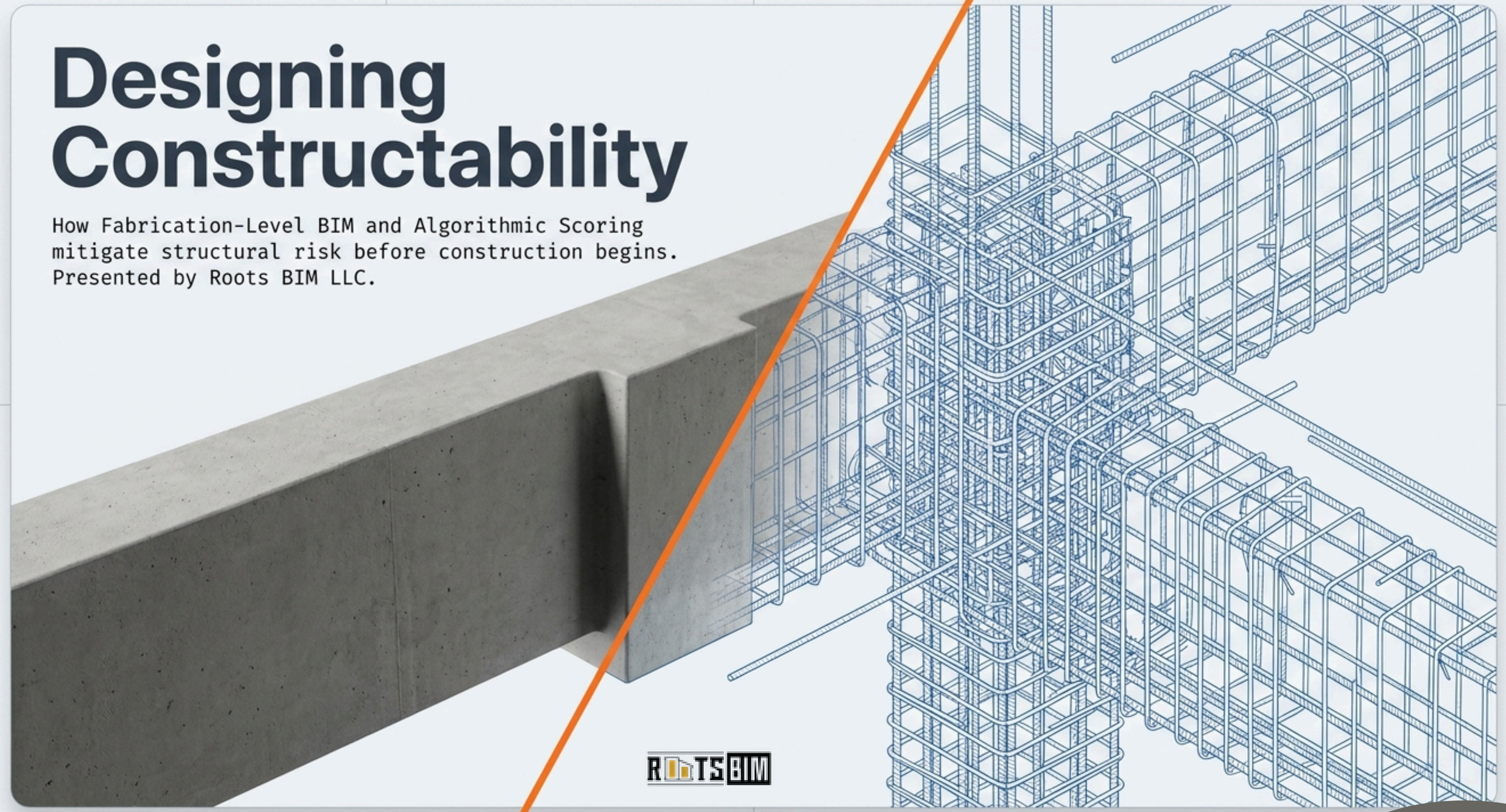
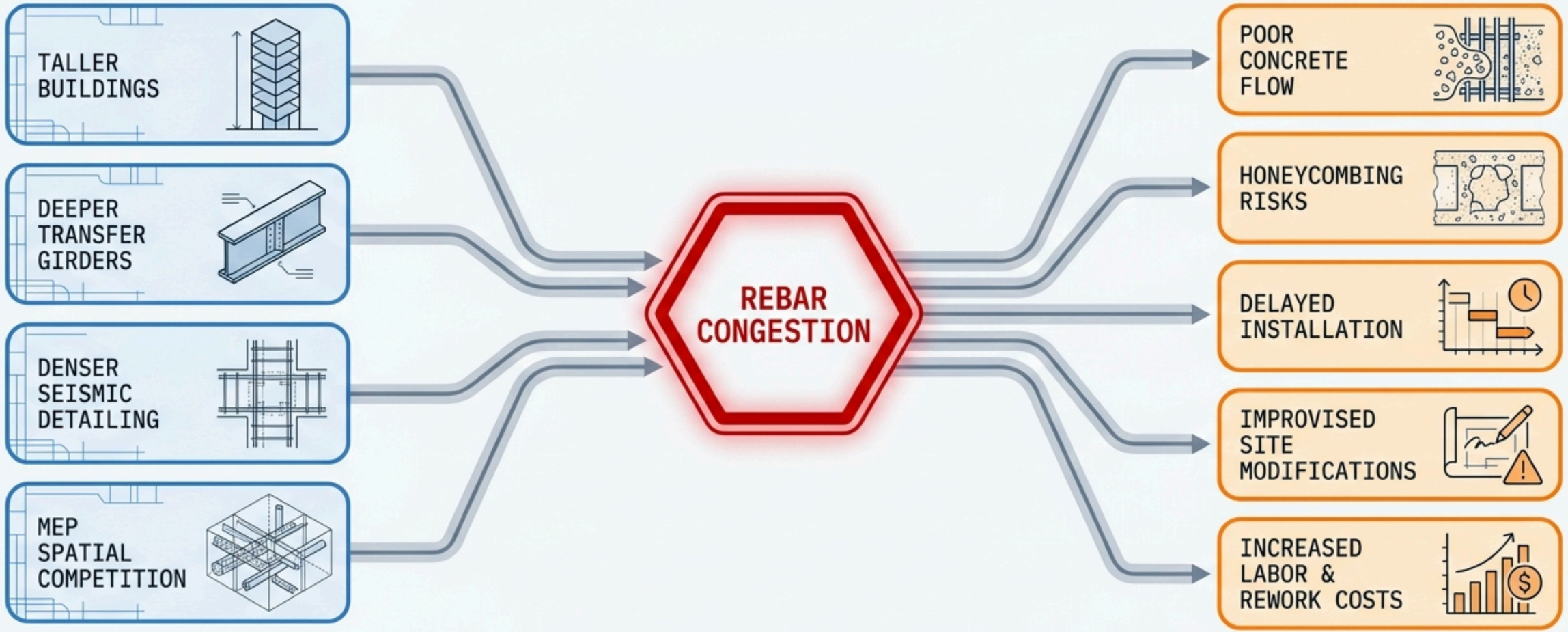
Designing Constructability

How Fabrication-Level BIM and Algorithmic Scoring mitigate structural risk before construction begins.
Presented by Roots BIM LLC.

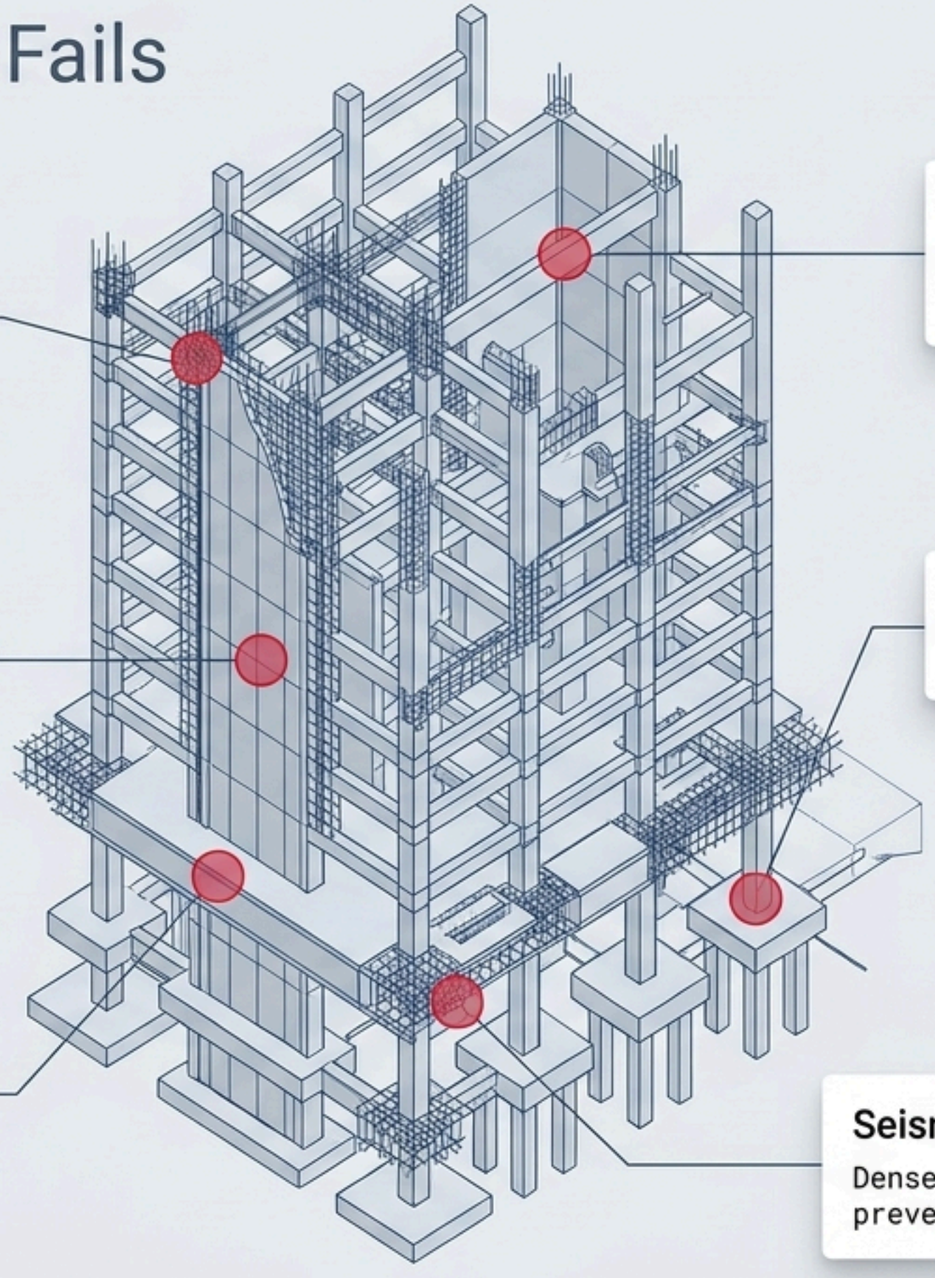


The Cascading Failure of Structural Ambition



Congestion is a critical threat to project delivery. The challenge is no longer structural instability—it is the physical impossibility of construction.

Where On-Site Improvisation Fails



Beam-Column Joints
High-density multiaxial intersections.

Shear & Core Walls
Heavily reinforced lateral load elements.

Transfer Slabs
Deep, load-shifting horizontal zones.

Coupling Beams
Confined, high-shear stress connectors.

Pile Caps
Foundation chokepoints.

Seismic Confinement Zones
Dense boundary elements preventing ductile failure.

Relying on field teams to manually resolve conflicts in these critical zones leads to guaranteed rework.

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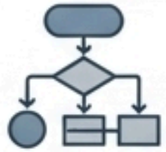
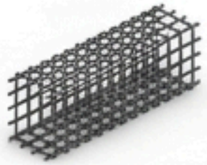
The Engineering Paradigm Shift

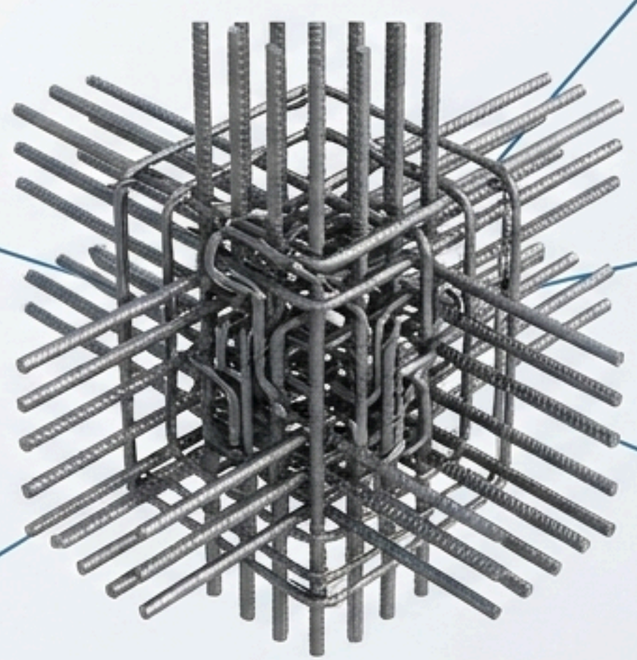
The Past: Reactive Drafting

Method:	2D Reinforcement Drawings
Process:	Manual checking; visually dependent
Detection:	Conflicts discovered on-site during installation
Asset Level:	Treats rebar as symbolic lines

The Future: Predictive Engineering

	**Method:**	Fabrication-Level BIM Analytics
	**Process:**	Algorithmic rule-based validation
	**Detection:**	Placement simulated before a single bar is cut
	**Asset Level:**	Treats rebar as exact physical geometry (LOD 400-500)

Defining Rebar Congestion Analytics



Specific Bend Radii

Calculated Lap Lengths

Coupler Geometry & Placement

Required Concrete Cover

Exact Bar Diameters

Rebar Congestion Analytics uses high-LOD structural BIM models to digitally evaluate reinforcement density, spacing compliance, and constructability before site mobilization.

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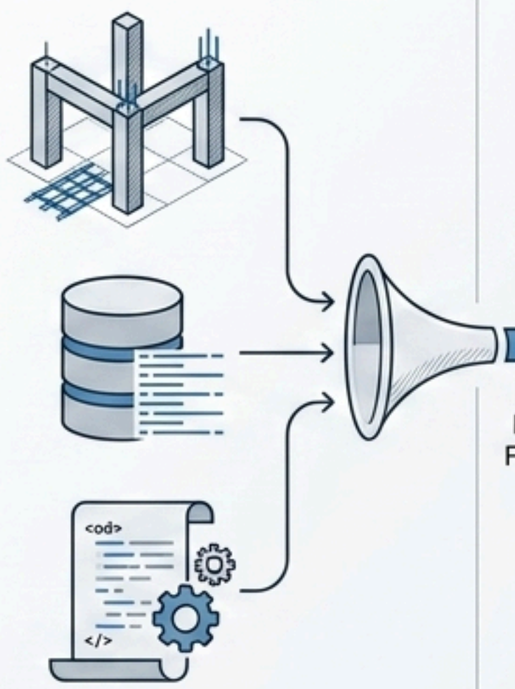
The Algorithmic Validation Engine

The Inputs



Data Feeds

The Processing Core

- [CHK] Minimum clear spacing
- [CHK] Aggregate size constraints
- [CHK] ACI / Eurocode / IS provisions
- [CHK] Concrete pour accessibility
- [CHK] Clash proximity thresholds
- [CHK] Coupler accessibility zones
- [CHK] Anchorage feasibility

Validation Rules

The Outputs

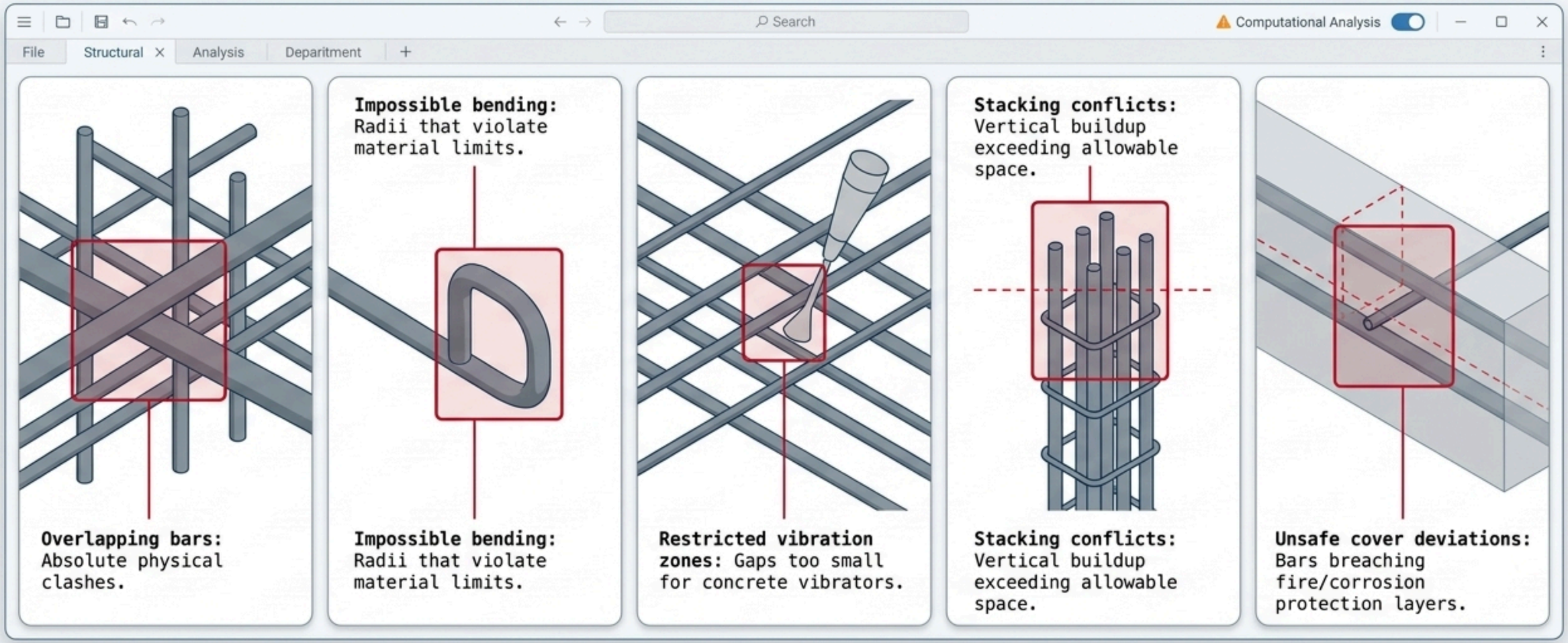
ALERT: Rebar Clash Detected (Zone 2A)

WARNING: Pour Accessibility Constraint (Section C)

CRITICAL: Coupler Proximity Violation

flagged safety-orange warning icons pushing into the next phase

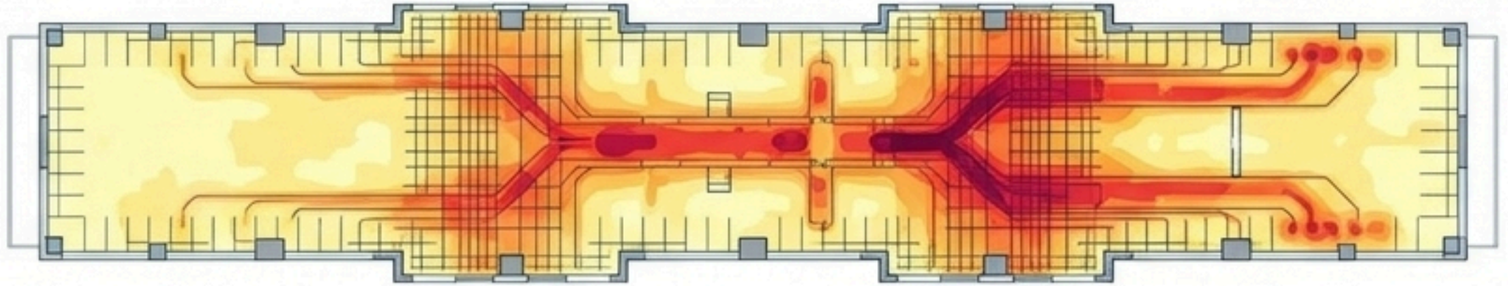
Predictive Flagging in the Interface



Transforming QA/QC from reactive visual checking into proactive computational intelligence.

Constructability Scoring: Quantifying Buildability

Constructability Index



Reinforcement Density Ratios

Installation Sequence Complexity

Labor Accessibility

Concrete Flow Simulation Compatibility

Crane Handling Limitations

Prefabrication Readiness

Clashes are binary; constructability is a spectrum.

Advanced platforms assign measurable ratings to assemblies, moving beyond “does it fit?” to “how efficiently can it be built?”

Actionable Project Intelligence

Risk Mitigation

Instantly identify and isolate high-risk reinforcement areas before they disrupt the critical path.

Field Coordination

Pre-map likely installation challenges to brief on-site teams with precise, solvable data.

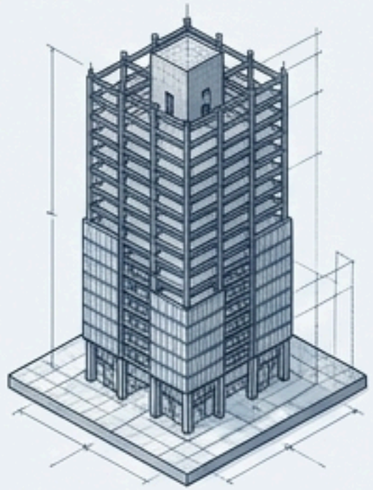
Schedule Protection

Prevent schedule-killing delays caused by rework, missing materials, or physical impossibility on the deck.

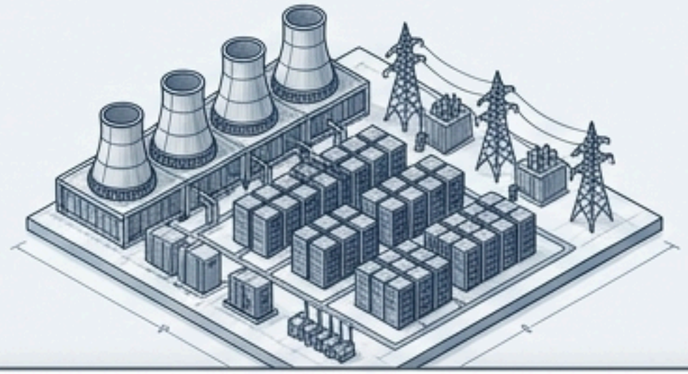
Assembly Optimization

Target specific highly-congested structural zones for prefabricated cage optimization and off-site assembly.

Shrinking Margins for Error

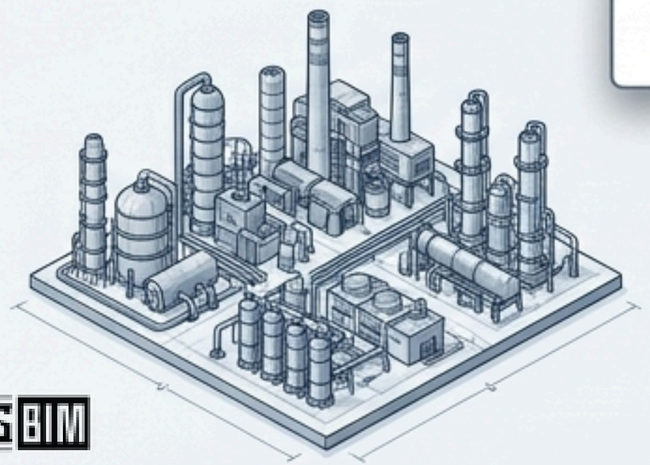


High-Rise Towers

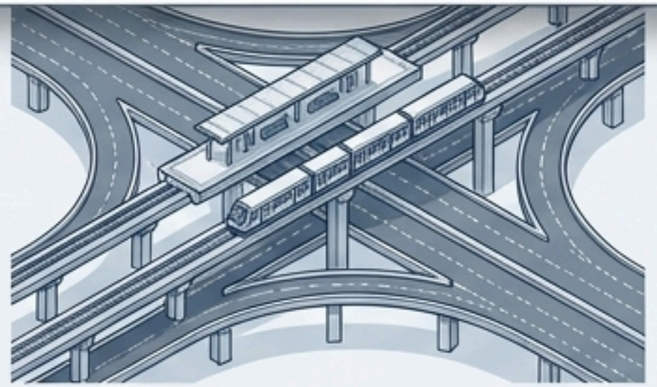


Hospitals

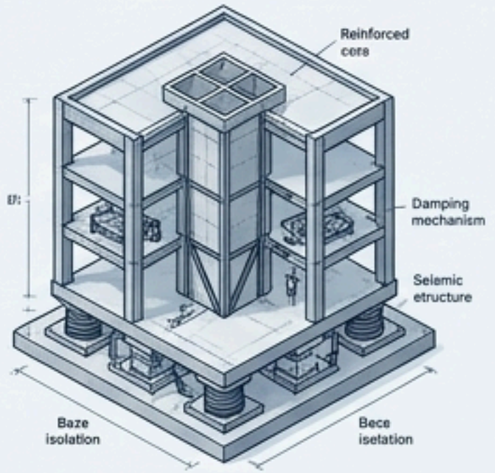
As global infrastructure scales in complexity, the margin for on-site improvisation disappears. We can no longer afford to ‘figure it out in the field.’



Industrial Facilities

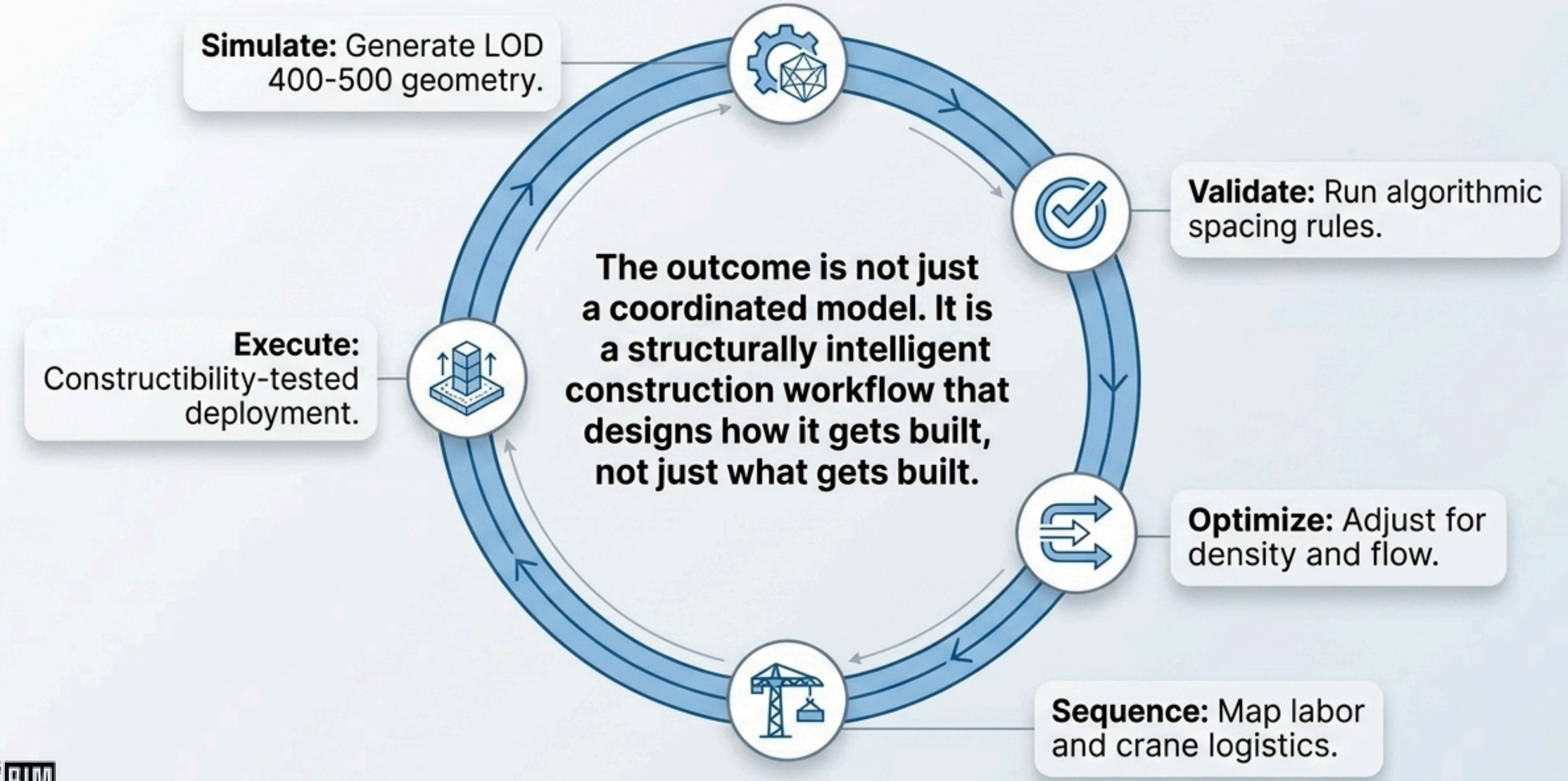


Transportation Infrastructure

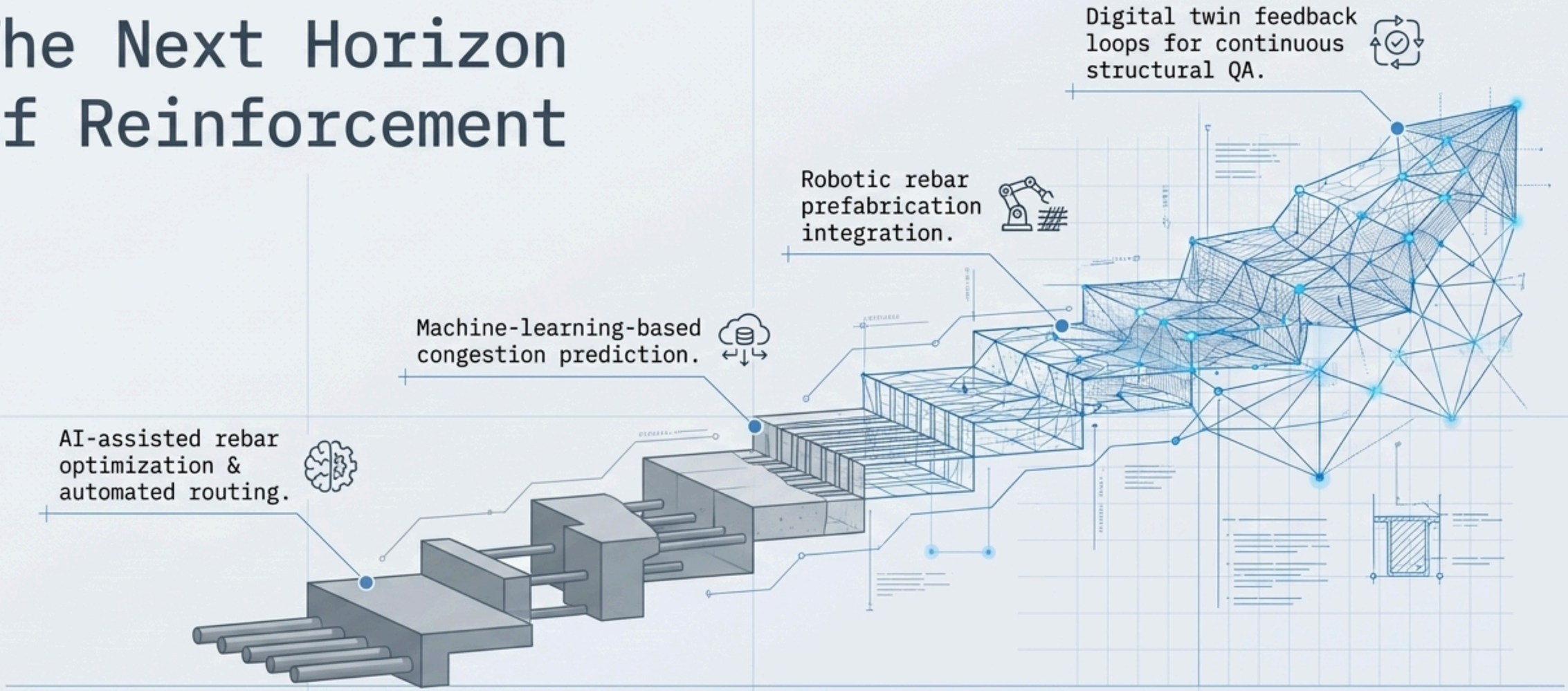


Seismic-Resistant Structures

The Structurally Intelligent Workflow



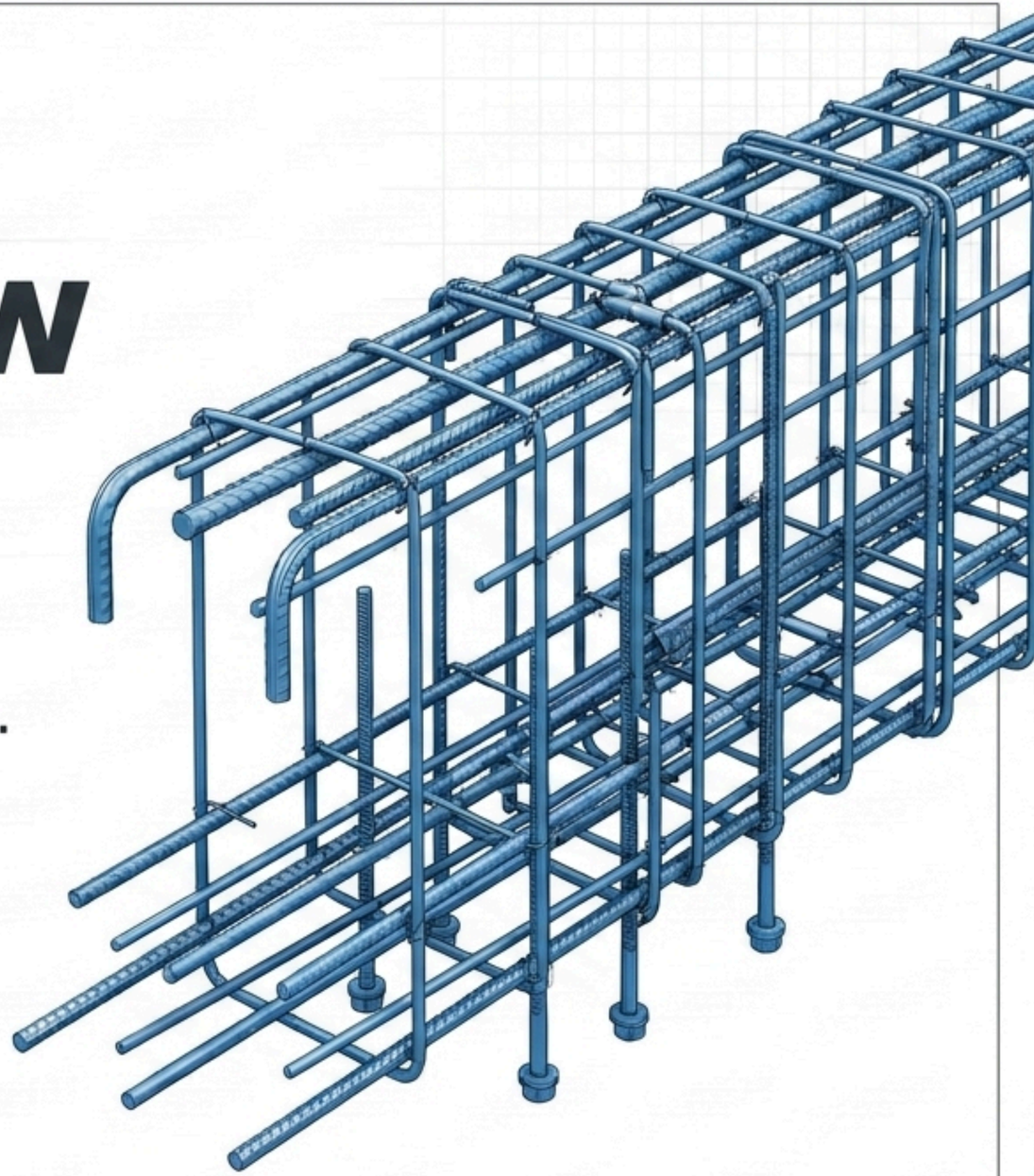
The Next Horizon of Reinforcement



BIM models will soon stop merely representing reinforcement.
They will actively, autonomously evaluate real-world build efficiency.

Engineering How It Gets Built

In advanced structural engineering, the challenge is no longer just designing strength.
It is designing constructability.



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