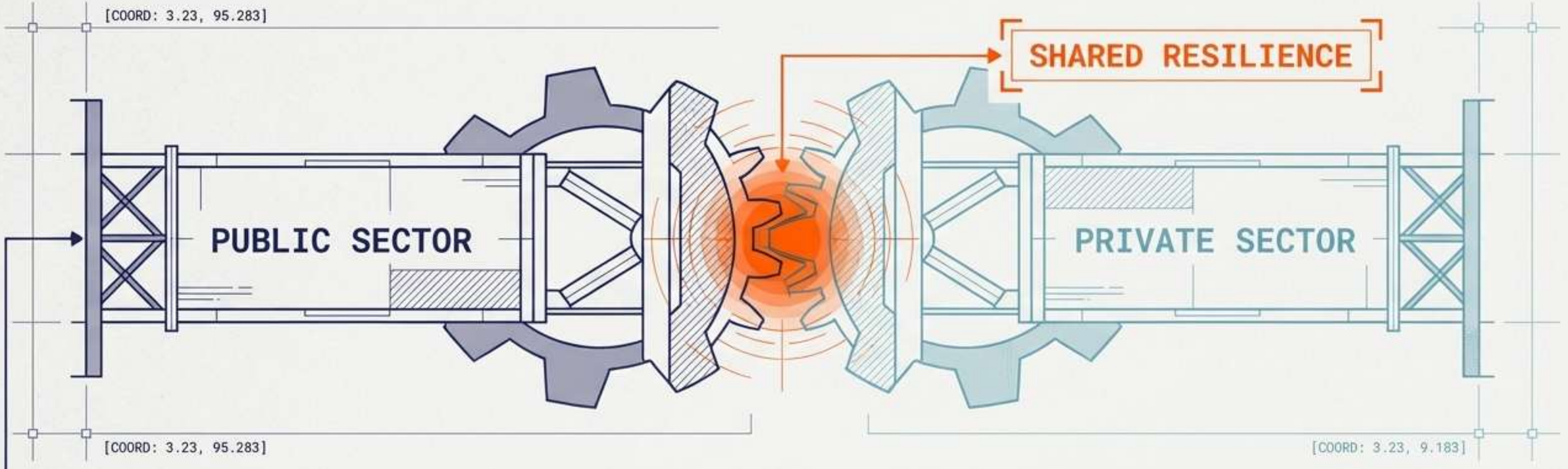
Integration of modern structural analysis tools to simulate seismic stress tests before a single brick is laid.



Current Operations:

Chief Engineer Way Phyo Linn is actively spearheading the evaluation protocols for all incoming local public building designs under the DQSR department.

Pillar 4: Forging Public-Private Partnerships (PPPs).



A Unified Front:

The Construction Industry is an ecosystem. Growth must be paired with resilience.

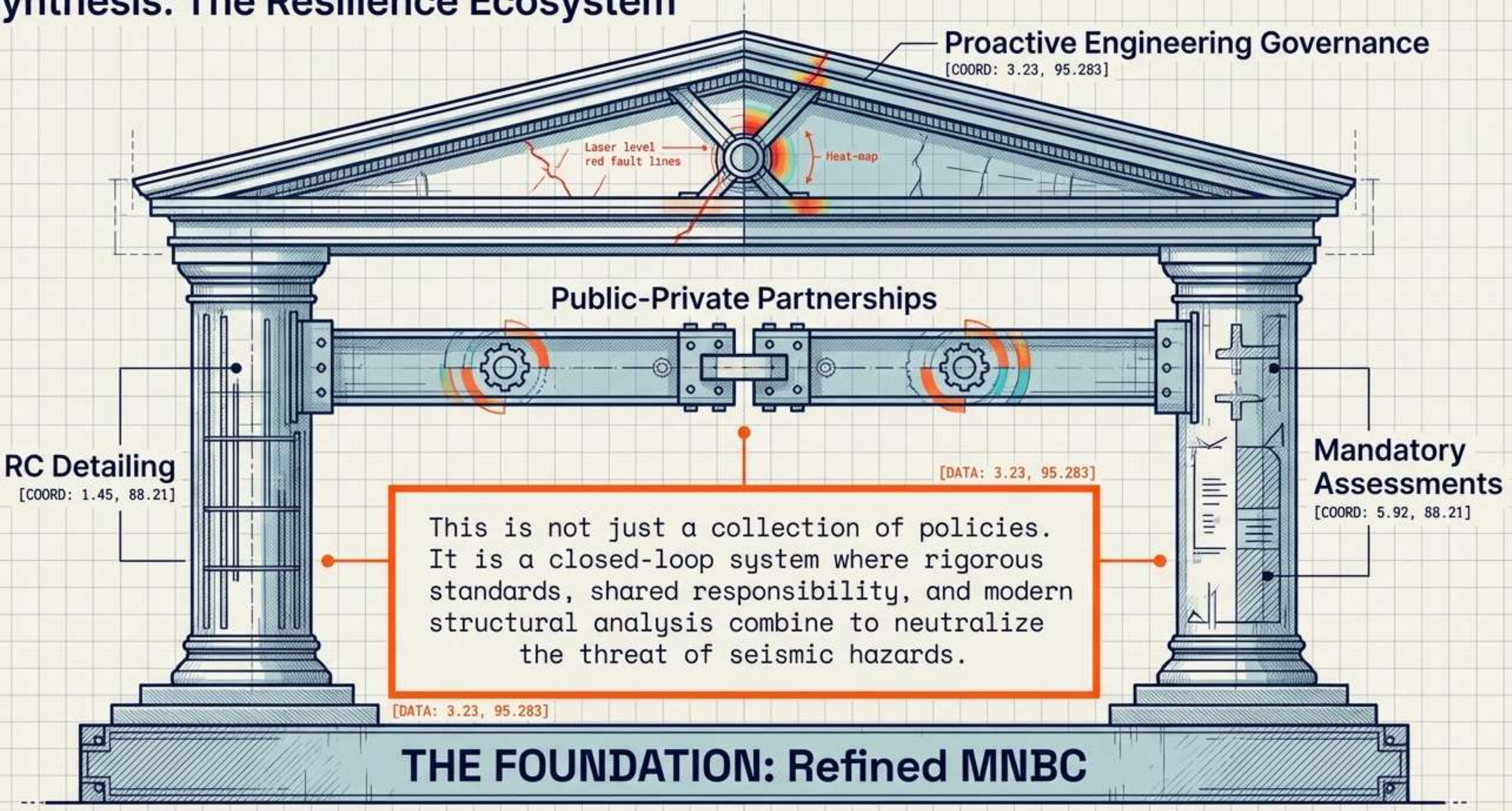
Shared Responsibility:

The Ministry provides the governance, oversight, and MNBC standards; the private sector drives innovation, scale, and rapid execution.

The Goal:

Ensuring that commercial urban development aligns perfectly with national seismic safety imperatives.

Synthesis: The Resilience Ecosystem



Engineering a future that stands firm.

By commemorating the tragedy of the past, we forge the blueprint for our future. A resilient Myanmar begins with uncompromising engineering governance today.

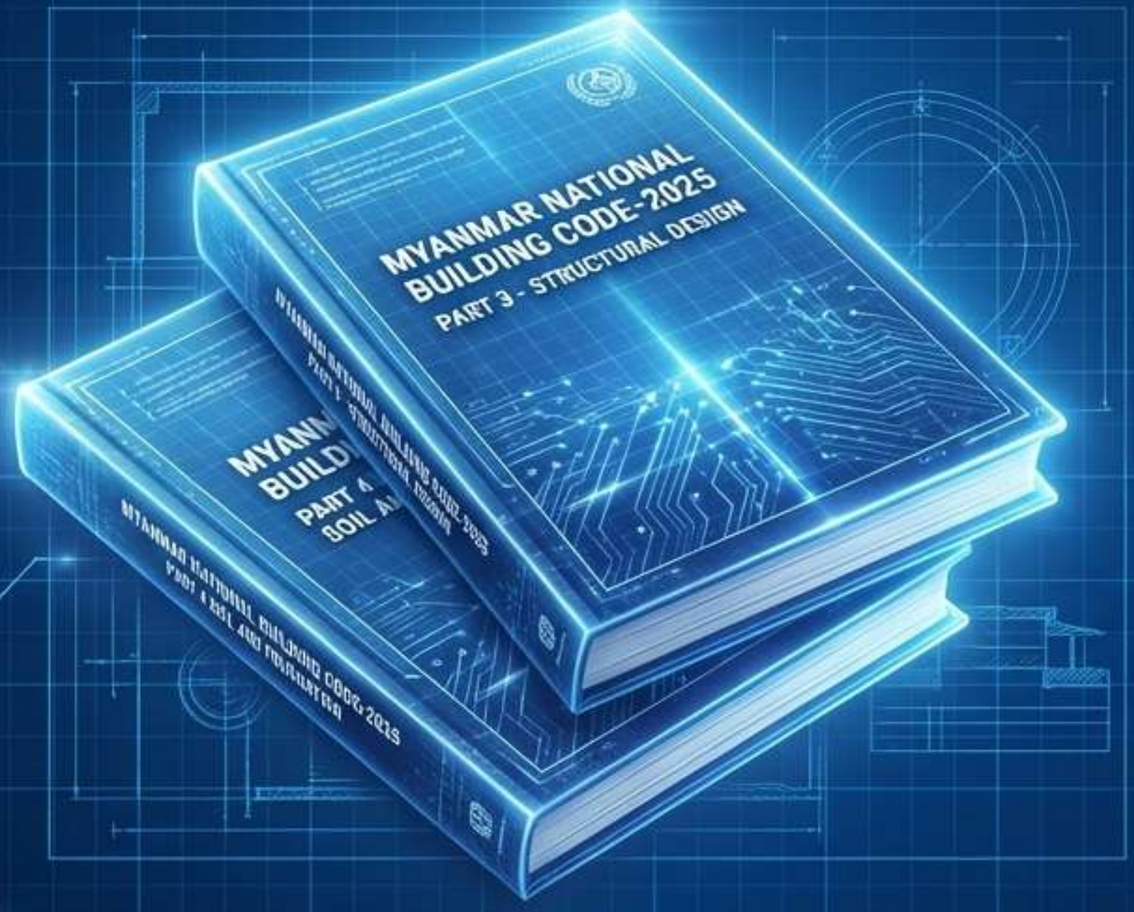
Ministry of Construction | DQSR Department

The Strategic Pivot in Engineering Governance

The Past		The Future
Reactive (Post-disaster damage assessment)	**Approach**	**Proactive** (Pre-seismic risk mitigation)
Localized Fixes (Patching damaged foundations)	**Focus**	**Systemic Resilience** (Updating national codes and zoning)
Visual Inspections	**Methodology**	**Mandatory Vulnerability Assessments & Multi-Sensor Verification**
Legacy Practices	**Standard**	**MNBC 2025** (Performance-Based Earthquake Engineering)

The **Ministry of Construction** is actively transitioning the urban development framework from emergency response to **preemptive, code-driven resilience.**

Updating the DNA of Construction: MNBC 2025



Developed by Technical Working Groups, UN-Habitat, and the Myanmar Engineering Council, MNBC 2025 provides the mandatory legal and technical scaffolding for a safer tomorrow.

Global Alignment

Calibrated with ASCE 7-05 and modern ACI standards.

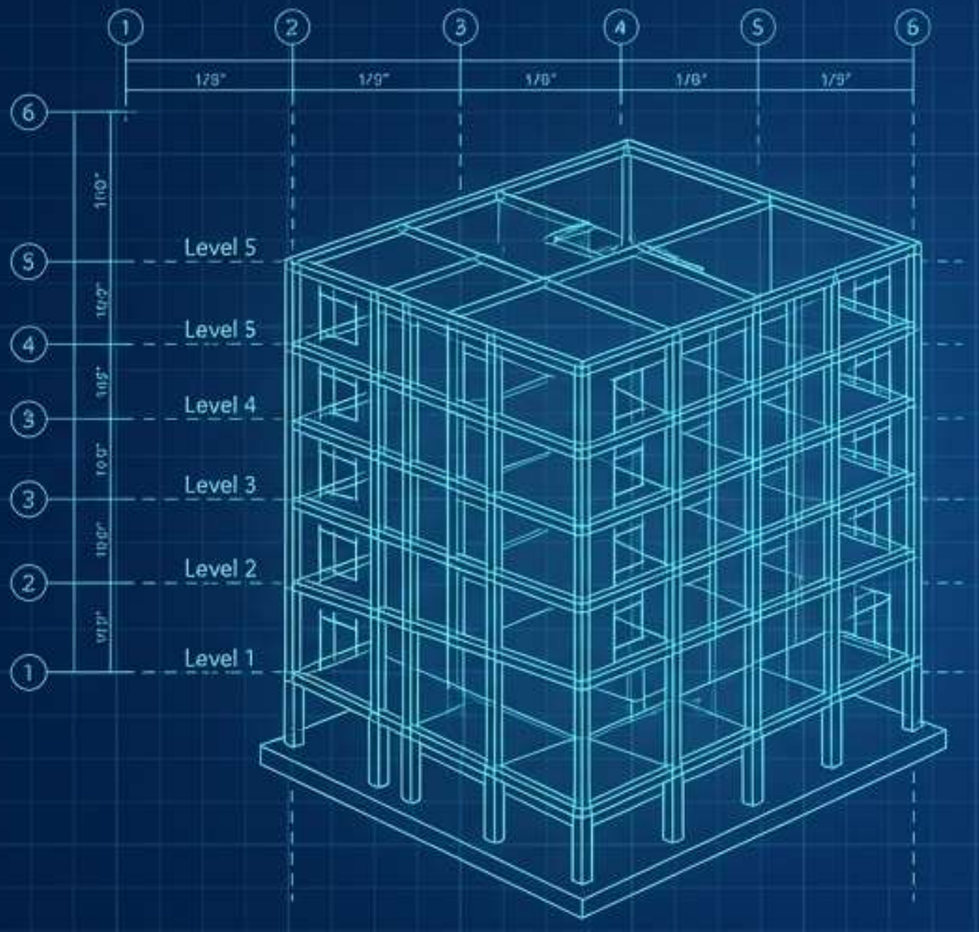
Seismic Design Categories (SDC)

Refined spectral response coefficients (S_{DS} and S_{D1}) and mapped maximum considered earthquake parameters.

Geotechnical Rigor

Updated soil load parameters, lateral pressures, and foundation performance metrics.

Pragmatic Implementation: The Low-Risk Provision



Applicability

Regular structures, <= 5 storeys, Occupancy Category II, fundamental period T <= 0.5s.

The Provision

Seismic Load Effect (E) can be reduced by a factor of 0.88 (for S_s < 1.5g) or 0.86 (for S_s >= 1.5g).

The Condition

This reduction is strictly contingent upon maintaining intermediate seismic detailing.

Economic realities demand practical codes. Appendix B ensures safety for low-rise buildings without paralyzing the construction industry.

The Golden Thread: Execution & RC Detailing

1. Material Compliance:

Enforcing minimum yield strengths and tensile requirements.

2. Structural Detailing:

Strict adherence to minimum spacing and concrete cover for durability and fire safety.

3. Site Verification:

Mandatory bar marking identification and weight variation checks.

Even the most advanced structural design will fail if the concrete and rebar lack rigorous quality control on the ground.

Shielding the Core: Mandatory Vulnerability Assessments

The Mandate

Rollout of mandatory pre-seismic risk assessments for all public-sector buildings and critical infrastructure.

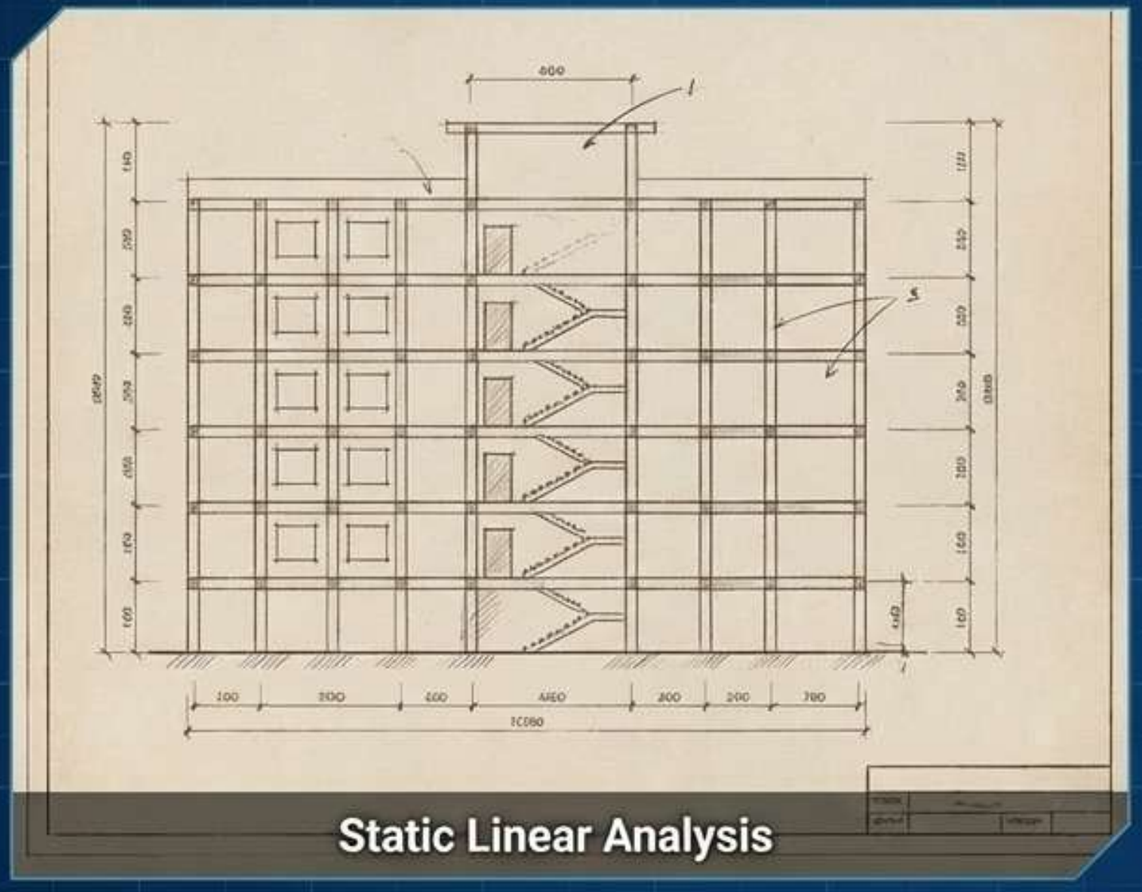
The Method

Transitioning to nonlinear seismic assessment for existing RCC frames with infill walls.

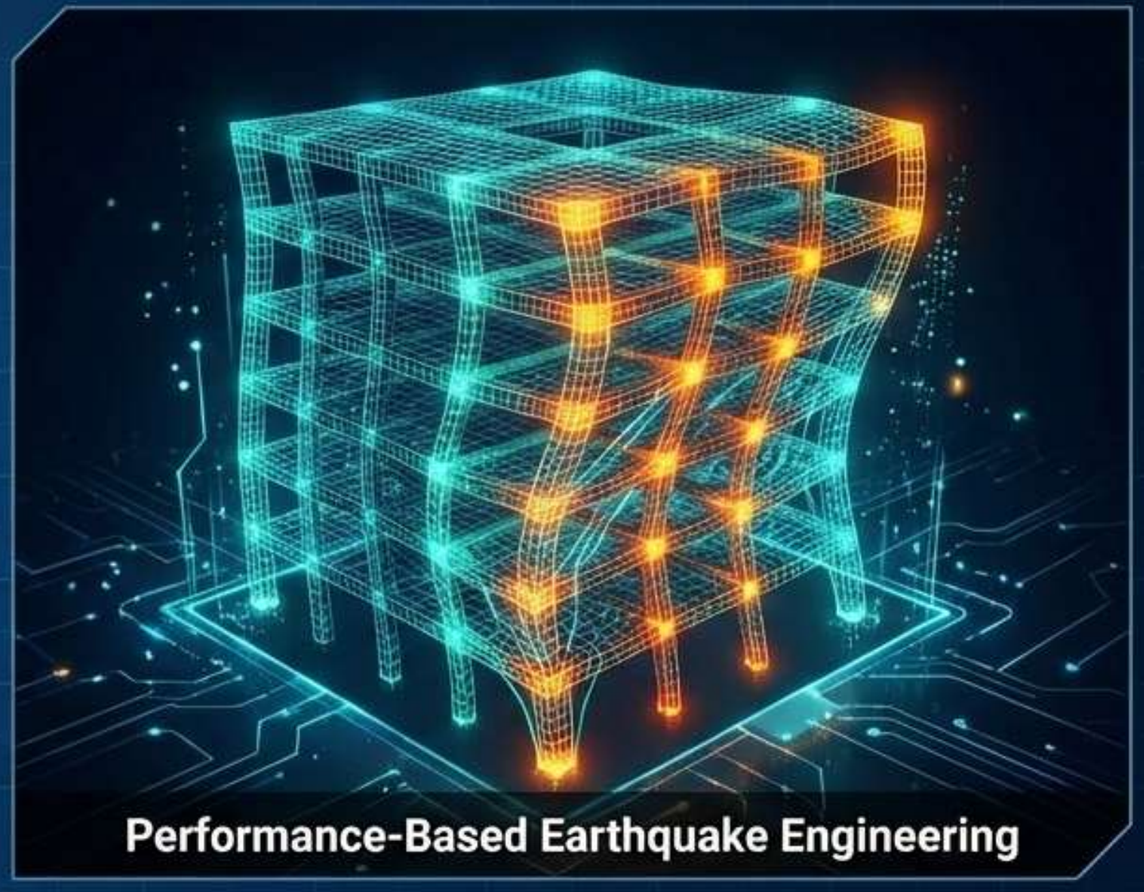
The Goal

Prioritizing retrofitting programs to prevent the collapse of essential lifelines during the next major event.

Integrating Modern Structural Dynamics



Static Linear Analysis



Performance-Based Earthquake Engineering

Performance-Based Engineering:
Moving beyond static linear analysis to predict actual building performance under extreme stress.

Soil-Structure Interaction:
Utilizing advanced geotechnical modeling to account for central Myanmar's complex subsurface conditions.

Capacity Building:
Continuous training for engineers, inspectors, and contractors on modern numerical modeling.

Growing Together: Public-Private Partnerships

Shared Responsibility: Fostering collaboration between the Ministry, the Myanmar Engineering Council, and private developers.

Built Back Better: Using post-disaster recovery as an economic driver to upgrade building performance, not just replace what was lost.

Awareness: Empowering communities with knowledge of seismic safety standards.

The Ecosystem of Urban Resilience

Policy
MNBC 2025 & Mandatory Assessments

Technology
Advanced 3D Modeling (ETABS/PLAXIS) & Multi-Sensor Diagnostics

Execution
Rigorous QA & RC Detailing Standards

Collaboration
Public-Private Partnerships & Community Preparedness

True resilience is not a single code or a single assessment;
it is the continuous, interconnected operation of all four pillars.


Earthquakes cannot be prevented, but disasters can be mitigated through knowledge, preparedness, and engineering excellence.

Podcasts Created by NotebookLM

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Thank You

U Wai Phyo Linn
Chief Engineer, Department of Building
Ministry of Construction

Forum Resources

MNBC 2025 Download