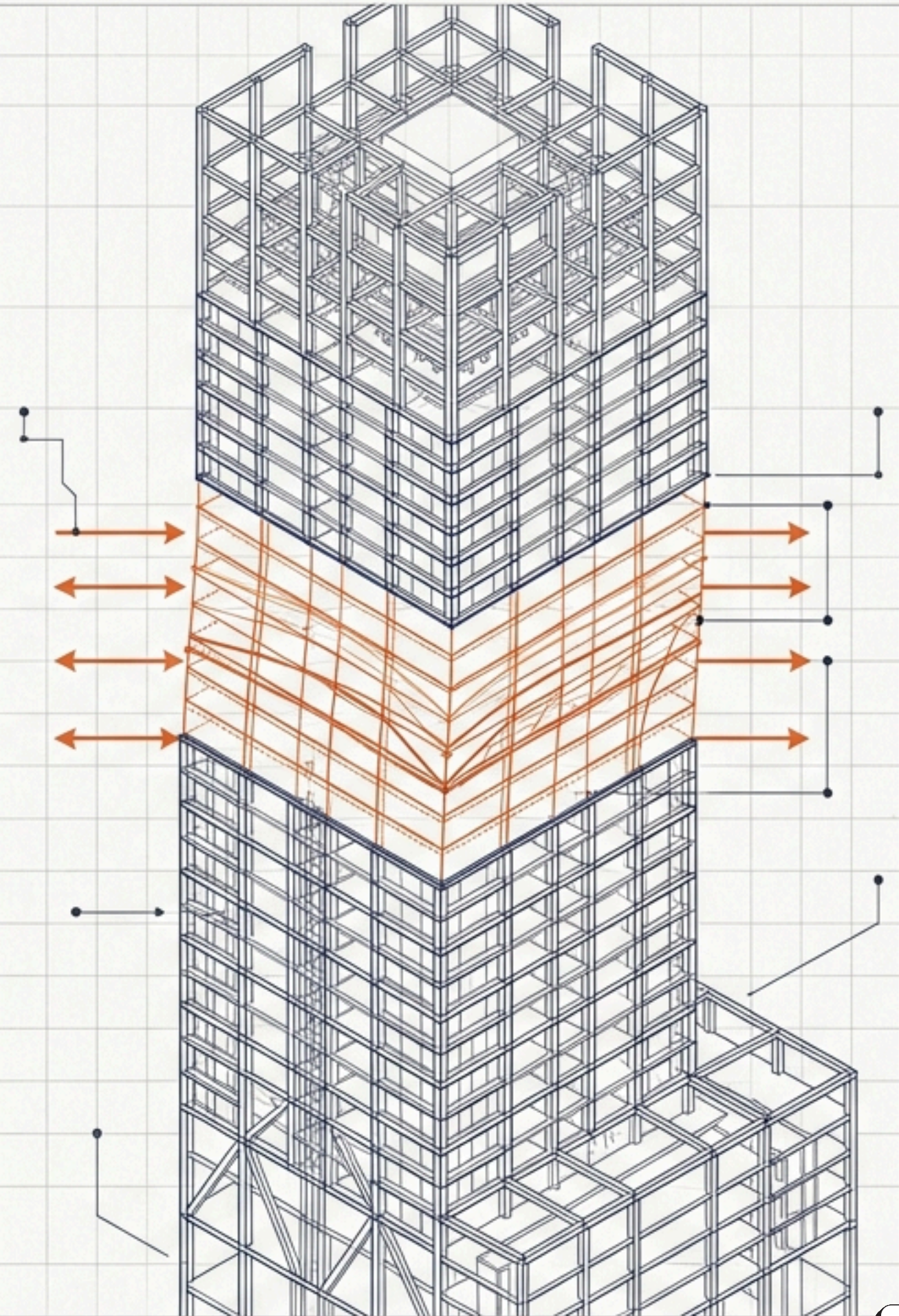


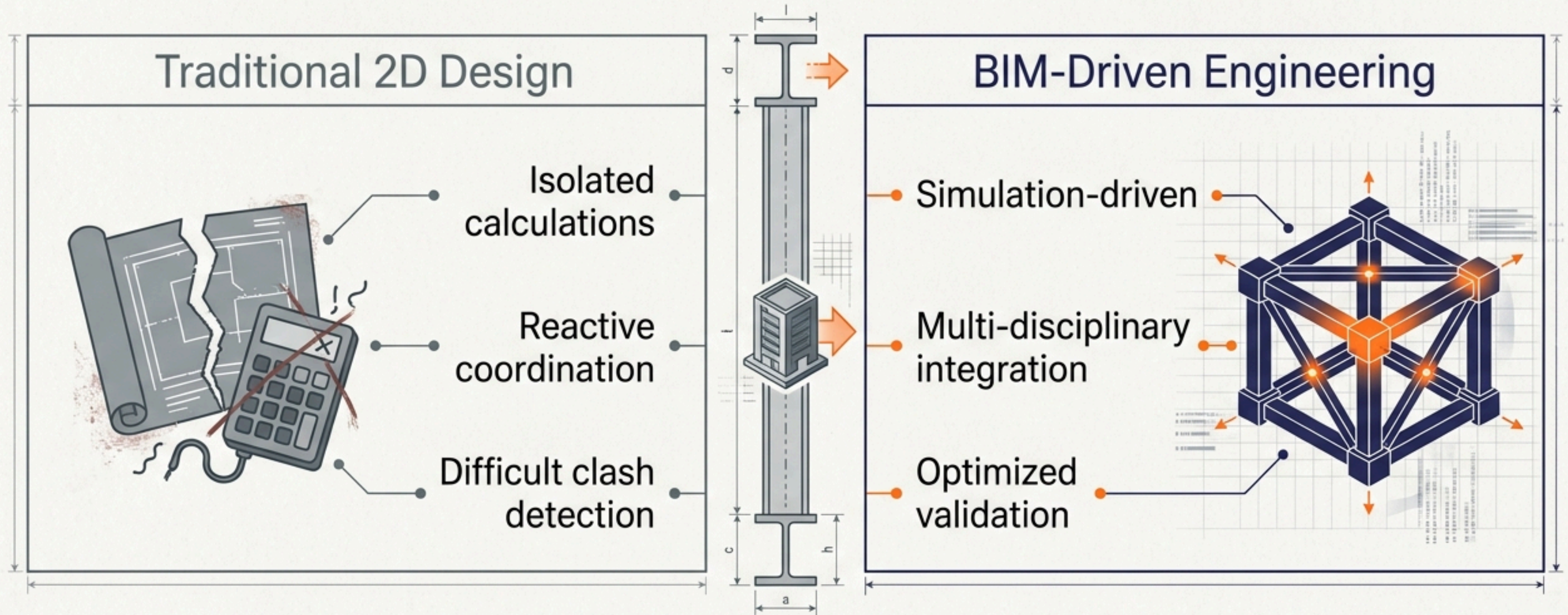
BIM Strategies for Seismic Resilience

Engineering Safer, Data-Driven
Structures for High-Seismic Zones



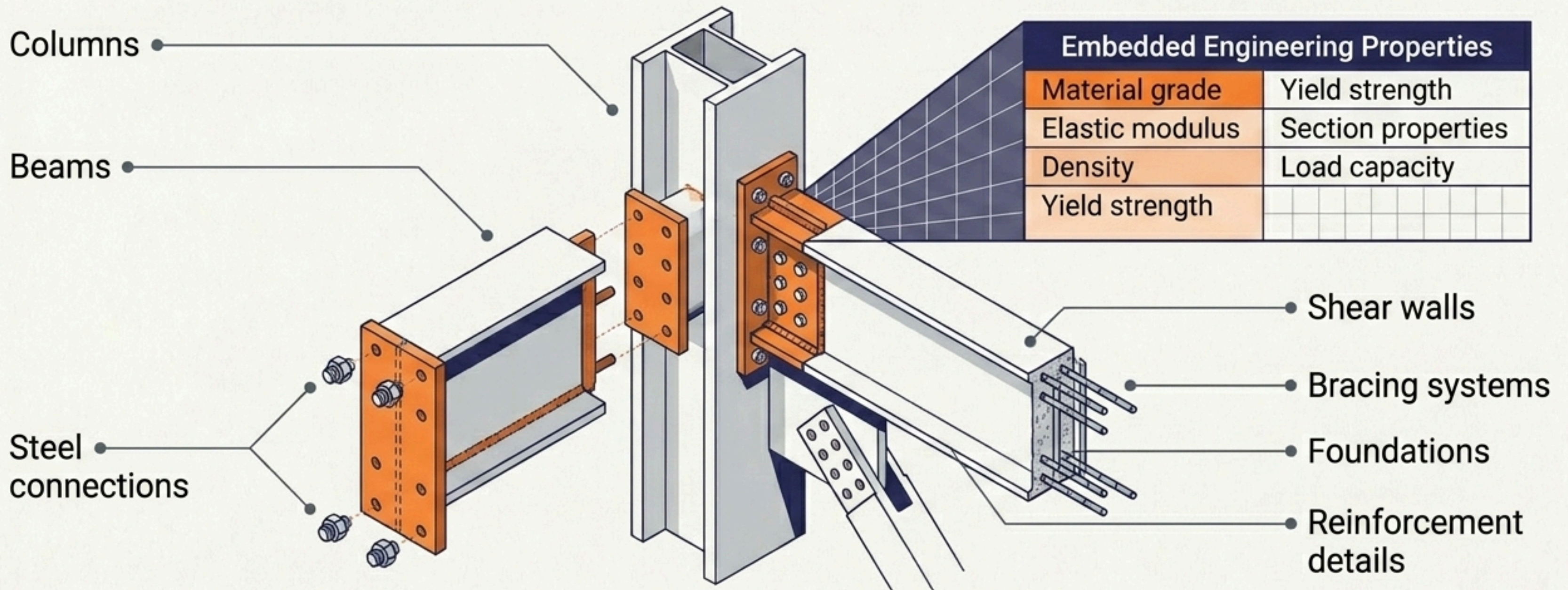
Shifting the Paradigm of Earthquake-Resistant Design

Every year, earthquakes cause billions in damage and thousands of lost lives. Reducing this impact requires a shift from isolated calculations to collaborative simulation.



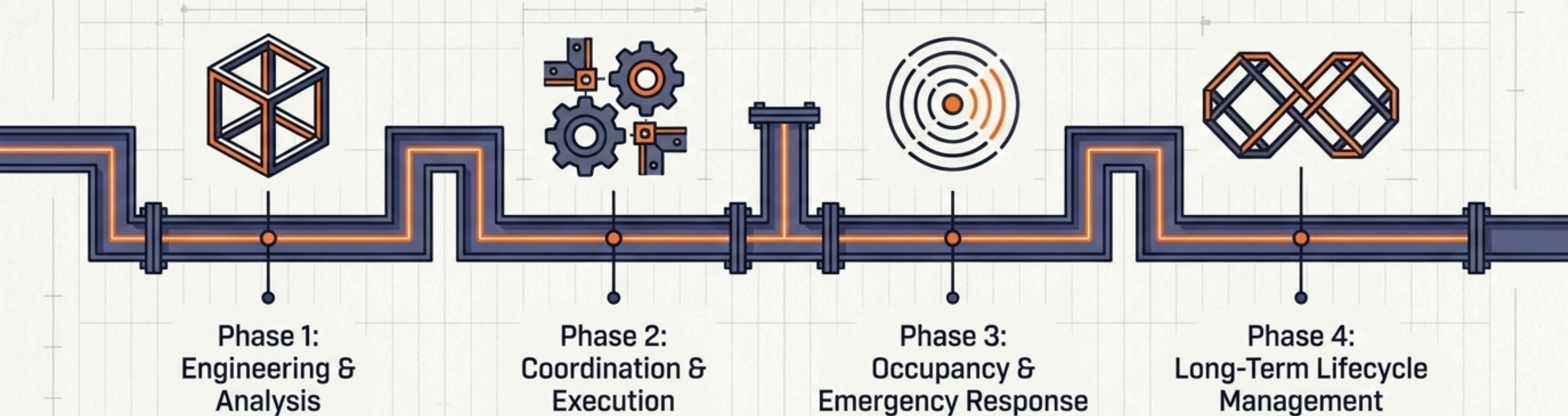
The Core Engine is Data, Not Just Geometry

BIM creates a highly reliable digital representation where every component contains the precise engineering properties required for rigorous seismic analysis.

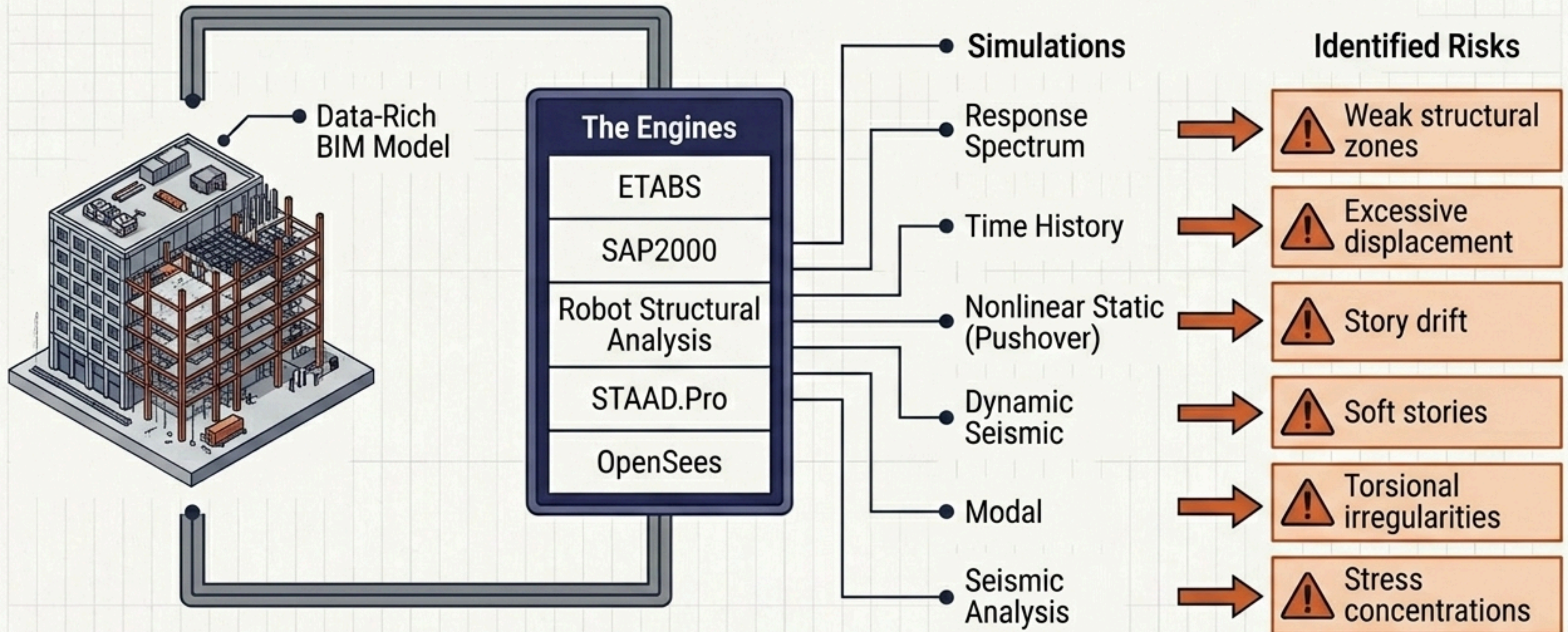


The Resilience Continuum: A Lifecycle Framework

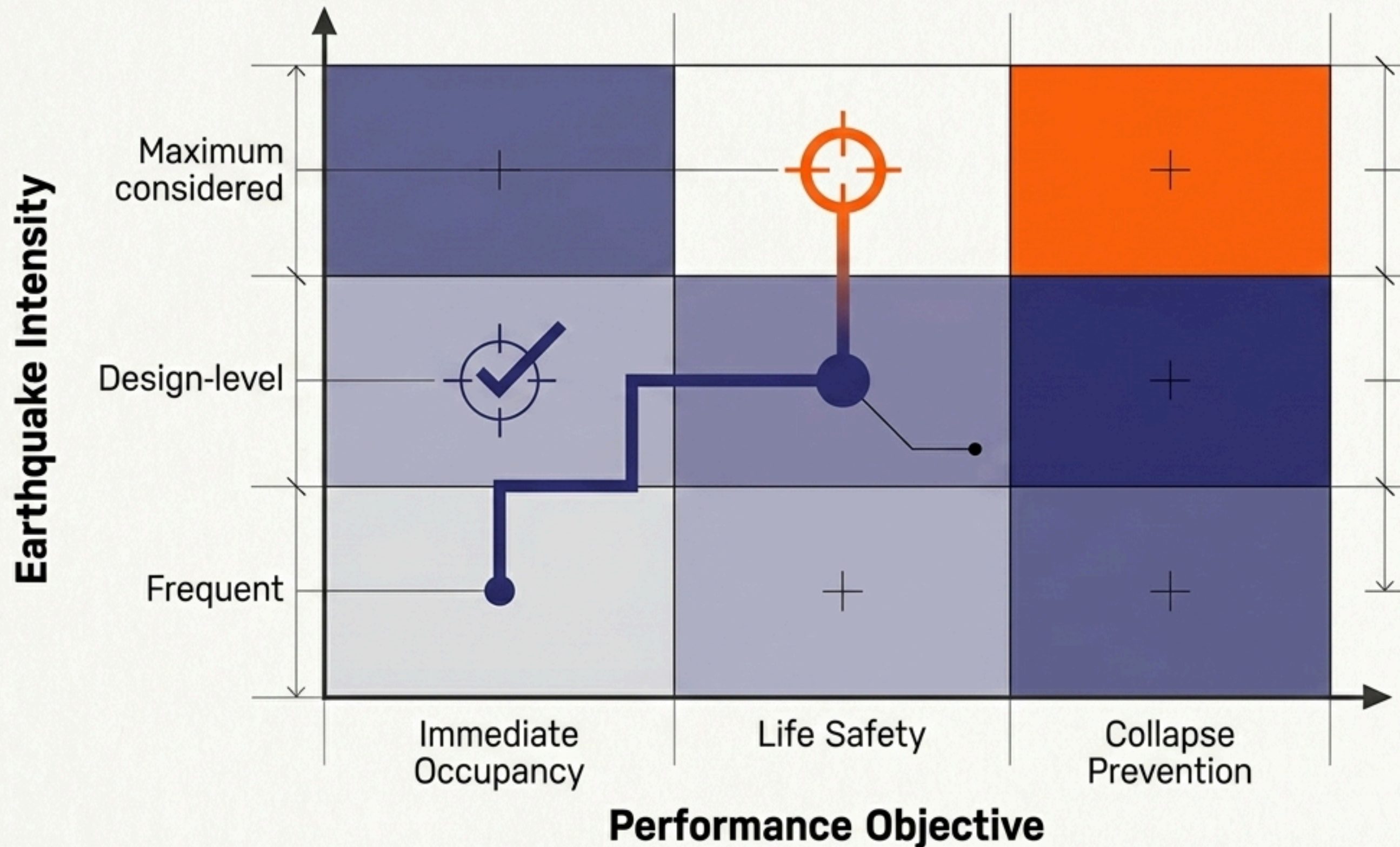
BIM's value doesn't end at the design phase. It actively protects the building, its occupants, and the investment long after construction is complete.



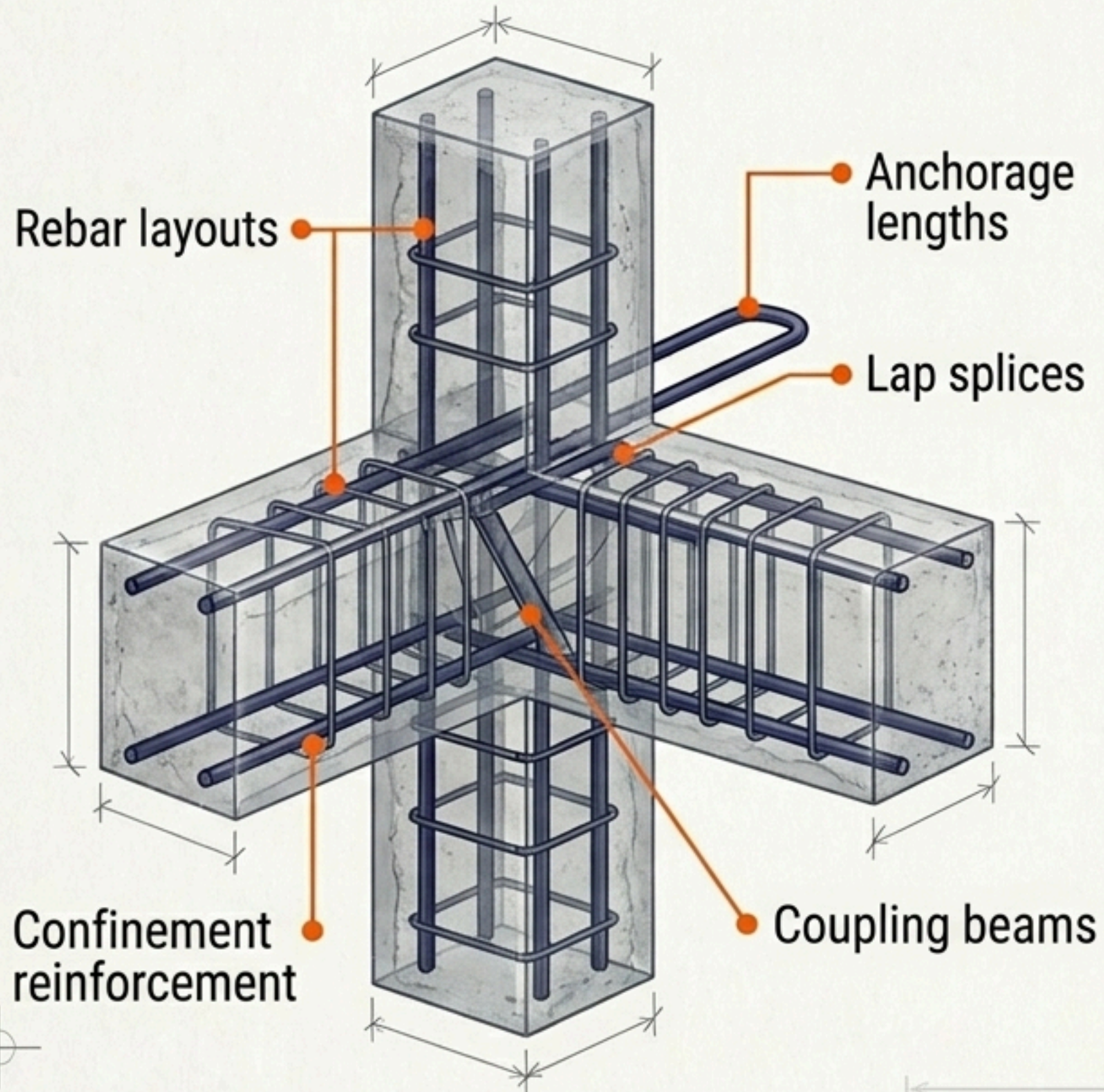
Phase 1: Integrating the Analysis Ecosystem

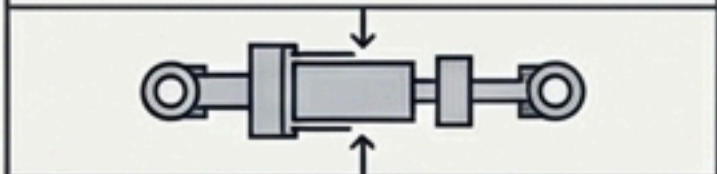
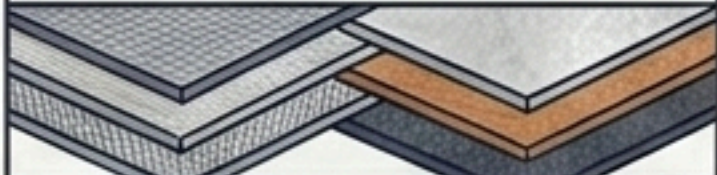


Phase 1: Targeting Outcomes with Performance-Based Design



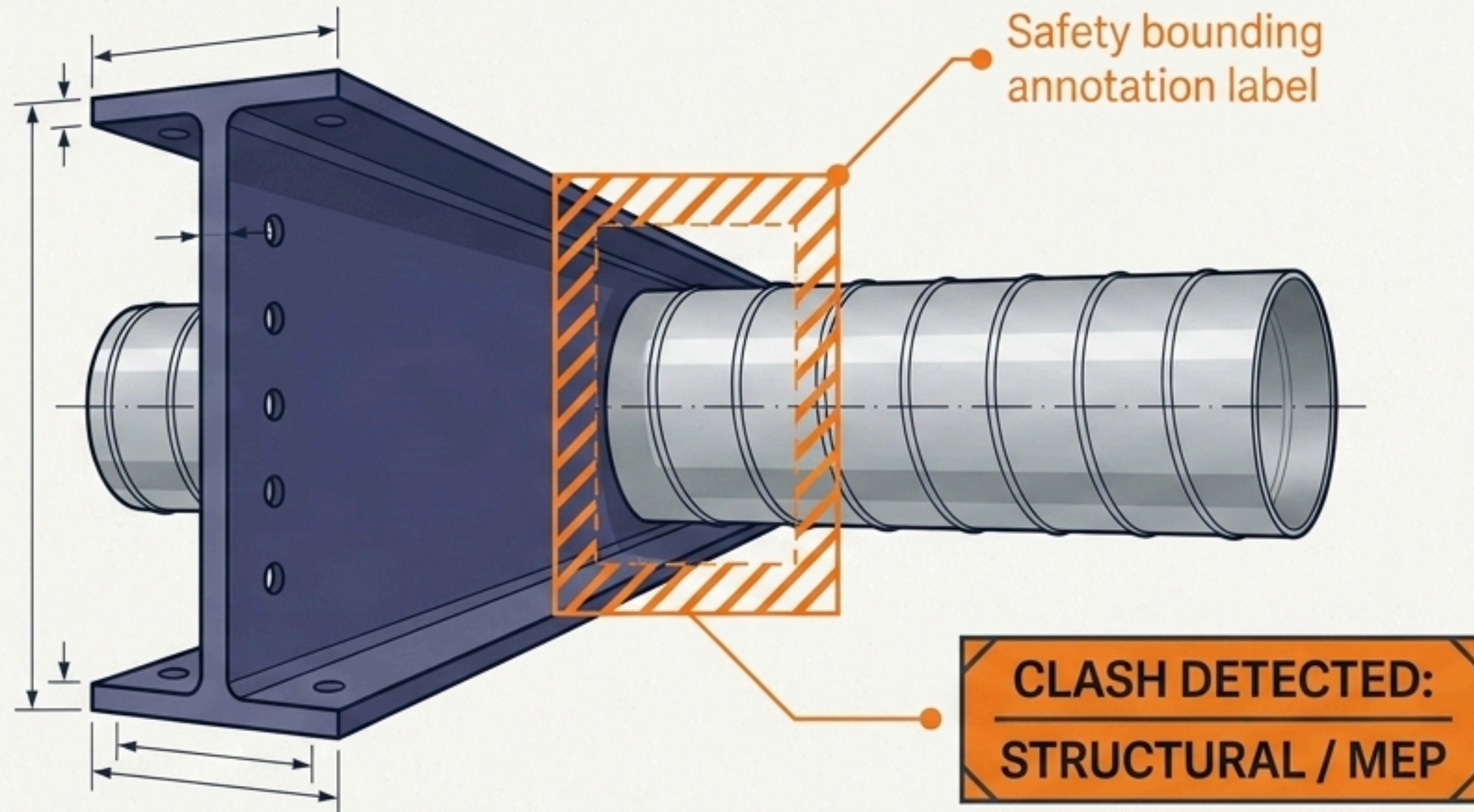
Phase 1: Optimizing Materials and Micro-Reinforcements



High-strength concrete  	Structural steel  
Base isolation systems  	Dampers  
Fiber-reinforced polymers  	Composite materials  

Phase 2: Resolving Clashes Before They Compromise Safety

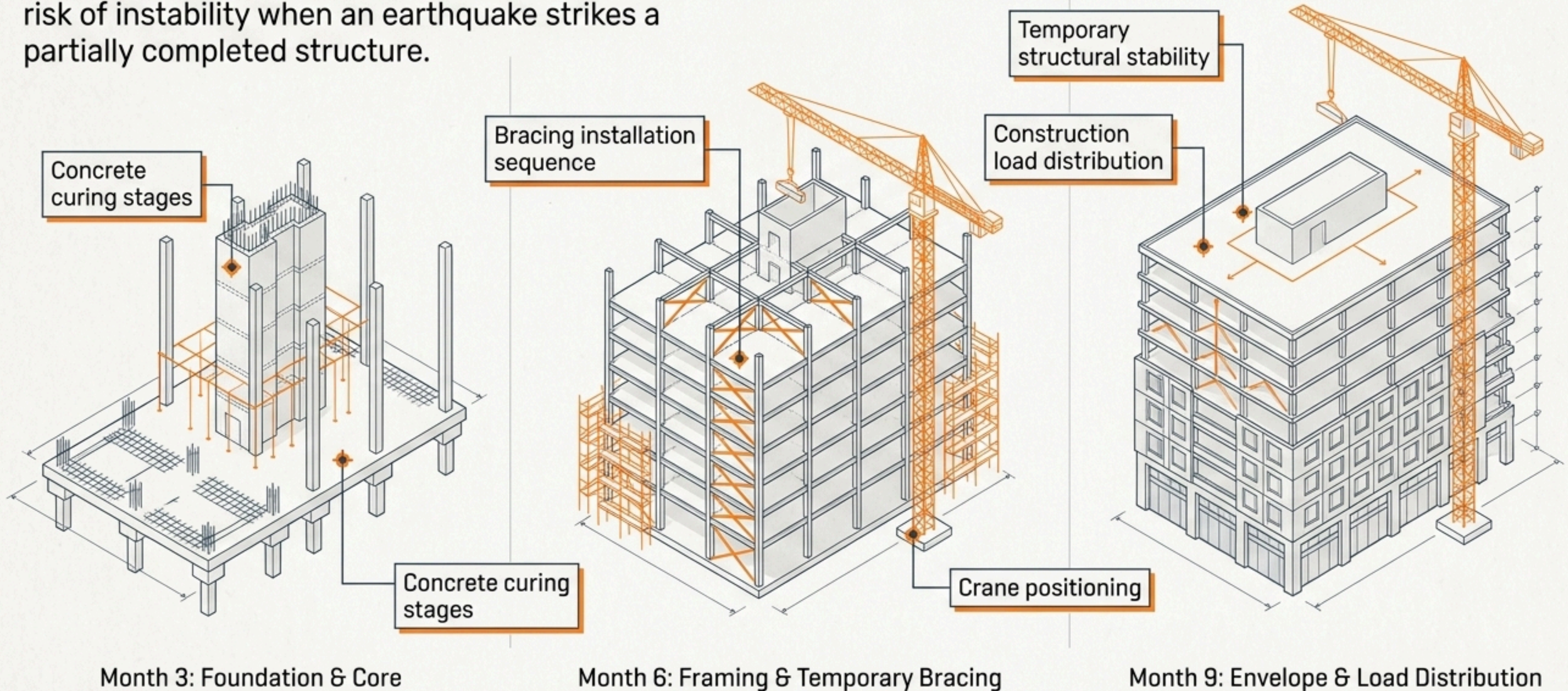
Resolving conflicts digitally prevents on-site structural modifications that could critically compromise a building's seismic performance.



Coordination Required	
☐	Structural beams
☐	HVAC ducts
☐	Plumbing pipes
☐	Fire protection systems
☐	Electrical conduits
☐	Cable trays

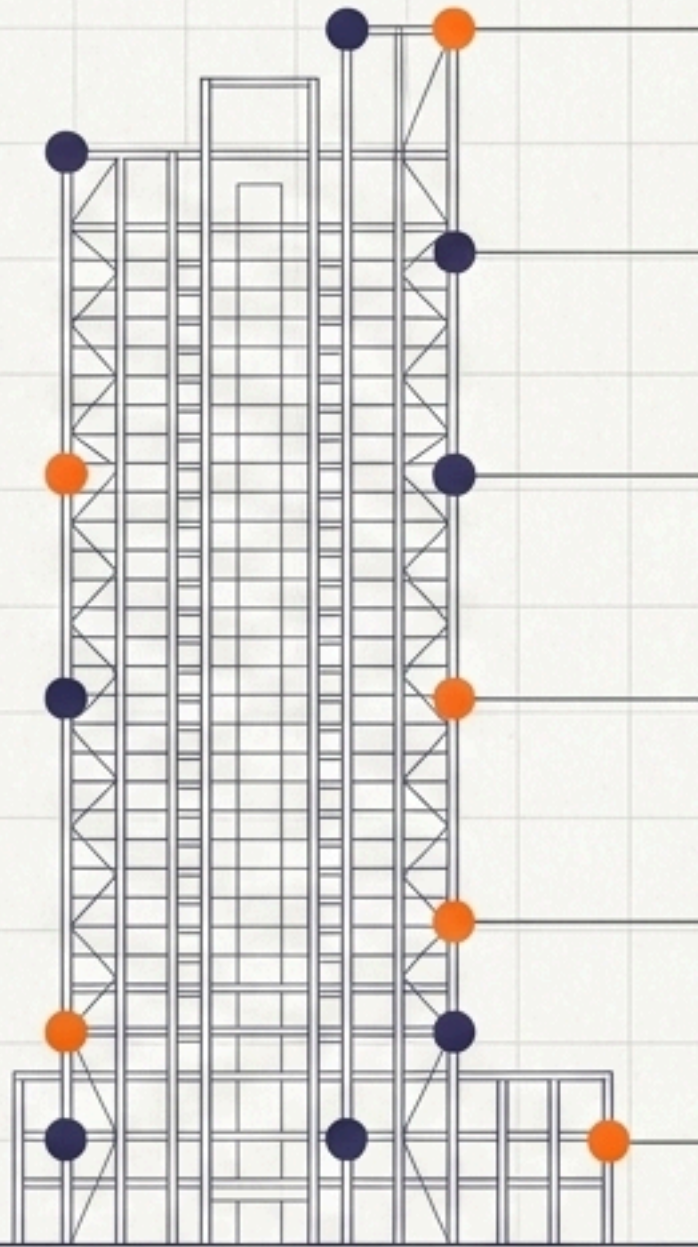
Phase 2: 4D Sequencing for Temporary Construction Stability

Proper 4D sequencing mitigates the extreme risk of instability when an earthquake strikes a partially completed structure.



Phase 3: The Digital Twin and Real-Time Health Monitoring

Following a seismic event, real-time sensor data is instantly compared with the baseline BIM model to assess structural health and prioritize emergency inspections or repairs.



Sensor Metrics Dashboard

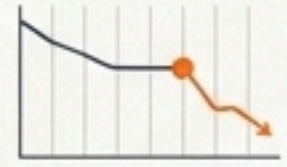
Structural displacement



Building vibration



Foundation settlement



Crack development



0.2 mm



Tilt



0.15° N

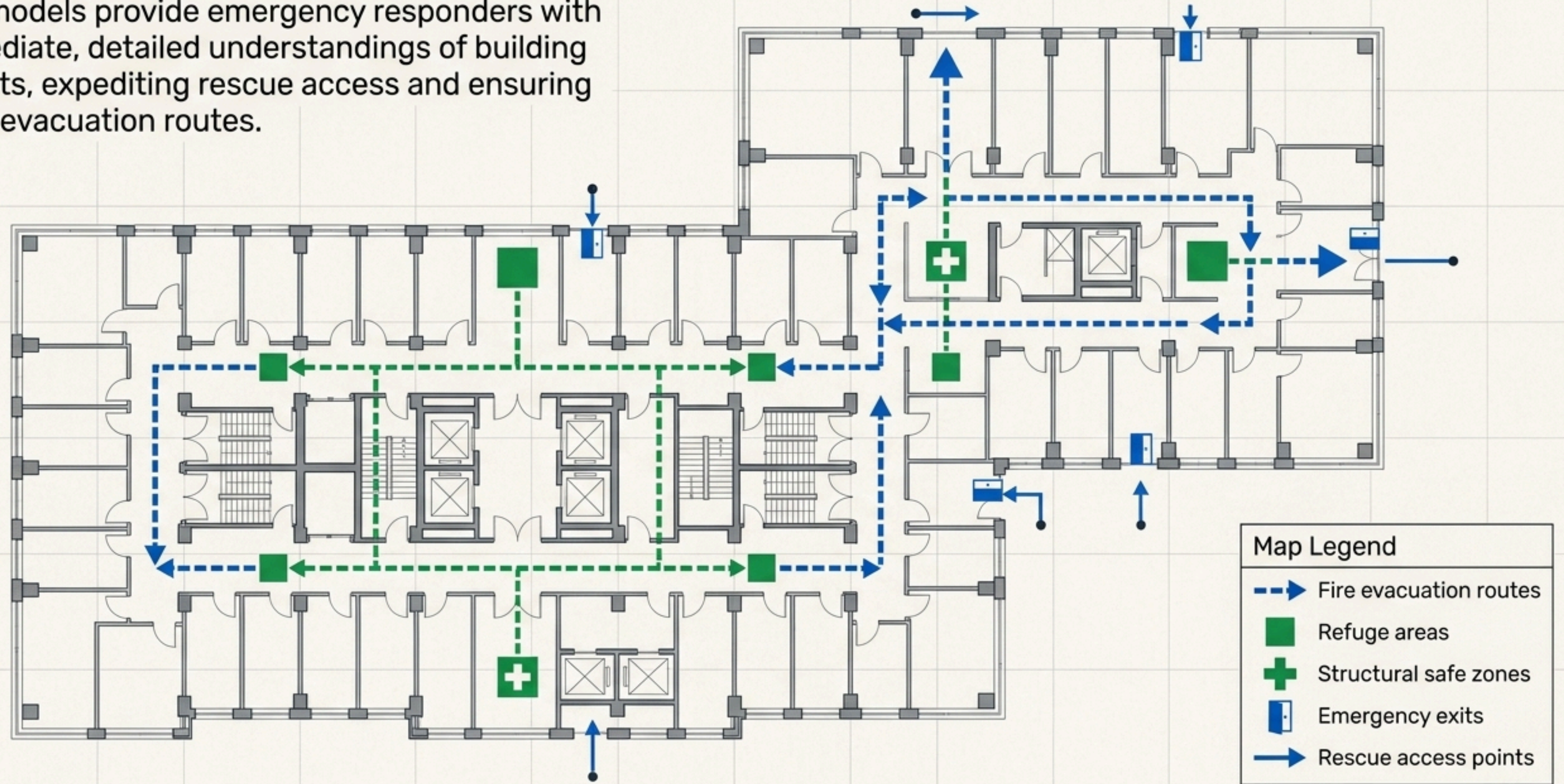
Accelerations



1.2 g

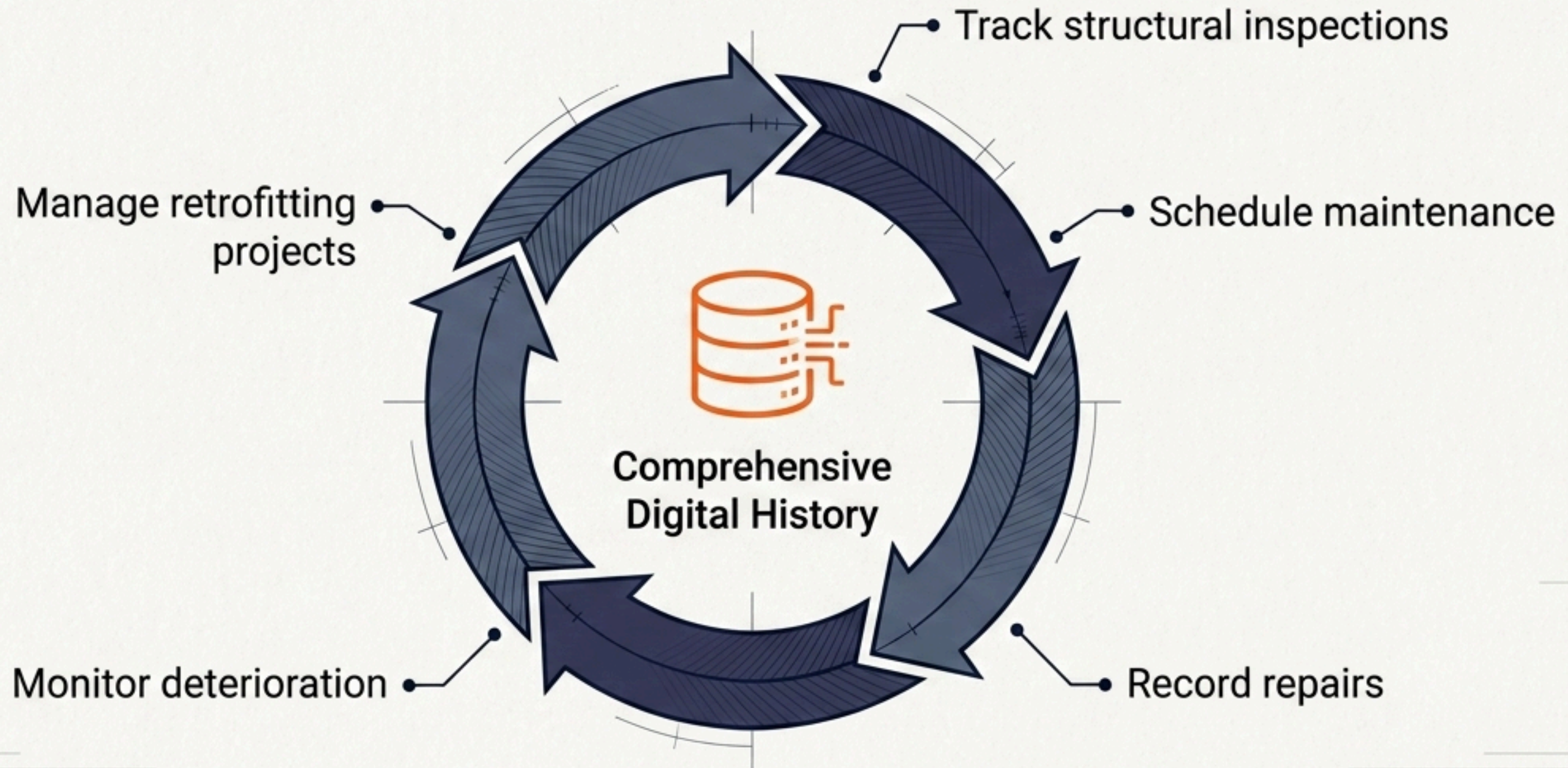
Phase 3: Facilitating Emergency Preparedness and Response

BIM models provide emergency responders with immediate, detailed understandings of building layouts, expediting rescue access and ensuring clear evacuation routes.



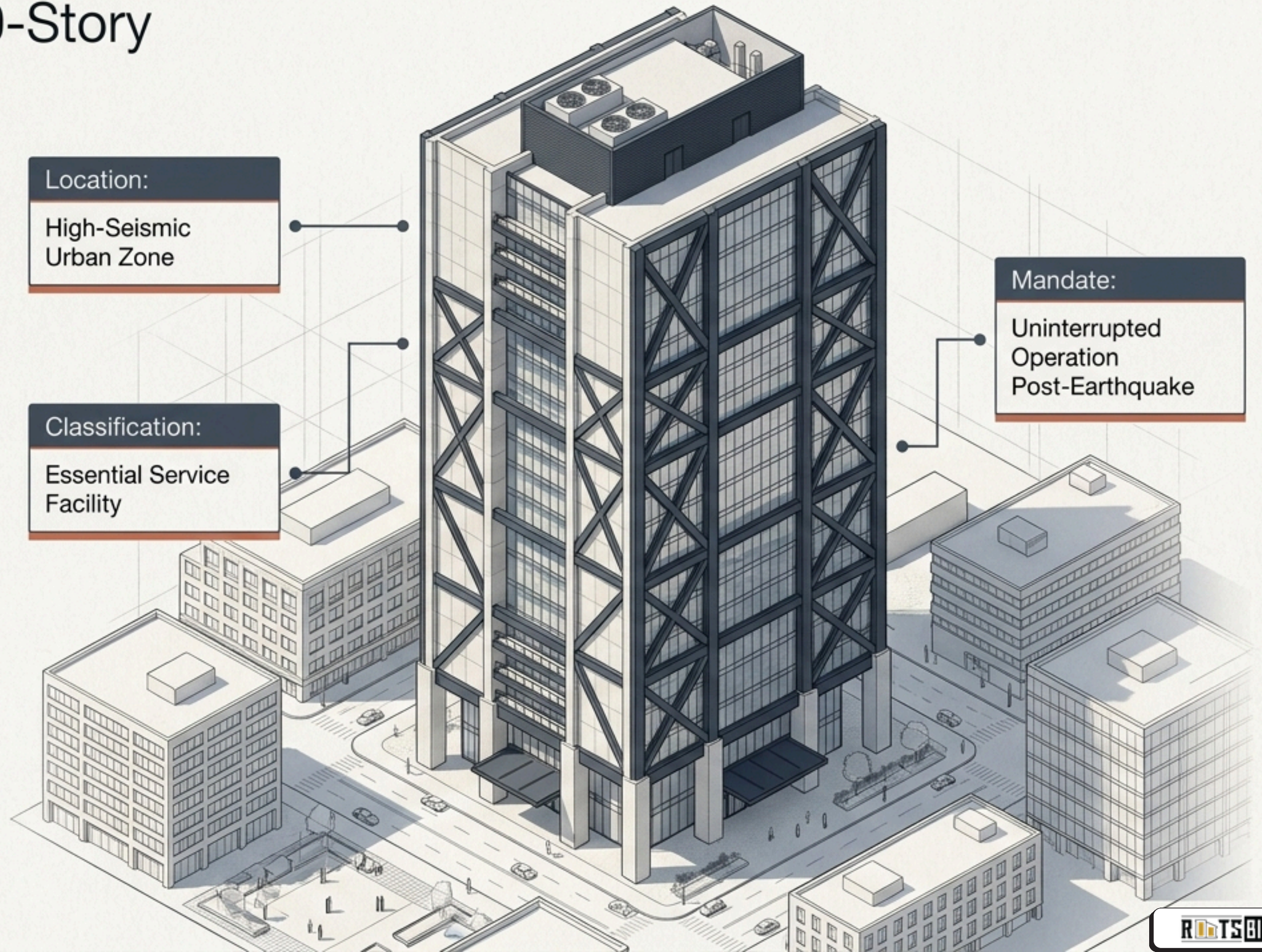
Phase 4: Lifecycle Management and Long-Term Reliability

Earthquake resilience extends far beyond construction. A living BIM model supports long-term asset management and ensures the structure remains capable of withstanding future events.

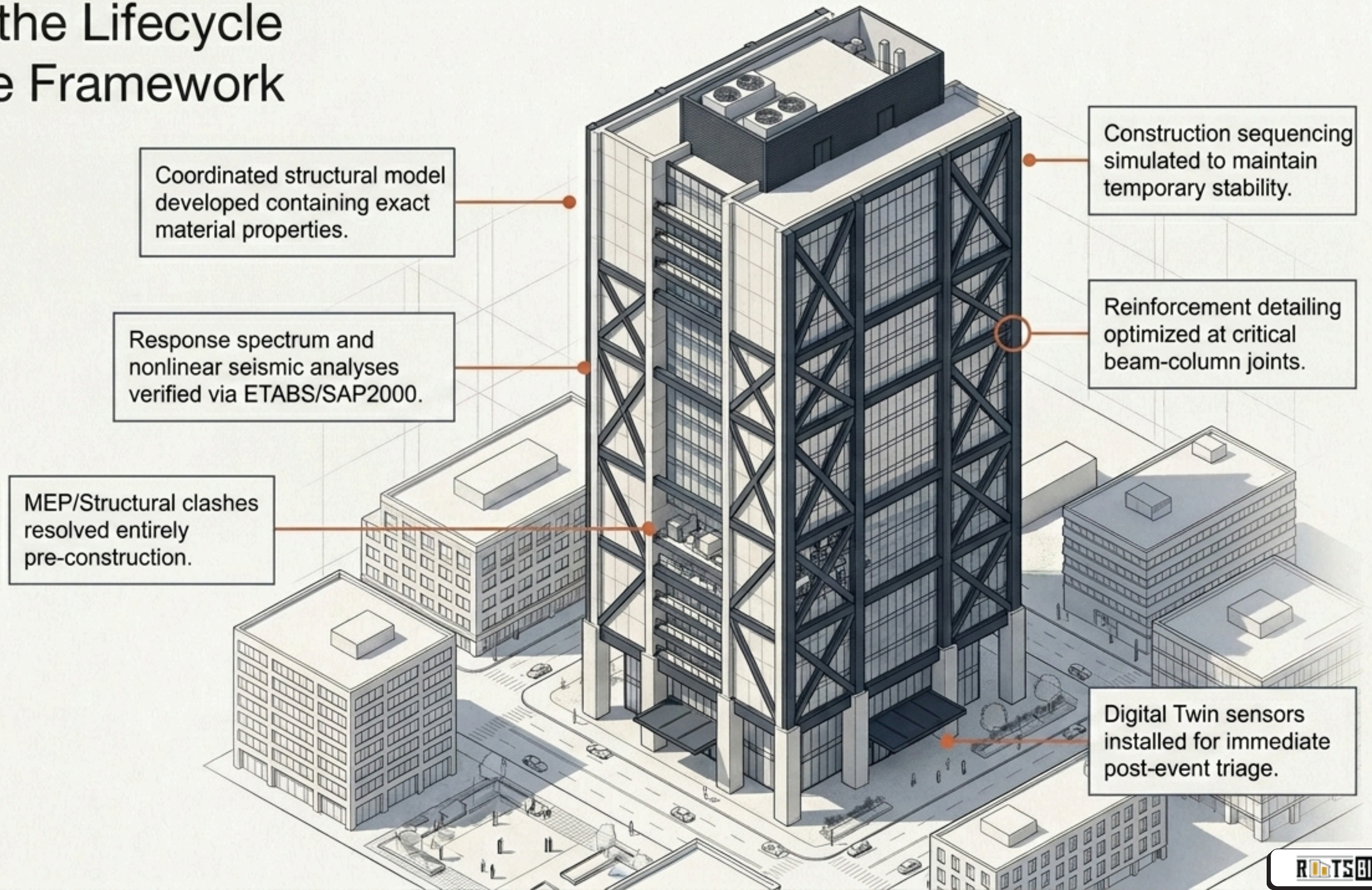


In Practice: The 40-Story Essential Facility

To maintain essential services and recover quickly, a facility of this scale requires the implementation of a comprehensive, end-to-end BIM resilience strategy.



Applying the Lifecycle Resilience Framework



The Resilience Dividend: Engineering Safer Futures

Accuracy & Design

- Improved structural accuracy
- Early vulnerability identification
- Faster iterations

Construction Efficiency

- Enhanced multidisciplinary coordination
- Reduced errors/rework
- Better code compliance

Lifecycle Costs

- Lower lifecycle maintenance costs
- Optimized material quantities

Safety & Response

- Improved post-quake assessment
- Greater safety for occupants and infrastructure

In an era of increasing urbanization, BIM has evolved from a simple design tool into a comprehensive disaster-resilience platform for the entire lifecycle of a building.