AUTODESK UNIVERSITY

BIM-Driven Engineering:
Structural Design Without Redundant Workload

Seth Roswurm, PE, SE

Senior Structural Engineer, API Integrations

Maher (Mack) Eltarhoni, PE, SE (OK)

Principal

Speakers

Seth Roswurm, PE, SE
Senior Structural Engineer, API Integrations

ENERCALC

- Structural design across various market sectors
  - Multi-family
  - Office / commercial
  - Healthcare
  - Educational
  - Government
  - Aviation
- Lead developer - ENERCALC for Revit

Maher (Mack) Eltarhoni, PE, SE (OK)
Principal

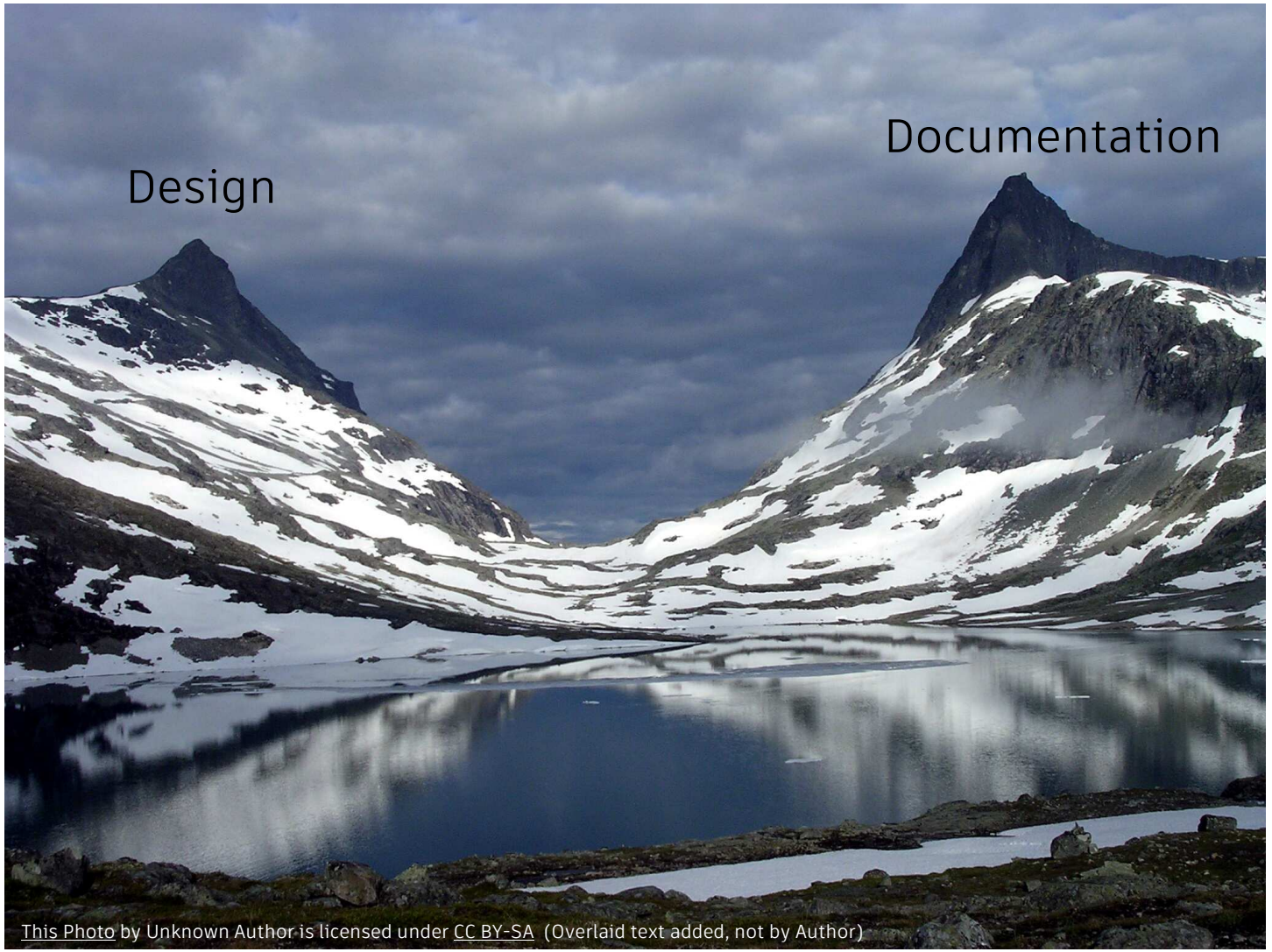
ELTA DESIGN GROUP

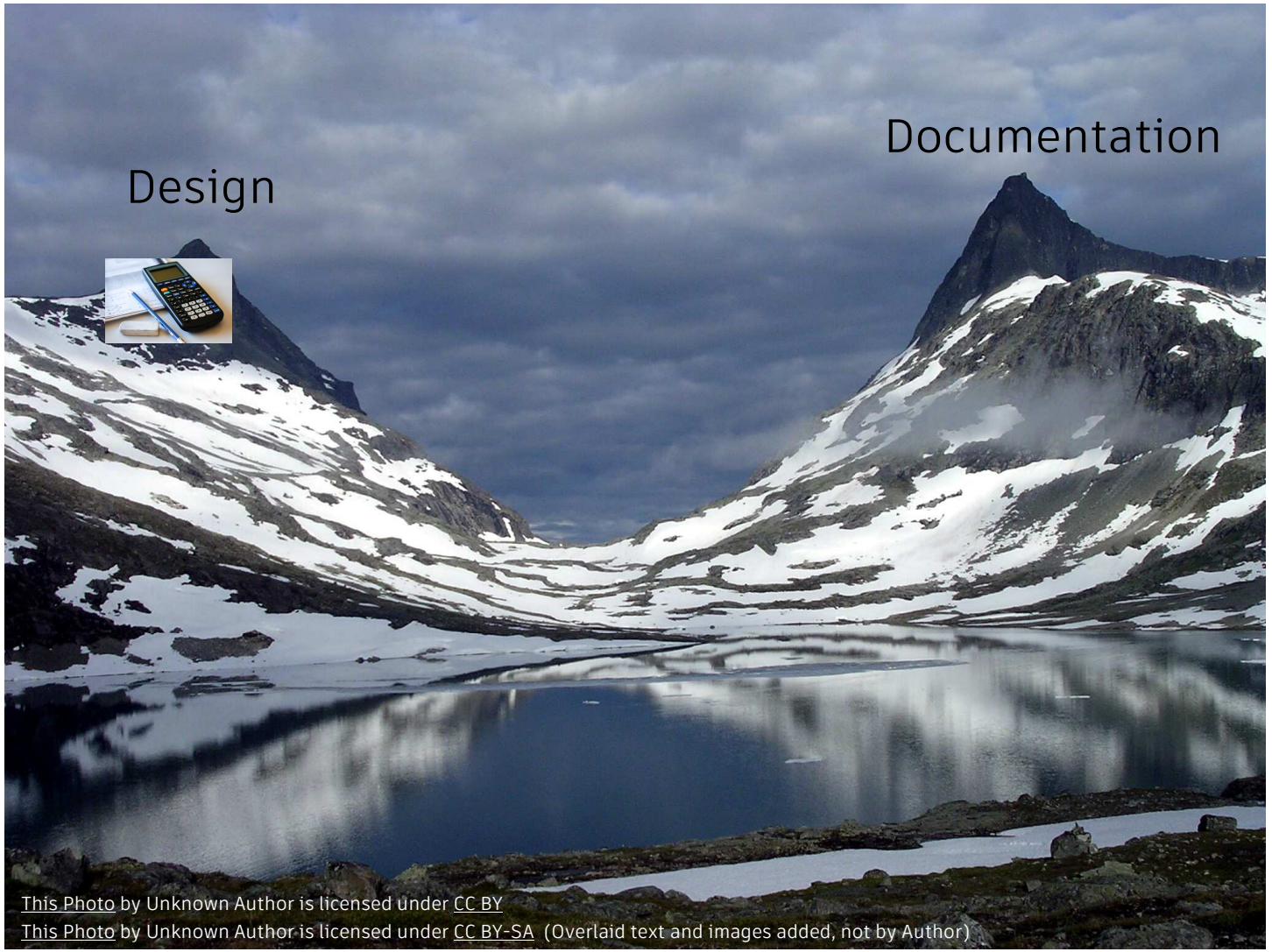
- General structural engineering services
- Delegated design of CFS Specialty Engineering
- Revit-focused production methods

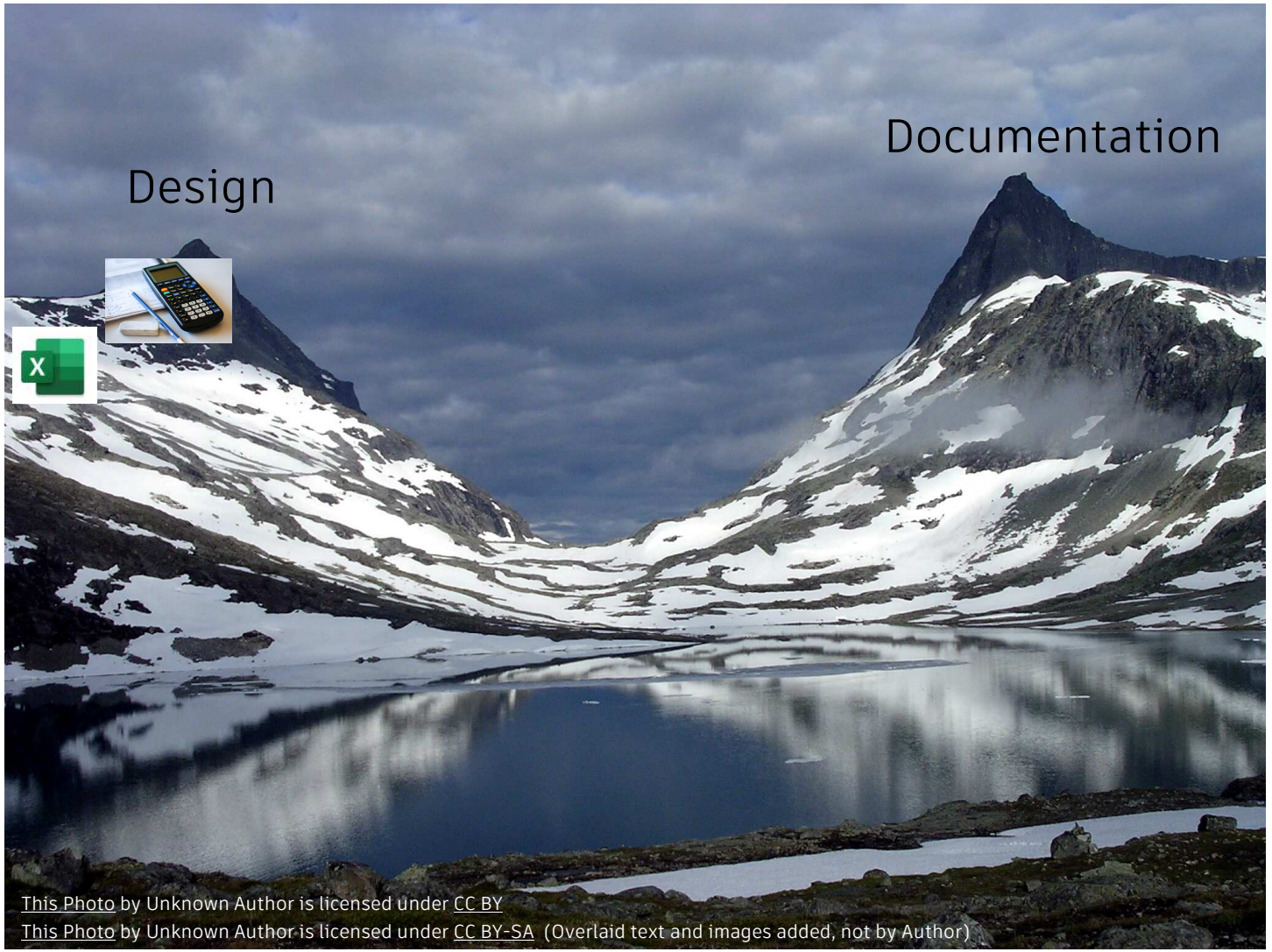
Topics

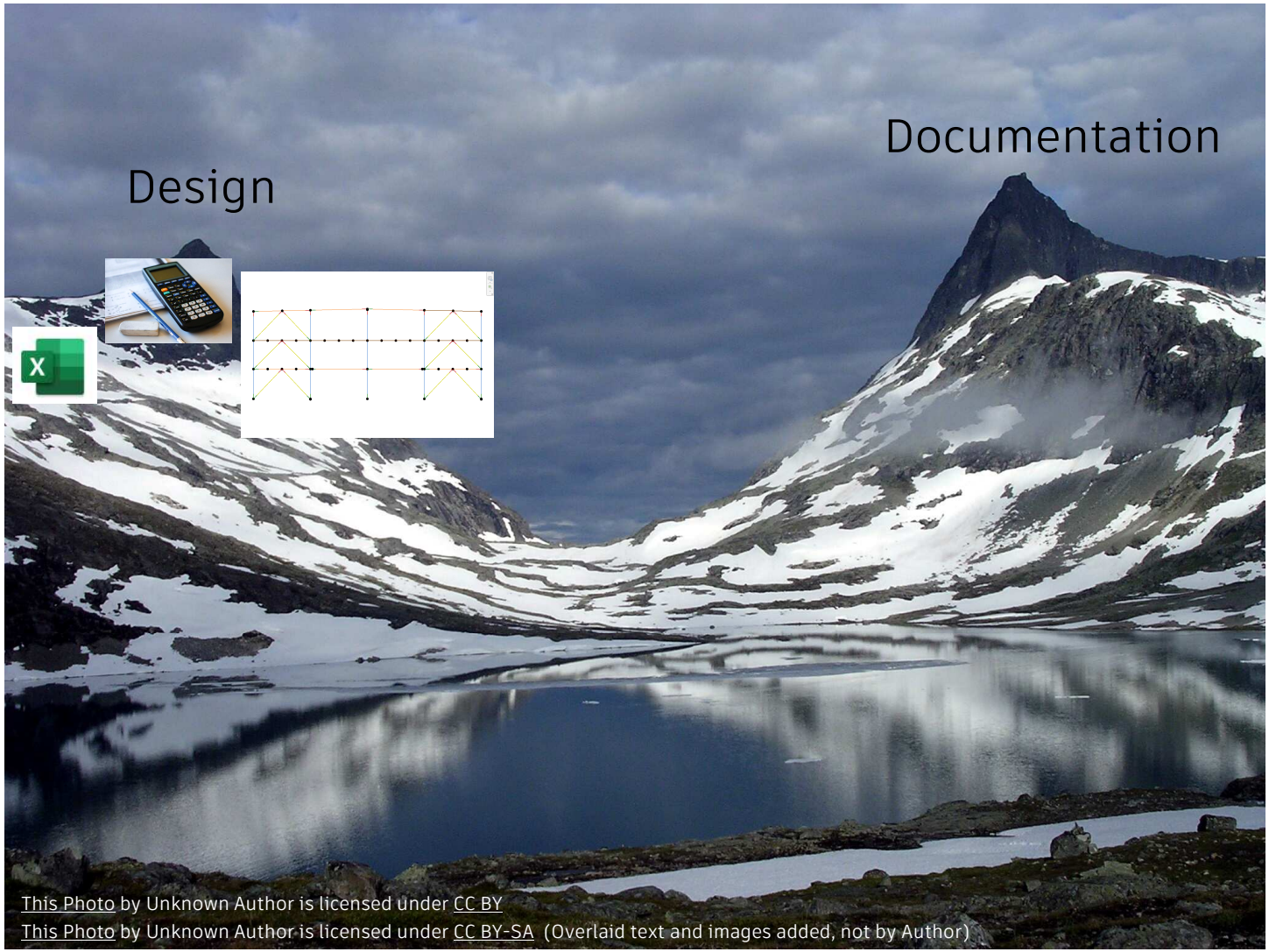
- Time is money: Assessing hidden costs of parallel work
- Intentional Integration: How to think BIM-centric and model purposefully
- Case Study: Revit-driven design of steel beam and girders


The Cost of Parallel Work



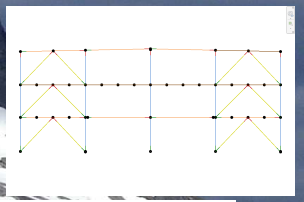


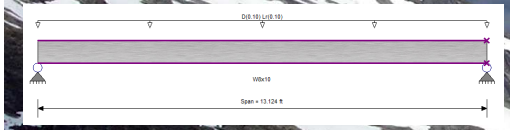


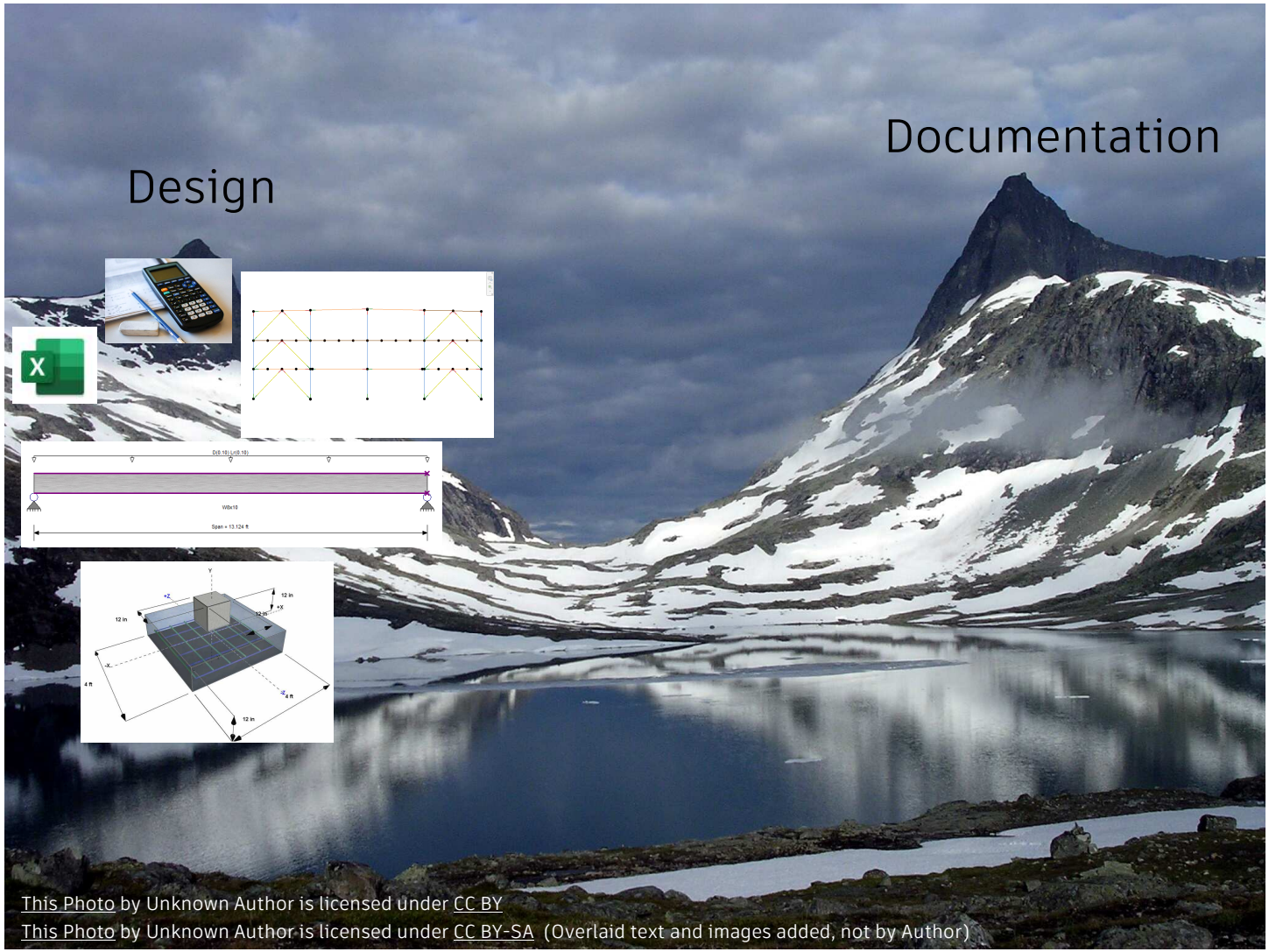


Design

Documentation







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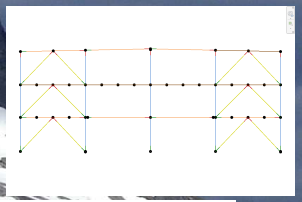

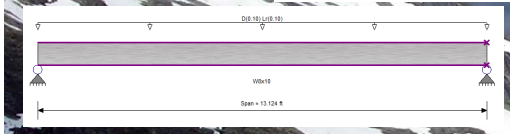

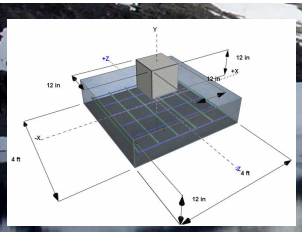

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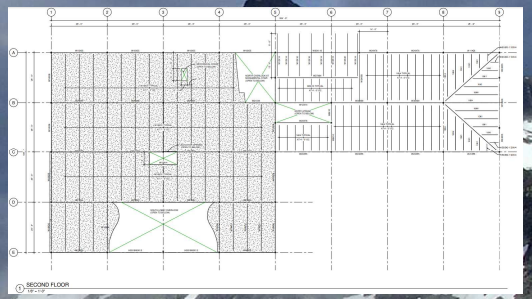

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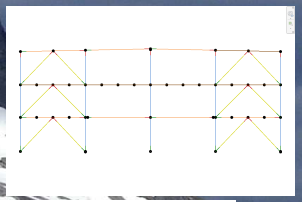

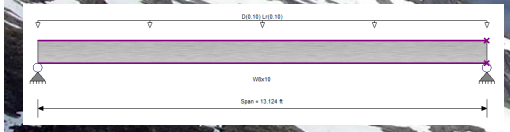

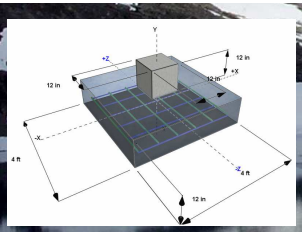

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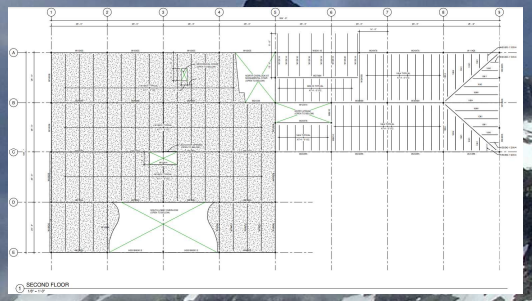
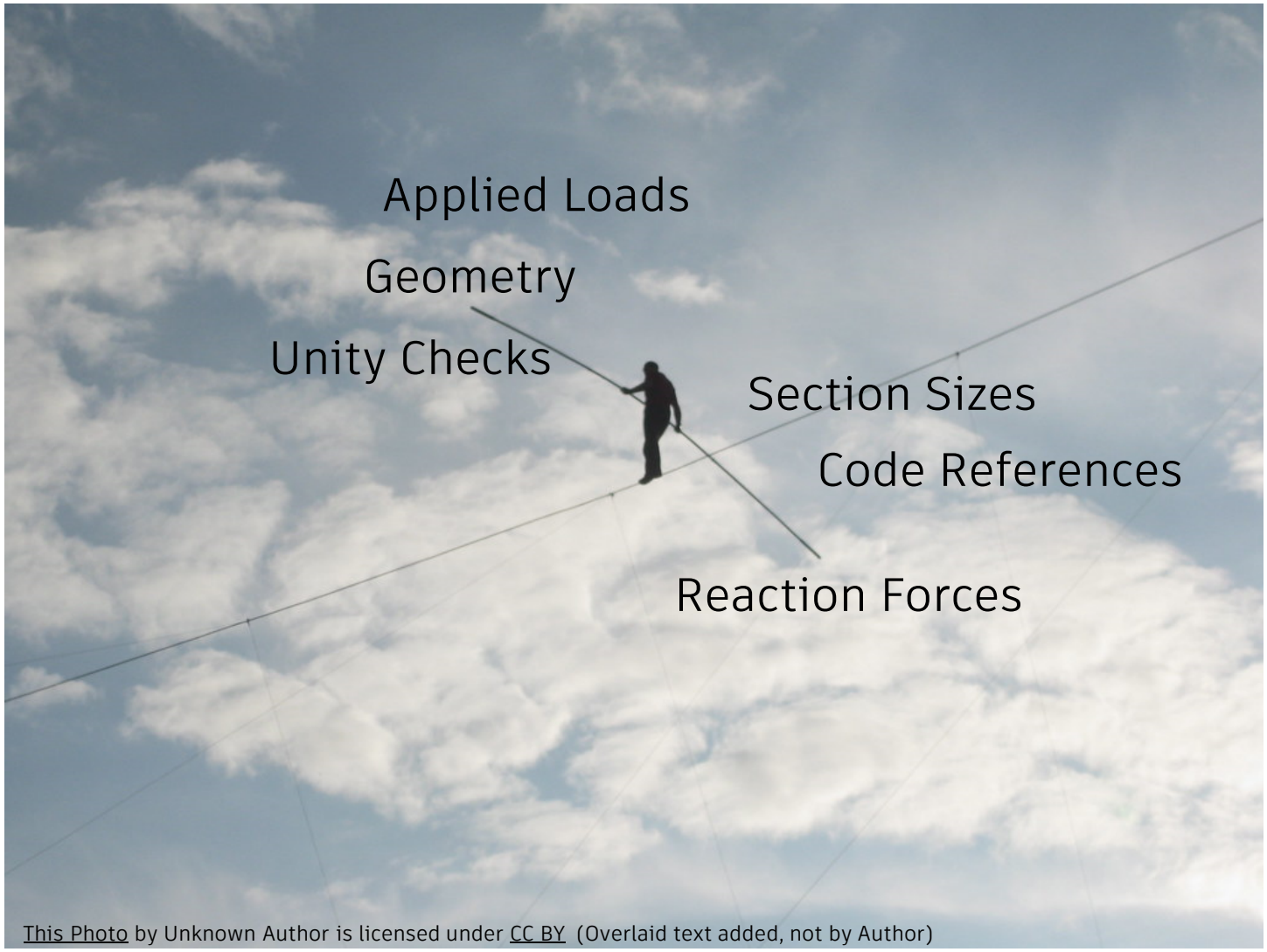
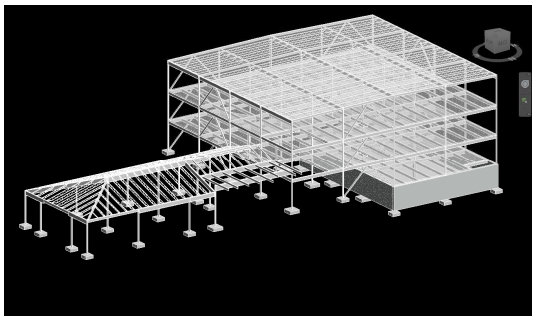
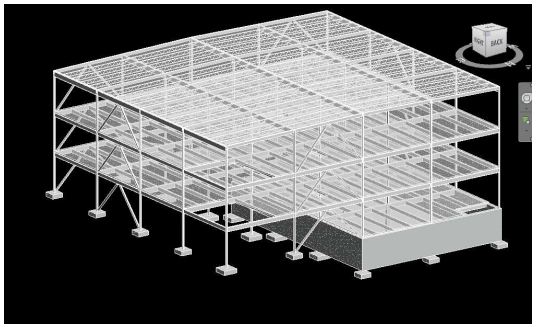


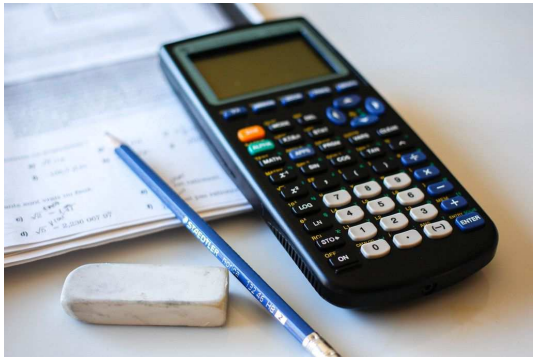


The building design lifecycle

“See updated 50% DD ARCH drawings…”
“Upcoming scope change…”
“Per client review comments…”
“The city code official has required…”







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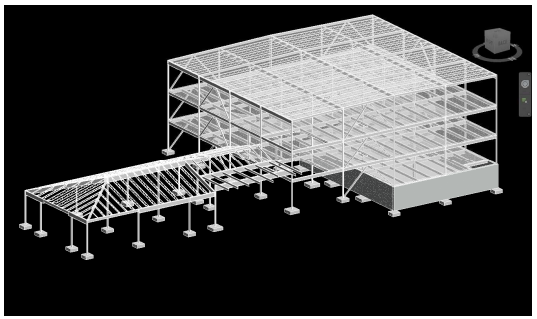

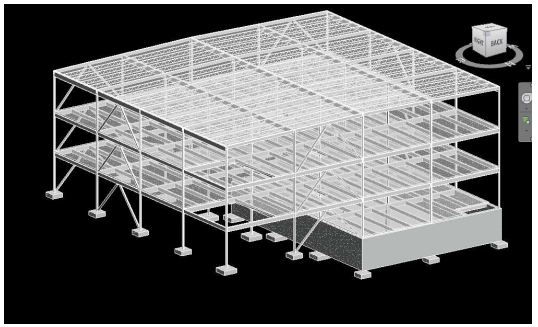

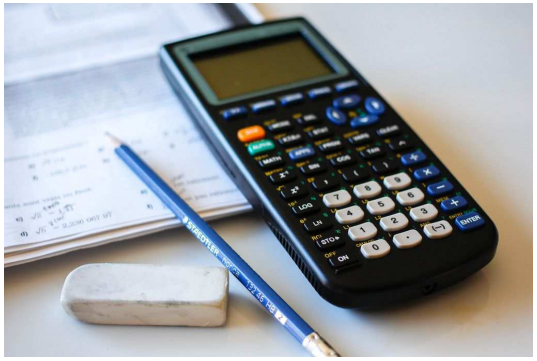

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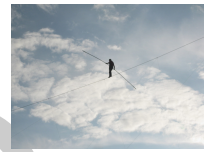
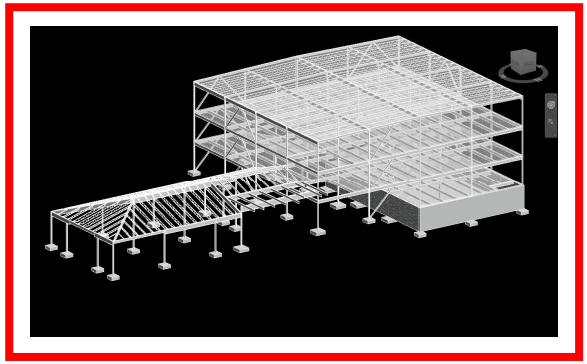
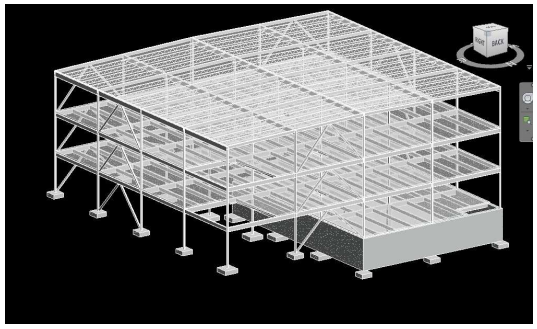
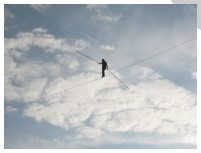
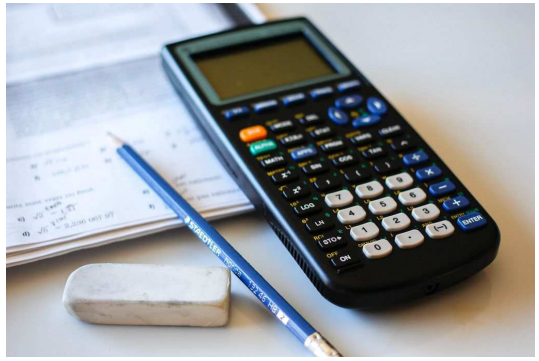
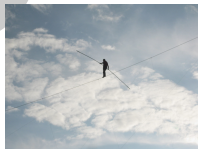




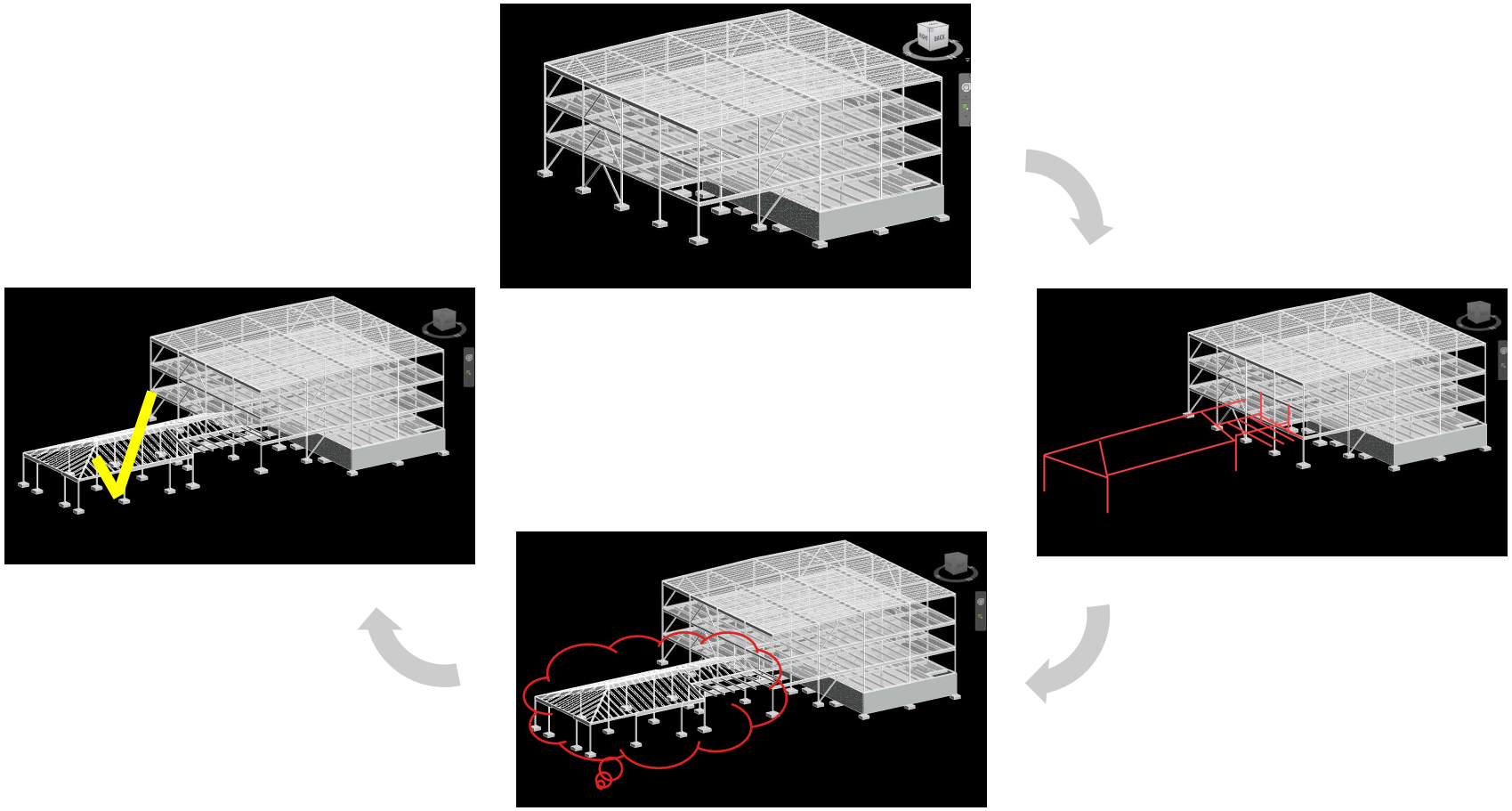








The structural documentation lifecycle



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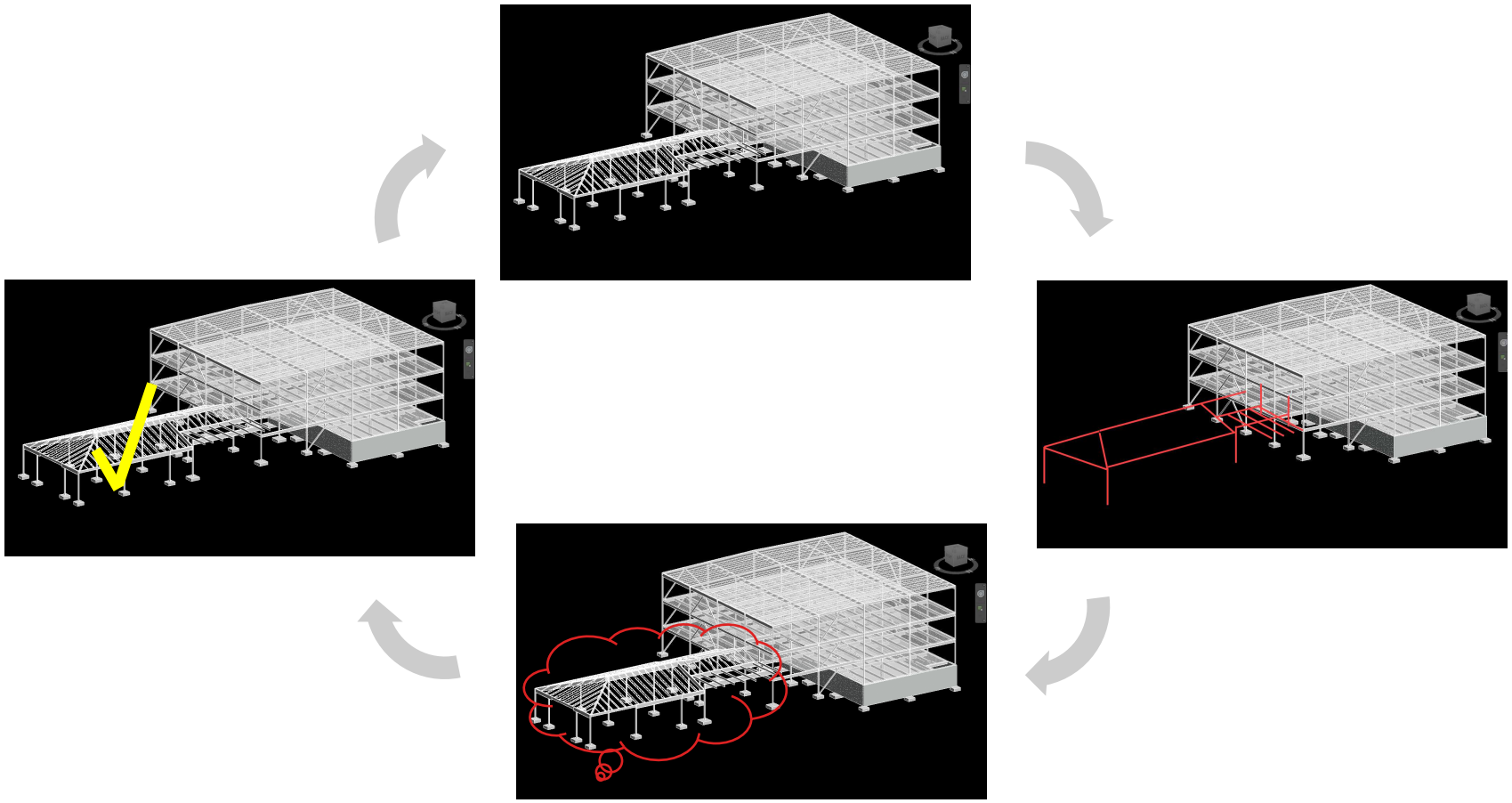


Think Revit-centric

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- Fewer trips across the chasm is better (more accurate, more profitable, etc.)
- Firms already invest significant time modeling structure in Revit for coordination and documentation
- Why not leverage it for design too?

Think Revit-centric

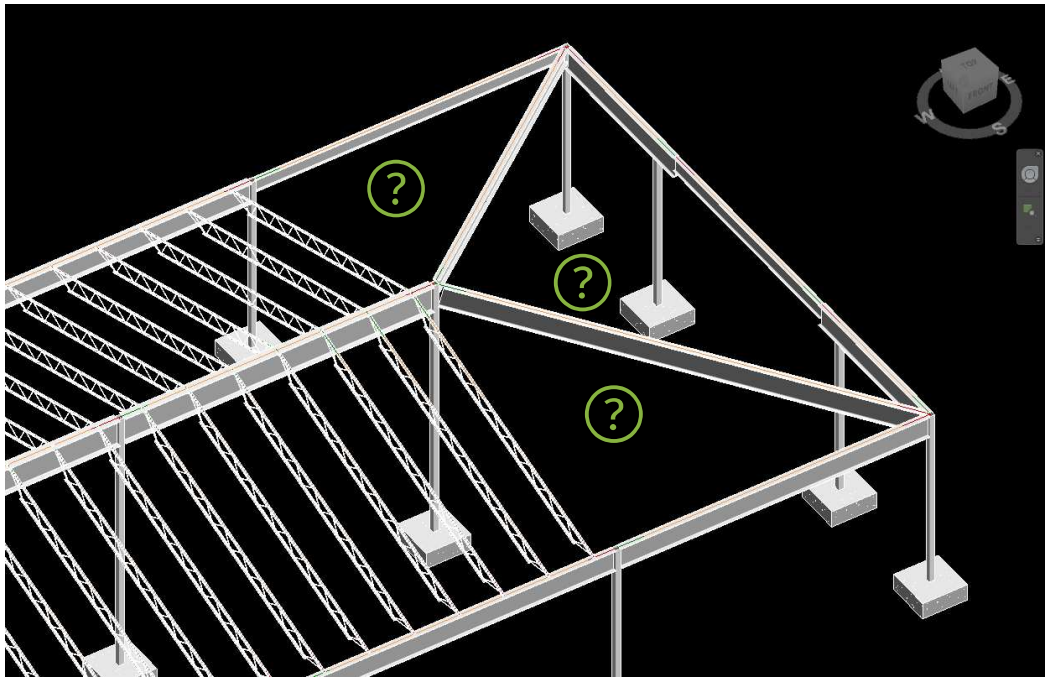
- What are the cornerstones of Revit's capabilities?
  - Annotation: 2D drafting tools, detail items, dimensioning, smart tagging, etc.
  - Modeling: Powerful 3D framing and dynamic model views
  - Parametric: Robust parameter framework and intelligent scheduling
  - API: Industry-leading programming interface for extending functionality

Think Revit-centric: Best practices?

- Revit is a data-rich environment – Use it!
- Avoid workflows that are data-poor, non-parametric, and static
- Thorough and accurate modeling helps unlock the full power of the platform
- These best practices are applicable for anything, including basic model management, scheduling / takeoffs, and even actual Revit-driven structural design

Think Revit-centric: Best practices?

- Line work (framing and scheduling)



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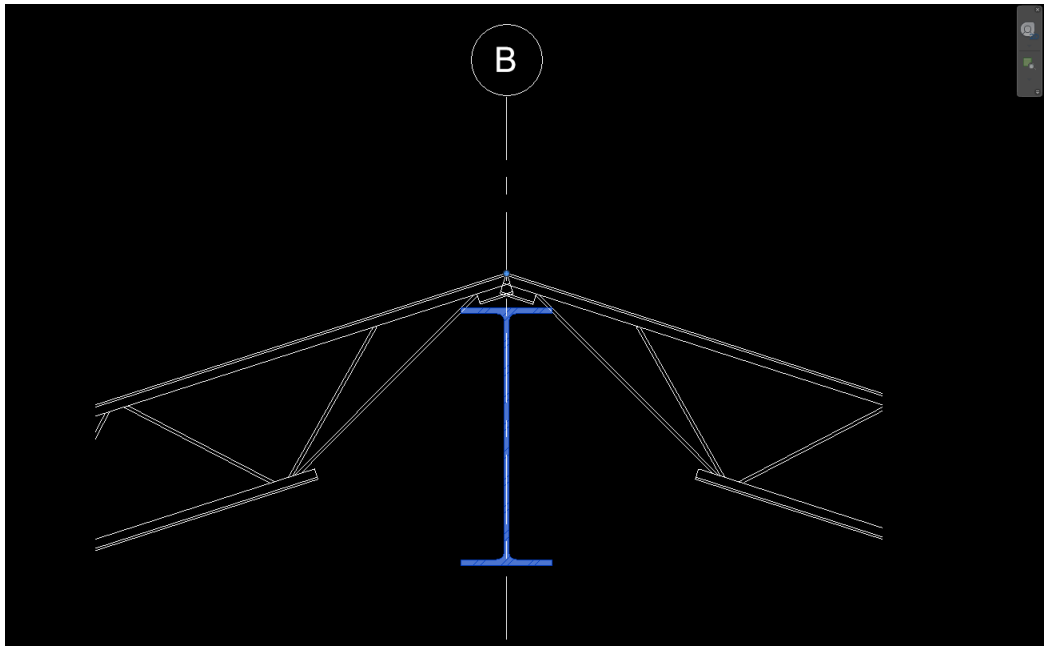

Think Revit-centric: Best practices?

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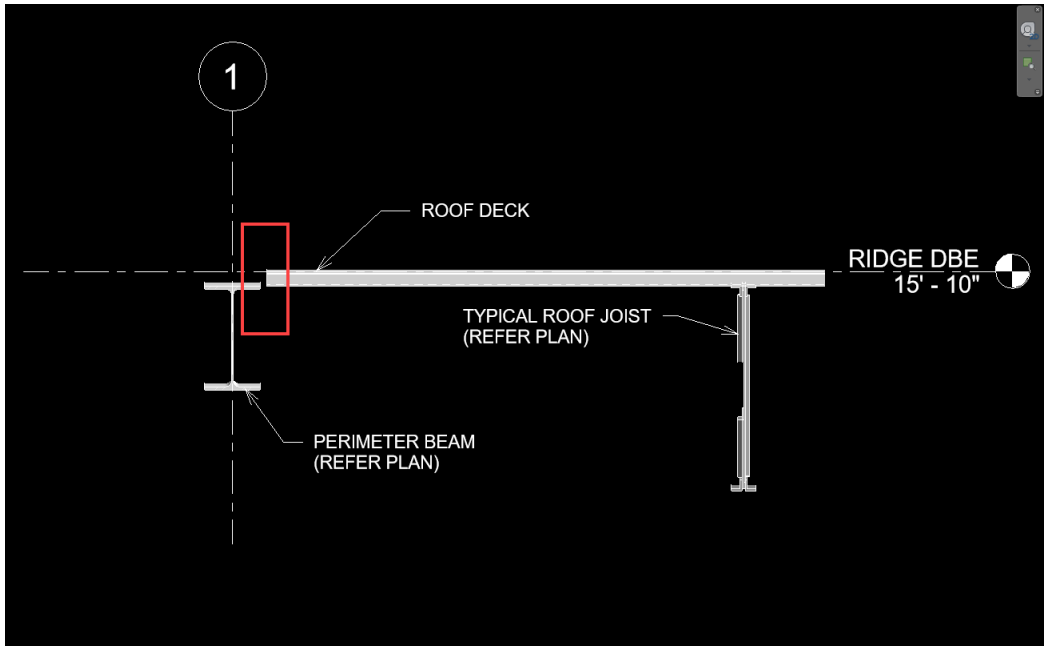
- **Floor edge support conditions**



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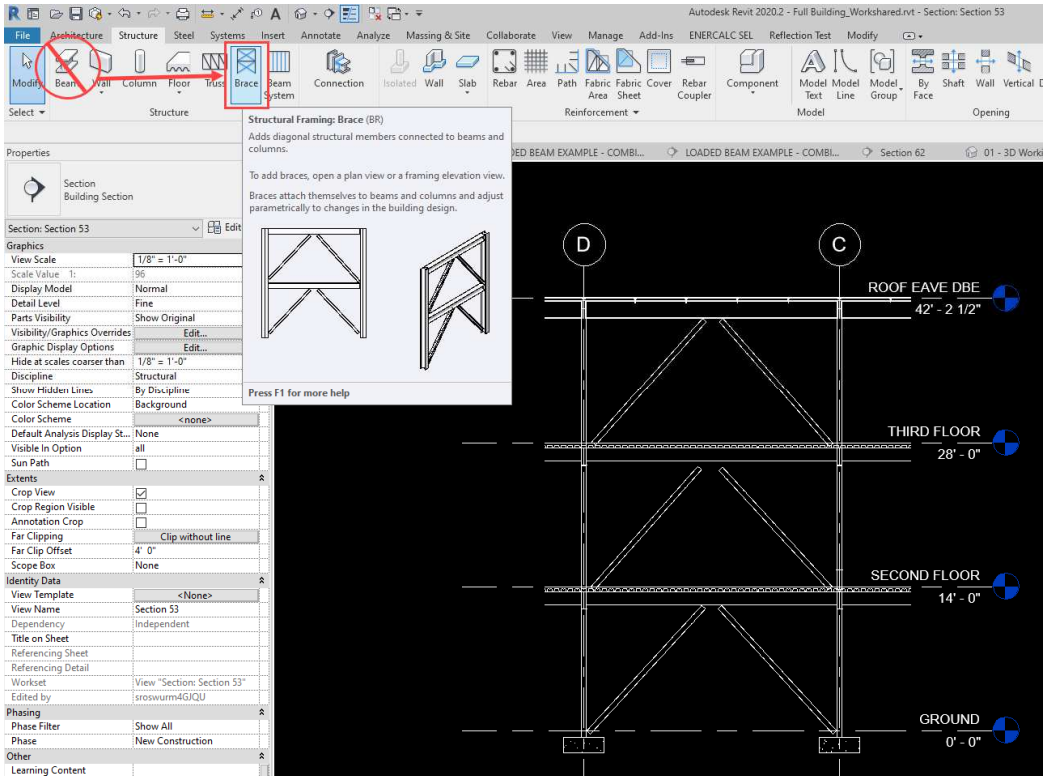
- **Structural types and usages**



Think Revit-centric: Best practices?

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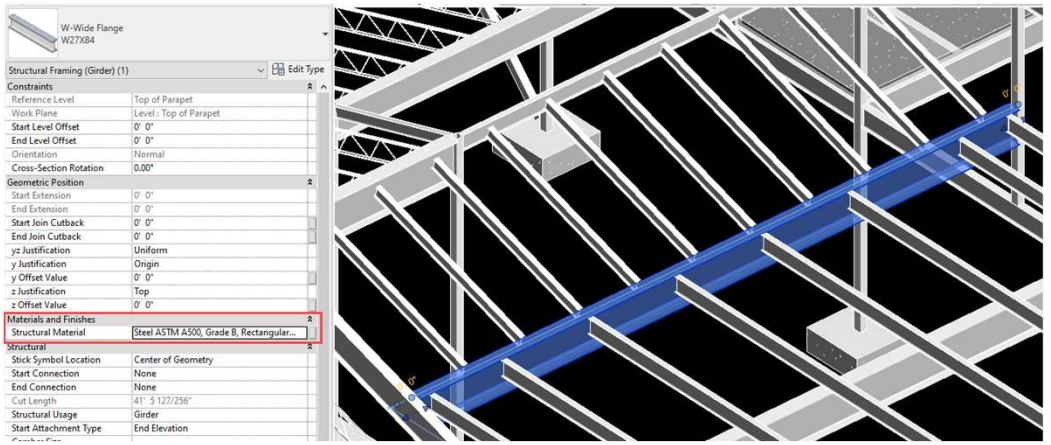
- Structural types and usages
- **Structural materials**



Think Revit-centric: How to adapt?

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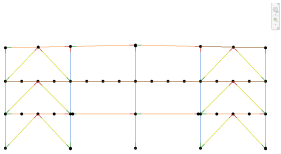
  - Bulk export to another environment / data exchange files

  - Managing Revit analytical modeling / parallel models



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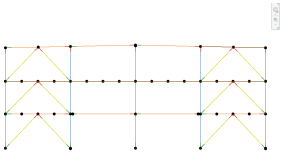

  - Still making laborious trips back and forth

  - There must be a better way…

Think Revit-centric: How to adapt?

- What if you could design without any trips to another environment?
- Revit-centric structural design software:
  - Perform structural design from directly inside Revit
  - Let Revit be the convergence point – No more tight rope walks!
  - Eliminate the risk of data transcription errors

ENERCALC SEL

- Over 40 structural engineering calculation modules for common design tasks

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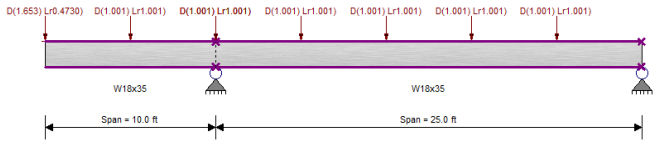
- Design of structural components



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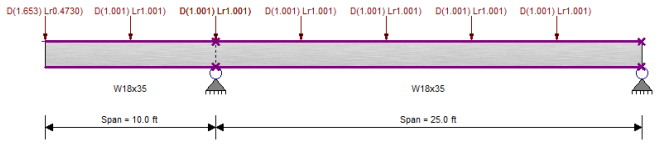
- Over 40 structural engineering calculation modules for common design tasks
- Design of structural components
- Structural analysis modules



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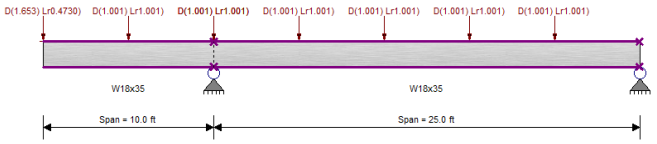

- Structural analysis modules

- Earth retention modules

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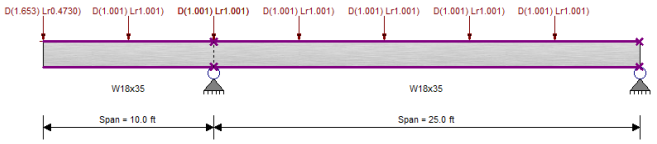


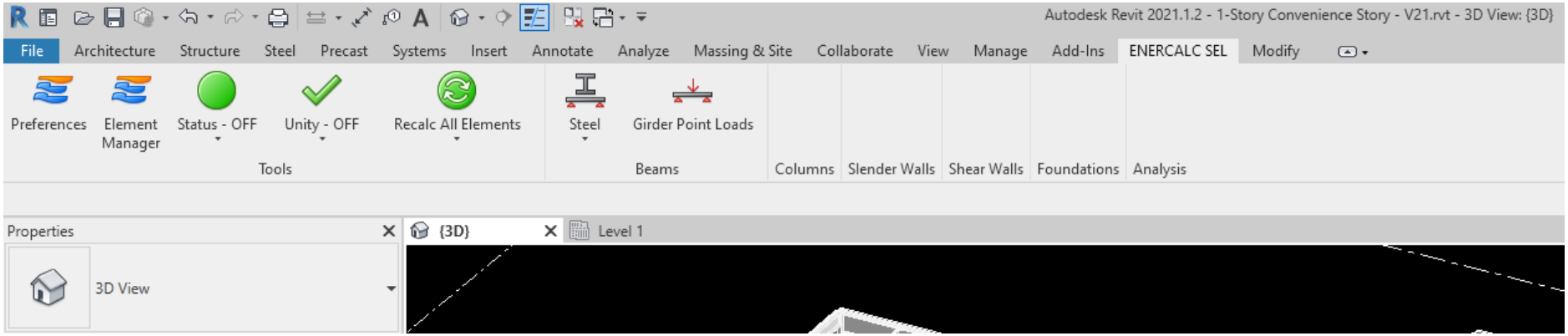
- Structural analysis modules

- Earth retention modules

- 3D frame analysis and FEM solutions

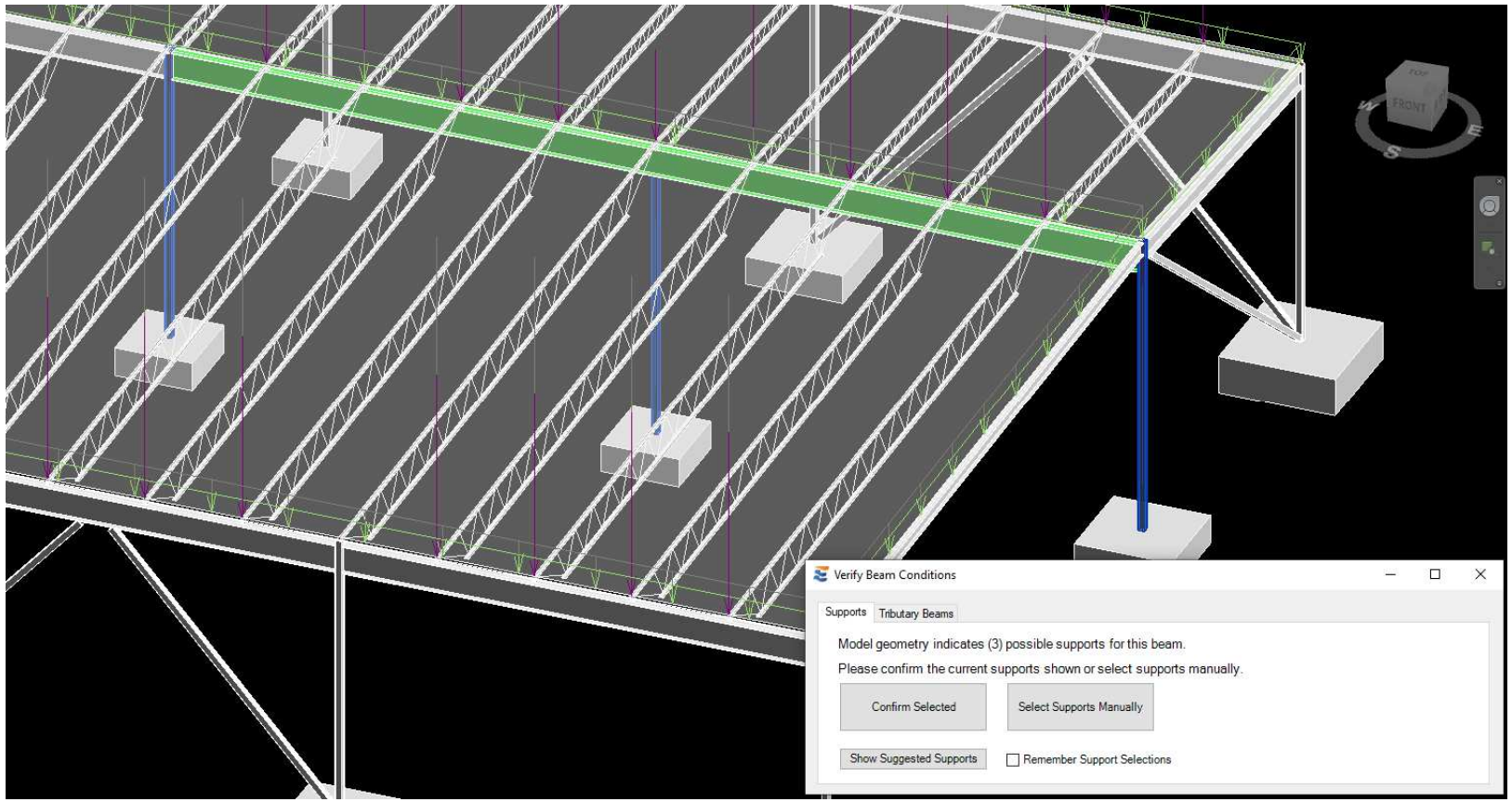
ENERCALC for Revit

Familiar Revit-based ribbon bar controls...



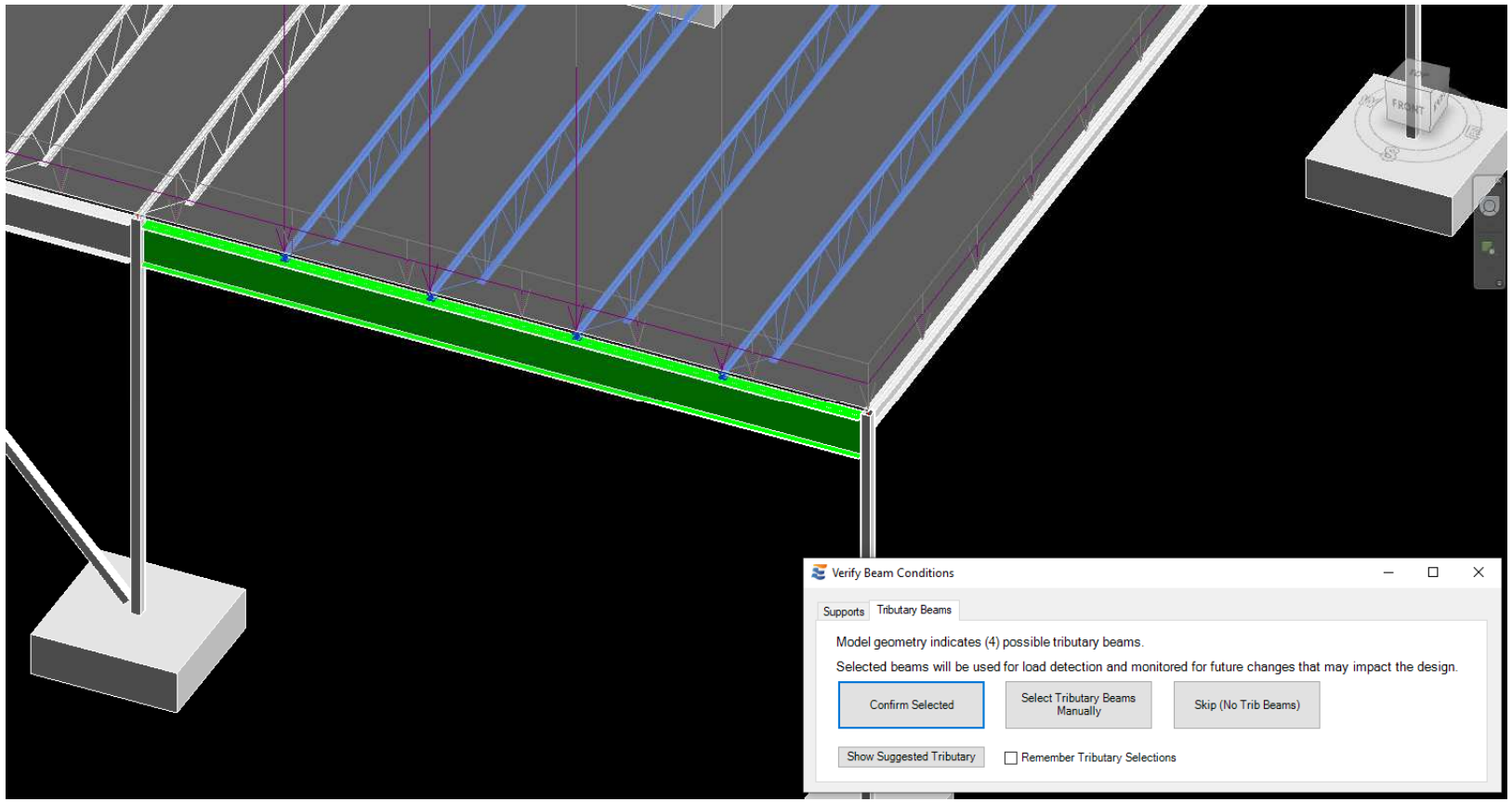
ENERCALC for Revit

Intuitive launching of calculations directly from Revit…



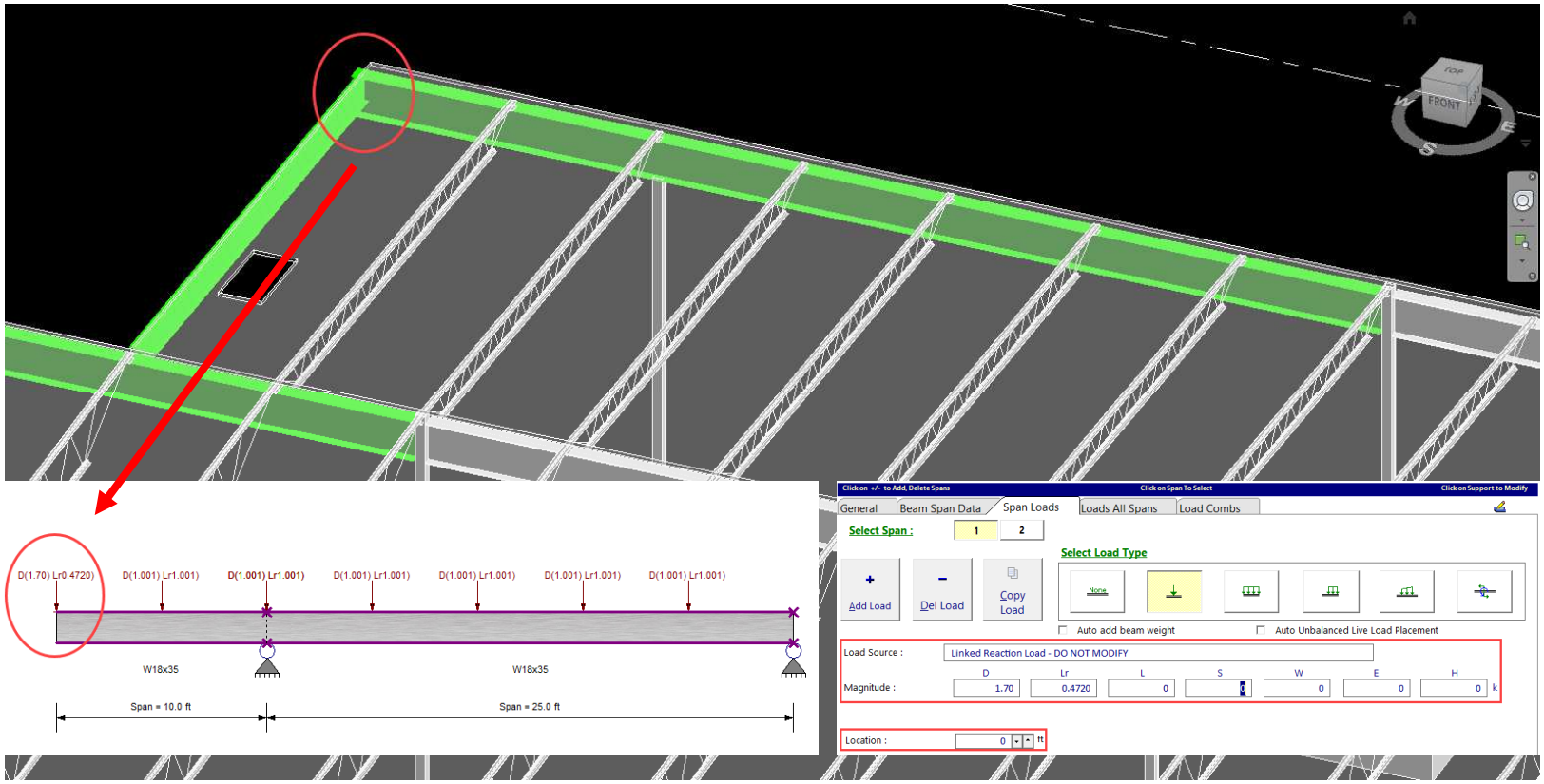
ENERCALC for Revit

Leverage Revit model structural geometry to eliminate parallel work...



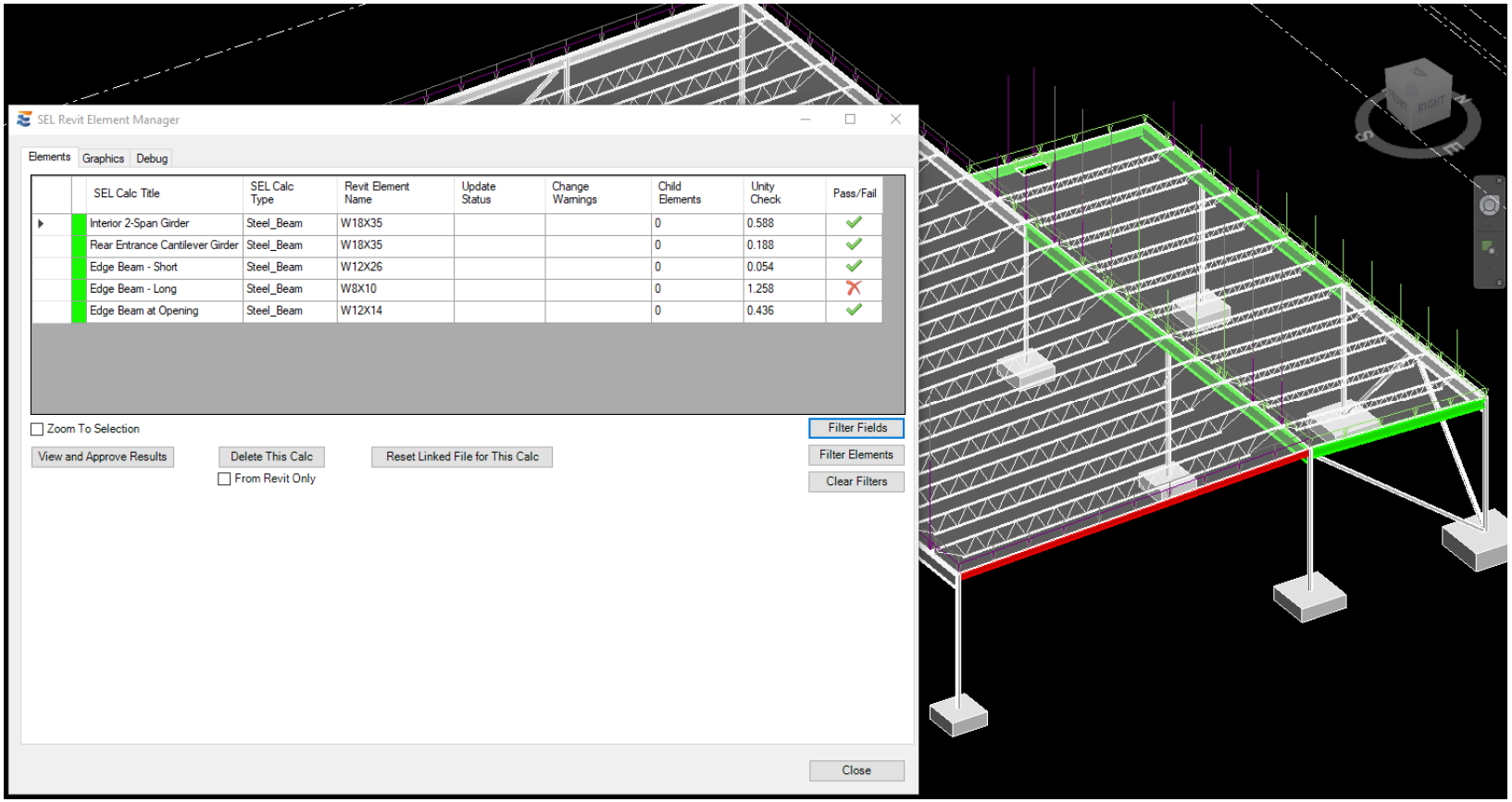
ENERCALC for Revit

Auto-linking of loads between connected element calculations...



ENERCALC for Revit

Rich visuals for managing designs inside the Revit environment…



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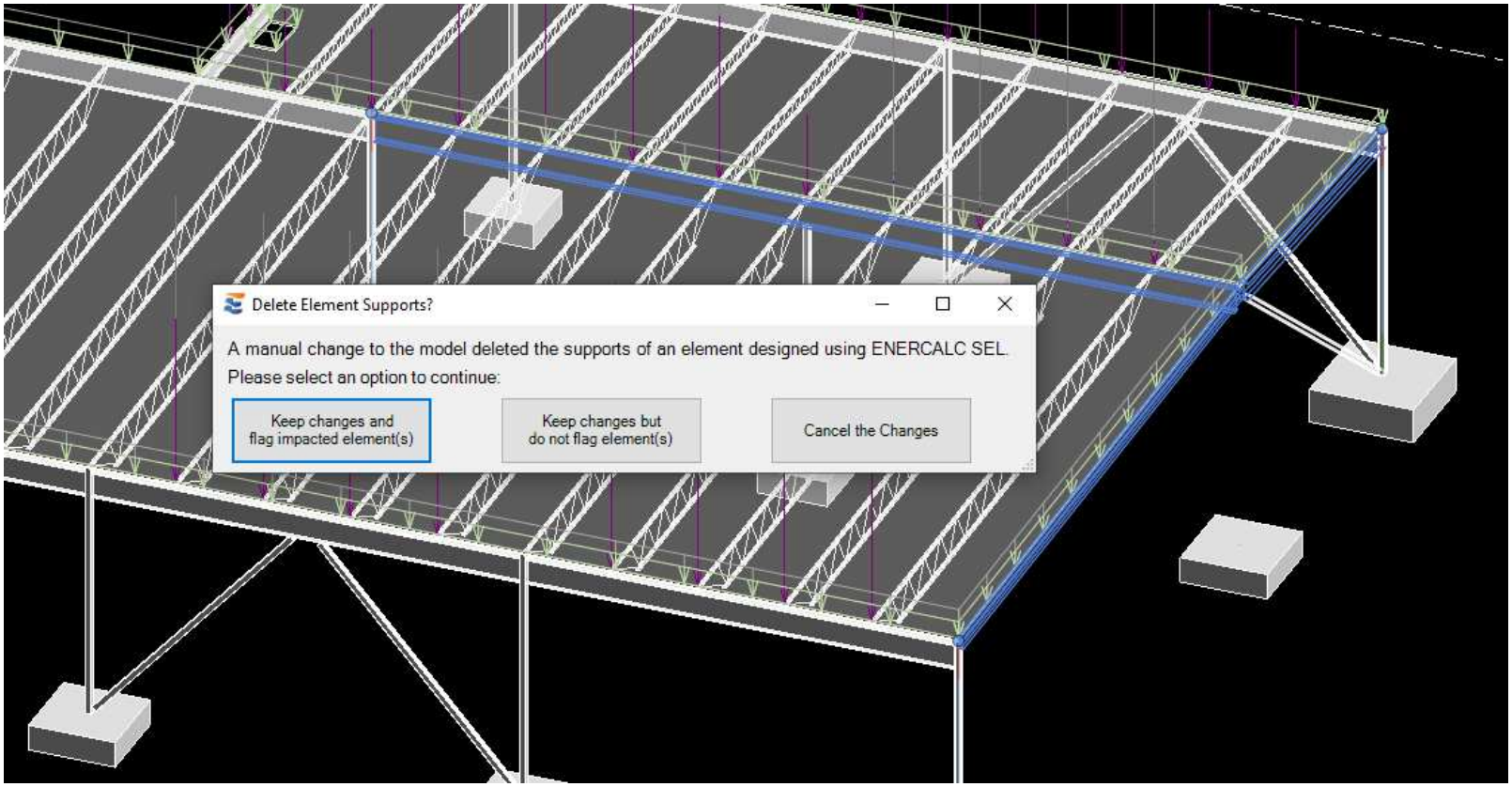
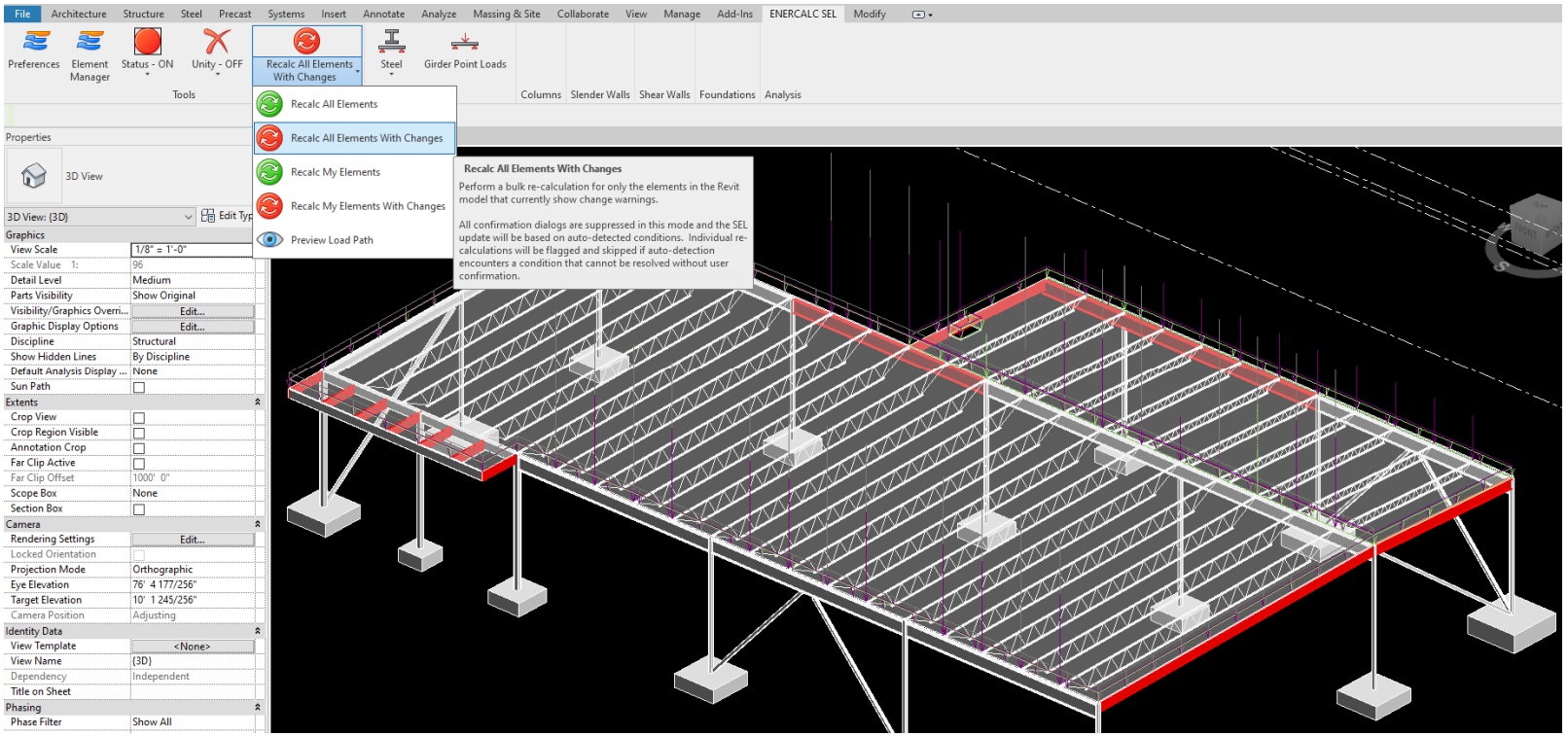
Real-time oversight of model changes that impact element designs...



ENERCALC for Revit

Easy updating via bulk recalculation tools...



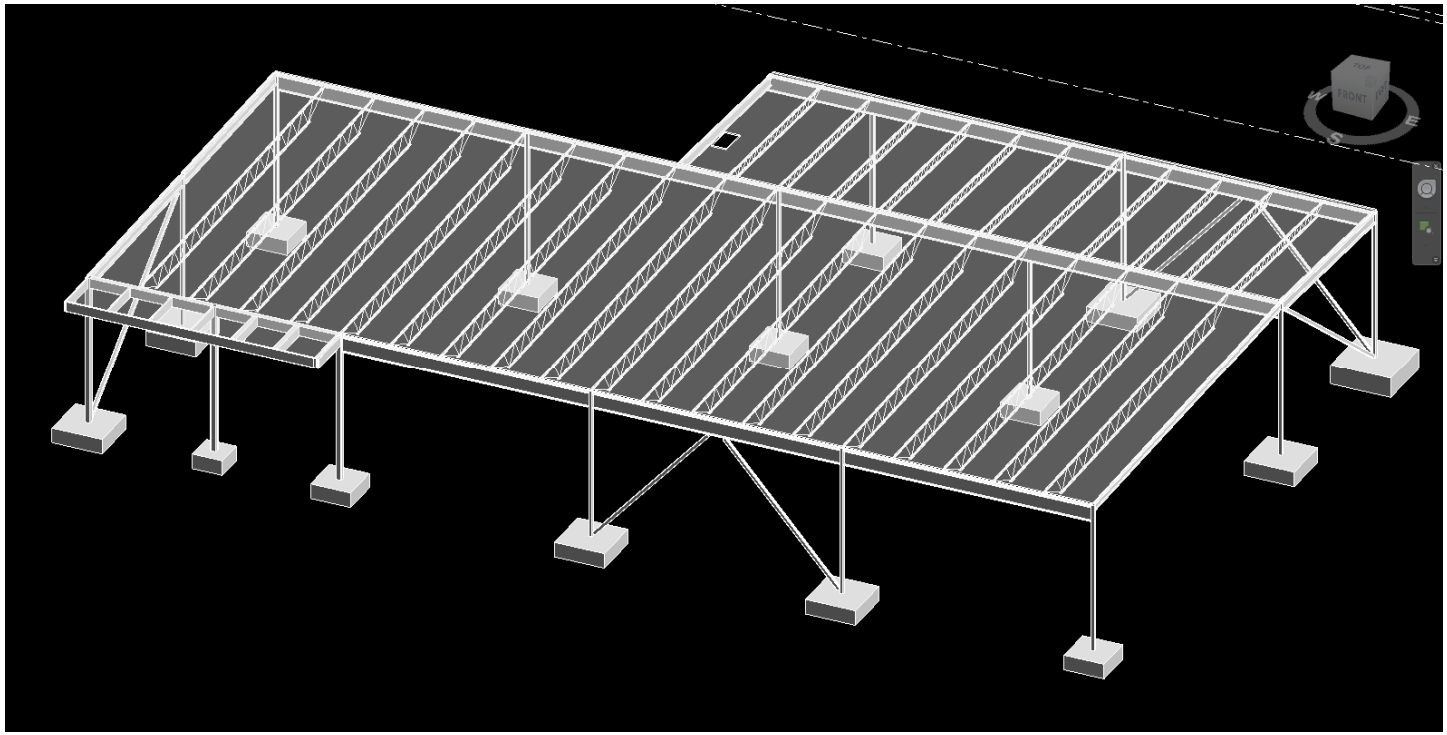
Case Study:

Structural Steel Design using ENERCALC for Revit

Maher (Mack) Eltarhoni, PE, SE (OK)
Principal, ELTA DESIGN GROUP, LLC

Case Study Structure

- Convenience store: Single-story steel framed



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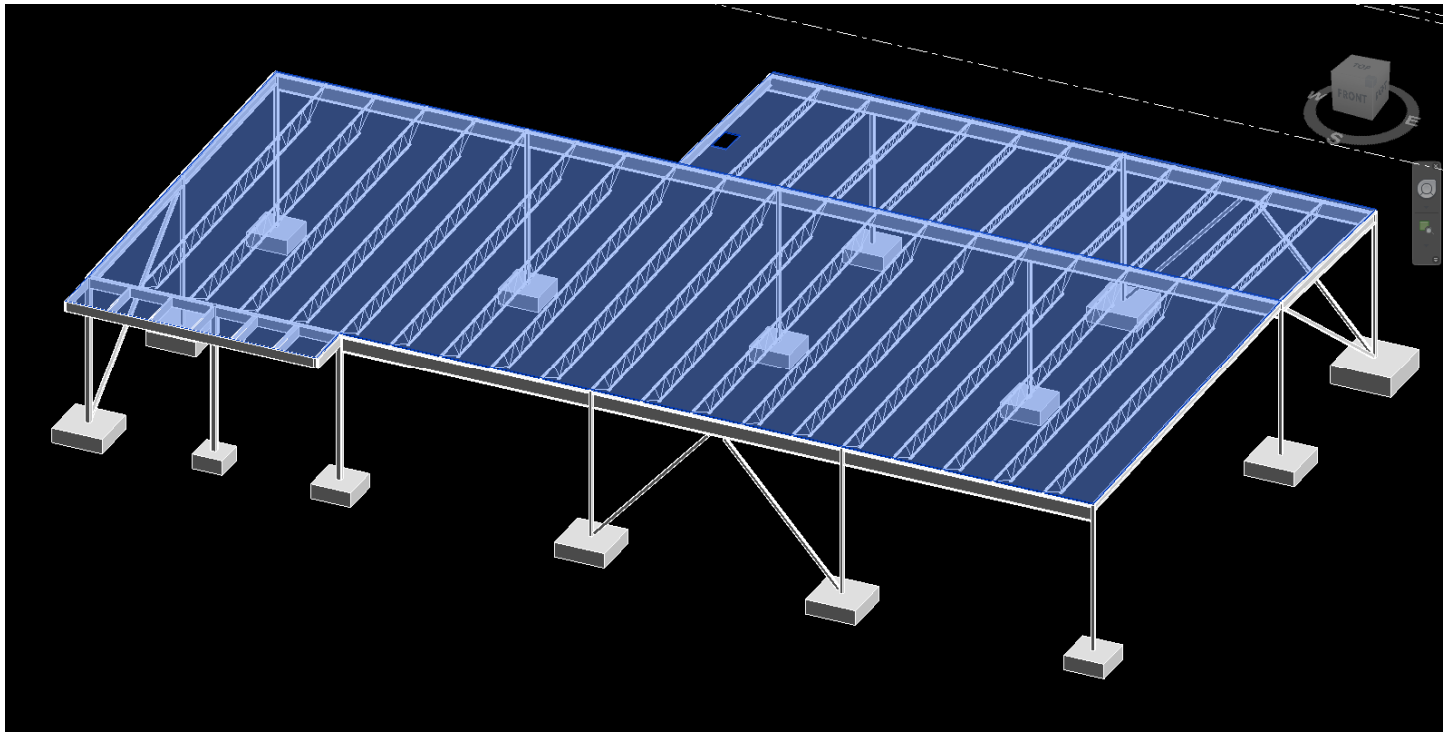
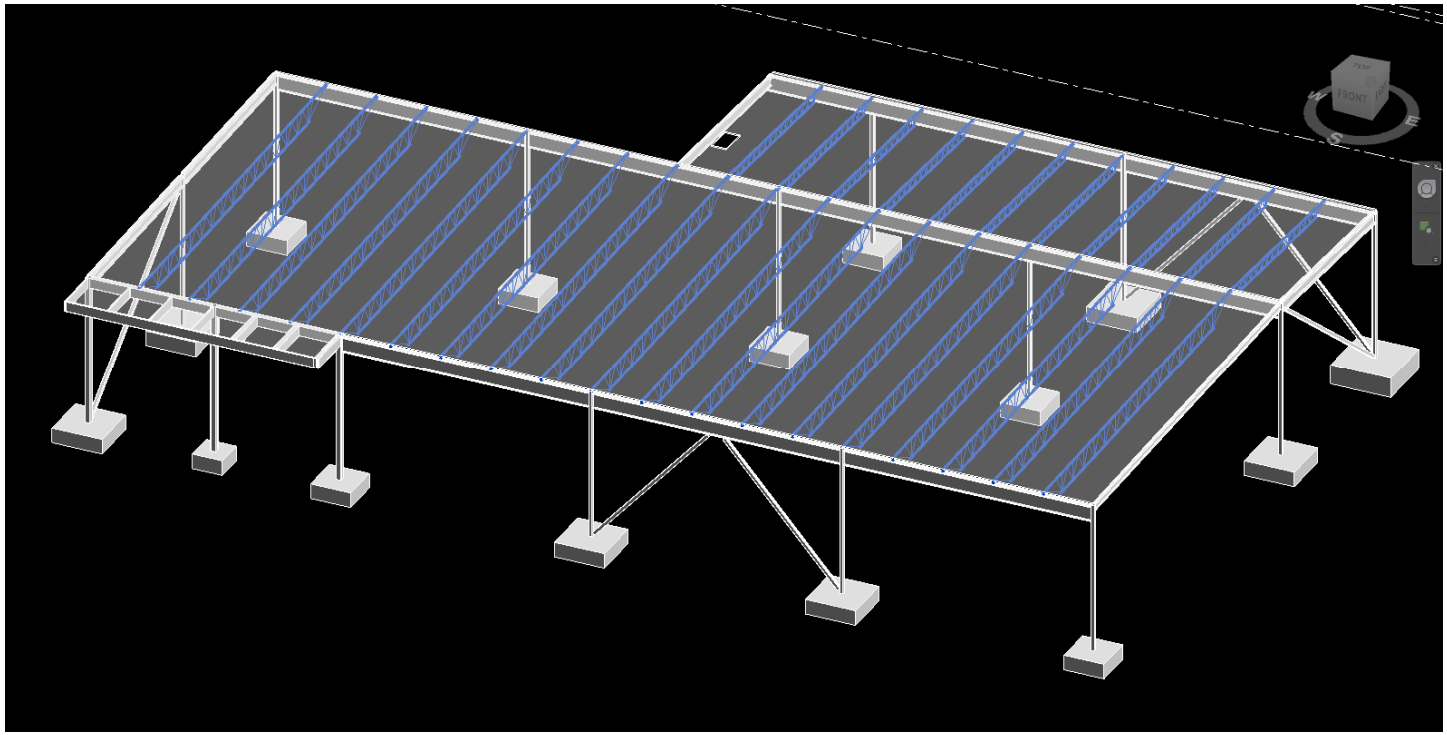
- Convenience store: Single-story steel framed

- **Steel deck**



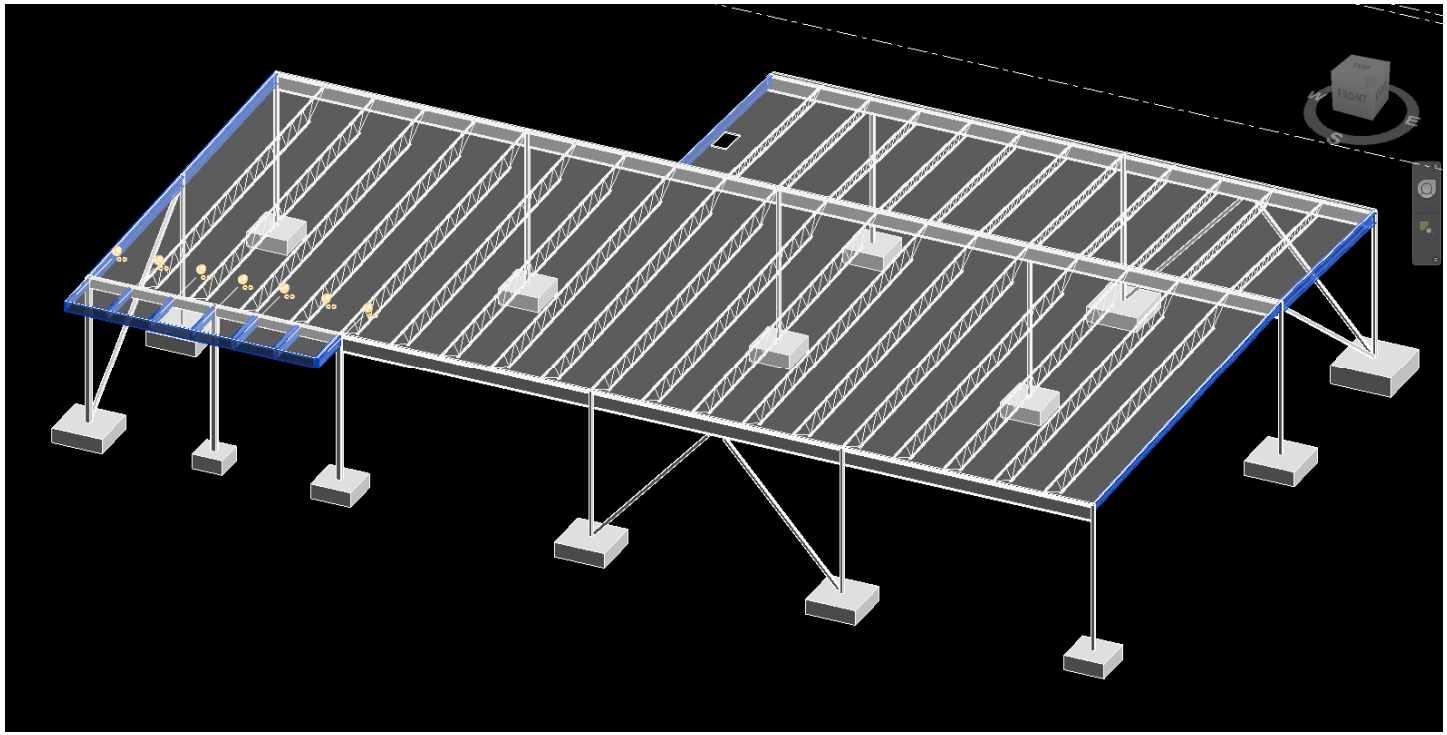
Case Study Structure

- Convenience store: Single-story steel framed
- Steel deck
- **Open-web joists**



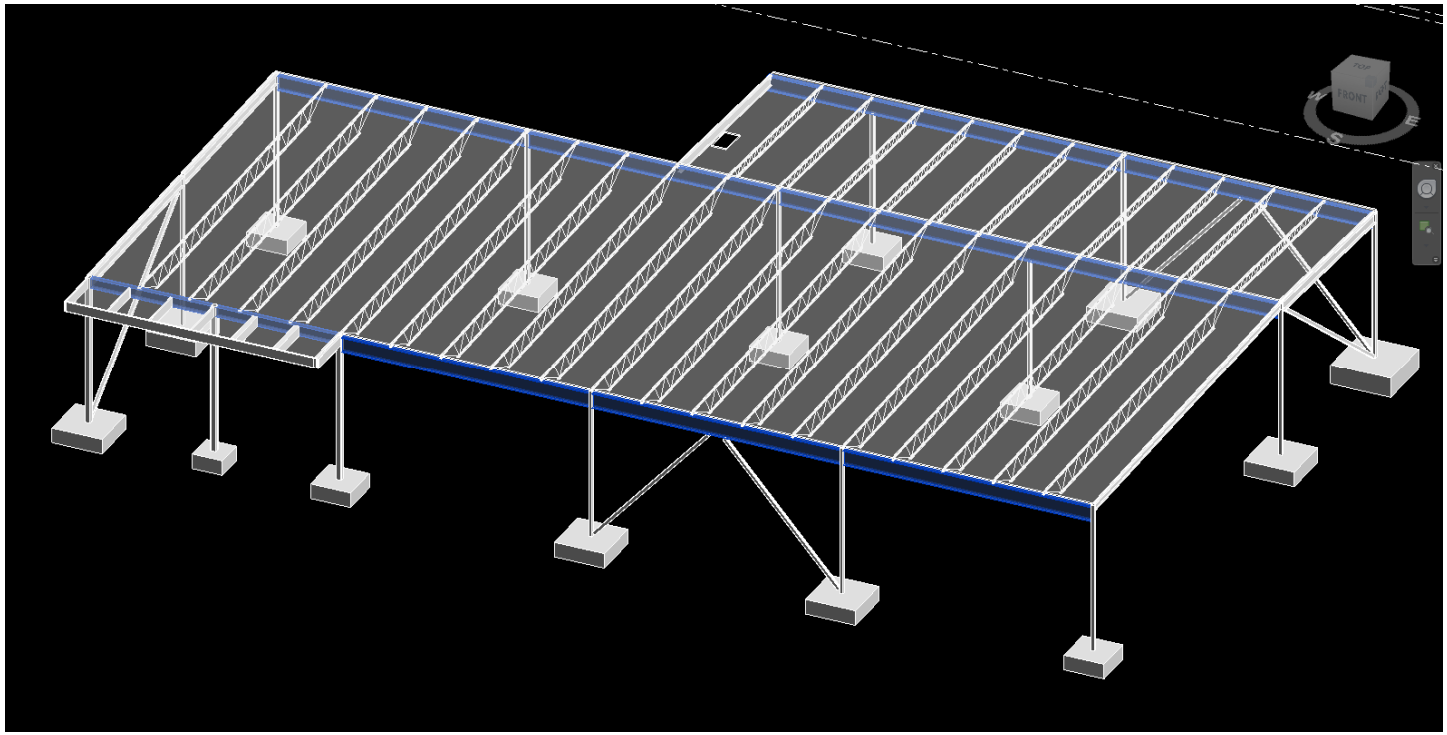
Case Study Structure

- Convenience store: Single-story steel framed
- Steel deck
- Open-web joists
- **Steel beams**



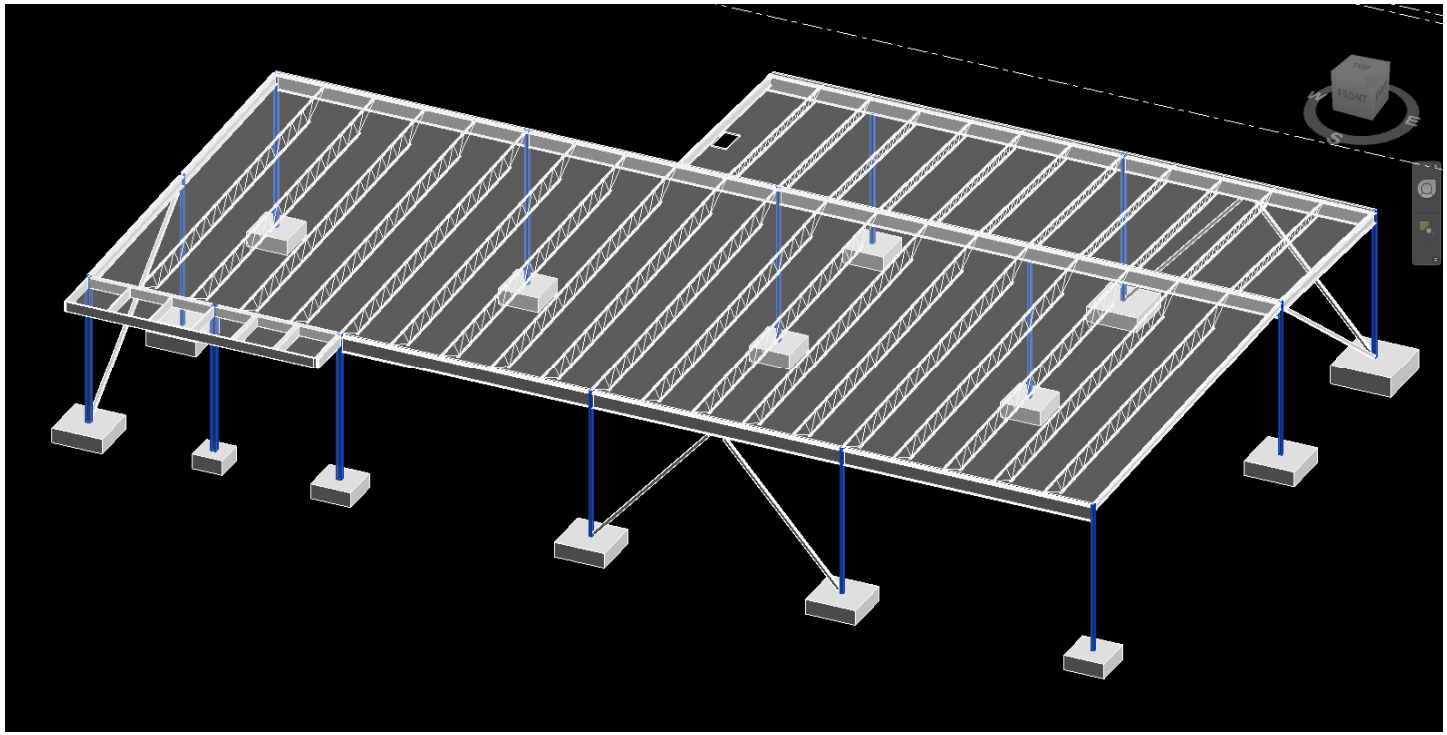
Case Study Structure

- Convenience store: Single-story steel framed
- Steel deck
- Open-web joists
- Steel beams
- **Steel girders**



Case Study Structure

- Convenience store: Single-story steel framed
- Steel deck
- Open-web joists
- Steel beams
- Steel girders
- **Steel columns**



Case Study: Conclusions

- Generate new calculations instantaneously
- Easily edit existing calculations with 2-way controls
- Powerful Revit visuals to overview completion status and code compliance
- Rapidly “what if” designs via model change tracking and fast recalc tools
- Fast and easy record keeping for calcs
- Load linking for reactions

ENERCALC for Revit

Steel beam is just the beginning...

ENERCALC

AUTODESK.
Authorized Developer

ENERCALC for Revit

Steel beam is just the beginning…

- ENERCALC users will soon have access to powerful Revit-based design for:
  - Beams and columns of all materials
  - Shear walls and slender walls of all materials
  - Foundation elements
  - Specialty analysis modules

ENERCALC for Revit

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- To learn about deploying **ENERCALC SEL** and **ENERCALC for Revit** at your firm:

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