Autodesk University 2008

Best Practices for Concrete Slab Design Using Revit® Structure

Florian Aalami – ADAPT Corporation

SE 100-3 Intended for structural engineers using Revit Structure (RST), this class will equip you with the skills needed to carry out detailed designs of concrete slab and foundation models using ADAPT® software. This presentation will cover best practices for slab modeling in RST, step-by-step instructions on exchanging model information between RST and ADAPT, review of the reinforcement design process in ADAPT, and instructions on how to automatically generate structural drawings. Attendees will learn how a model-based approach to concrete design using RST and ADAPT can dramatically increase their design efficiency, add flexibility, and improve the quality of their projects.

About the Speaker:
Florian Aalami is President of ADAPT Corporation, a leading developer of software for the design of concrete slab and foundation systems. He specializes in the development of technology and procedures for the efficient modeling, analysis, design and documentation of concrete structures. Florian earned his B.S. and M.S. degrees in Structural Engineering from UC Berkeley and Stanford University. He carried out extensive research on building information modeling for the AEC industry while completing his Ph.D. at Stanford.
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Best Practices for Concrete Slab Design Using Revit® Structure

Intended for Structural Engineers using RST

Course Objective: To learn how a model-based approach to concrete slab and foundation design using RST and ADAPT® can dramatically increase your design efficiency, add flexibility, and improve the quality of your projects.

Agenda

- Guidelines for slab modeling in RST
- Transfer of model from RST to ADAPT
- Advanced slab & rebar design in ADAPT
- Synchronize models and generate structural drawings
- Management of design iterations
  - RST change → ADAPT
  - ADAPT change → RST
- Q&A

Applicable Slab & Foundation Systems

Conventionally Reinforced or Post-Tensioned:

- Flat slab (two-way system)
- Beam and slab (one-way system)
- Girder and joist
- Waffle slab
- Mat foundation
- Grade beam or spread footing

Software Used for this Course

Software used for this course:

- Revit Structure 2009

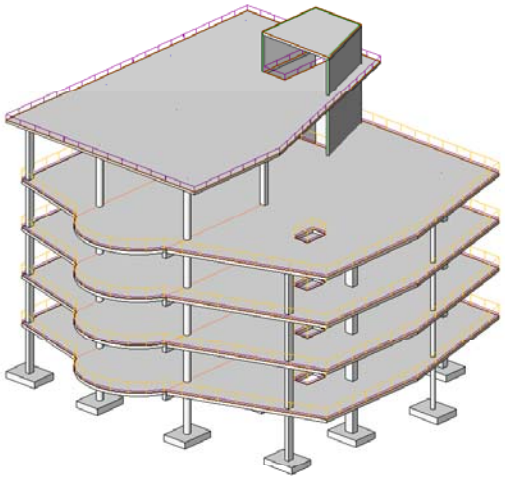

ADAPT-Builder Structural Concrete Design Suite v3 or 2009


ADAPT-Floor Pro


ADAPT-MAT

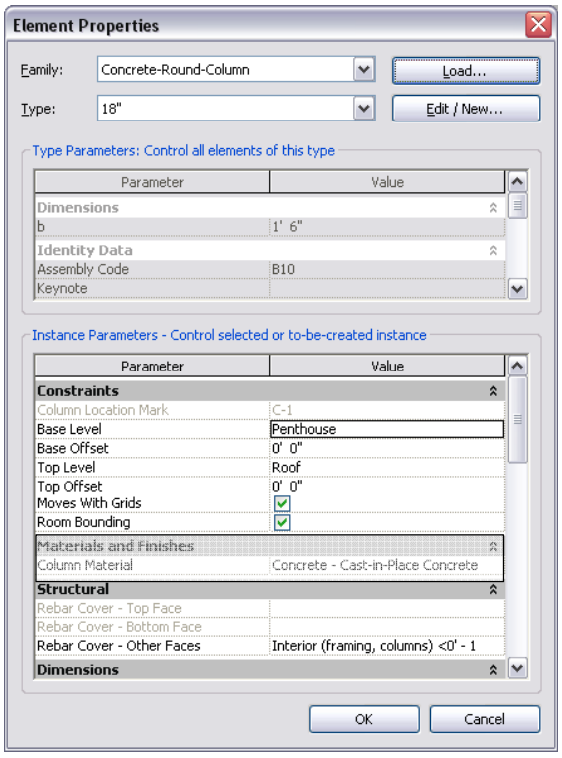
Guidelines for Slab Modeling in RST

- Do not worry about Analytical Model if designing using ADAPT
- Model each floor system level-by-level using Physical Model
  - Slab
  - Openings
  - Columns
  - Walls
- Structural Components should align properly



Guidelines for Slab Modeling in RST

- Assign proper concrete material property to all Structural Components



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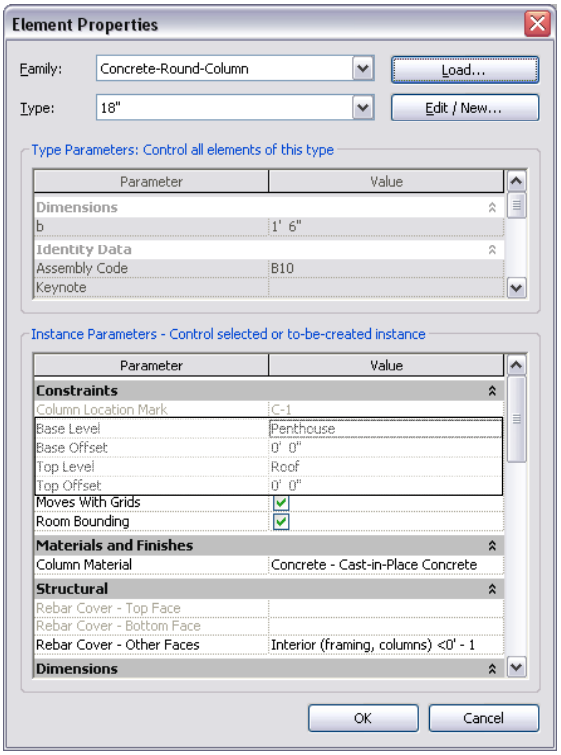
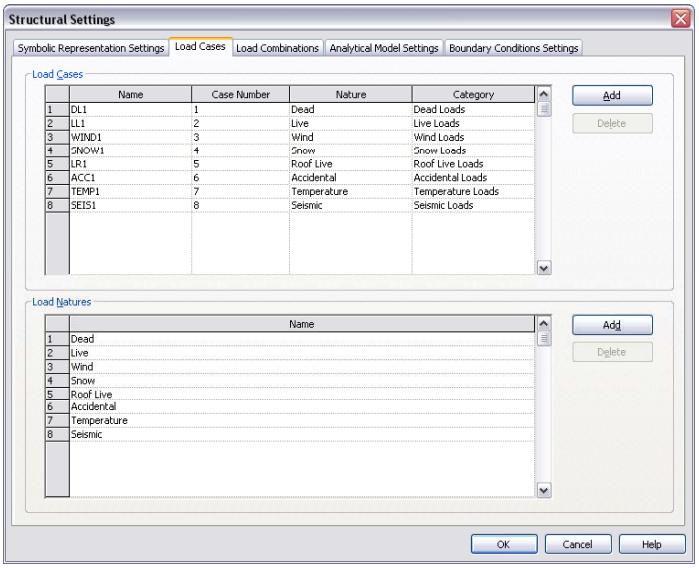
Guidelines for Slab Modeling in RST

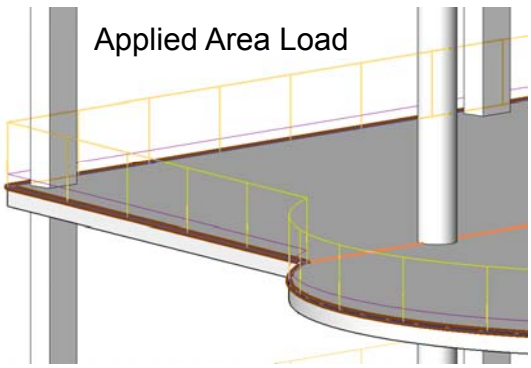
- Set proper Level Assignments and Offsets
- Pay particular attention when modeling a structure with varying floor-to-floor heights



Guidelines for Slab Modeling in RST

- Add design loads to your model (optional)
  - Loads
  - Load Cases
  - Load Combinations

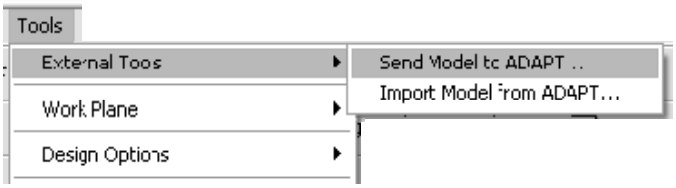




Transfer Model from RST to ADAPT

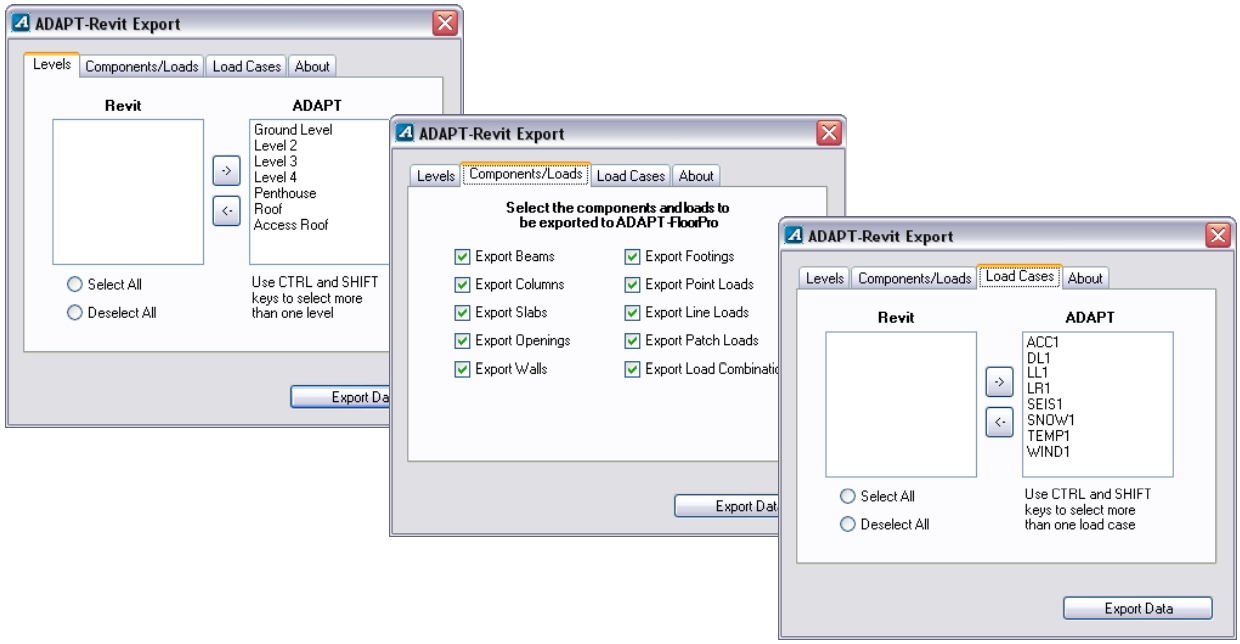
- Install free ADAPT-RST Link 2009
  (for up-to-date information go to www.adaptsoft.com/revitstructure)

- Under Tools select External Tools | Send Model to ADAPT…



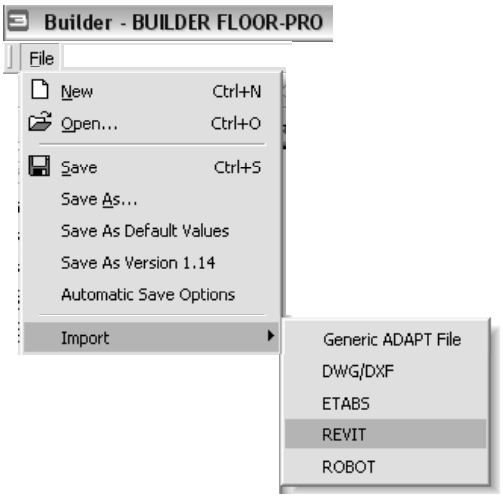
Transfer Model from RST to ADAPT

- Select items you wish to transfer and select Export Data to create ADAPT Model Exchange [*.inp] file



Advanced Slab & Rebar Design in ADAPT

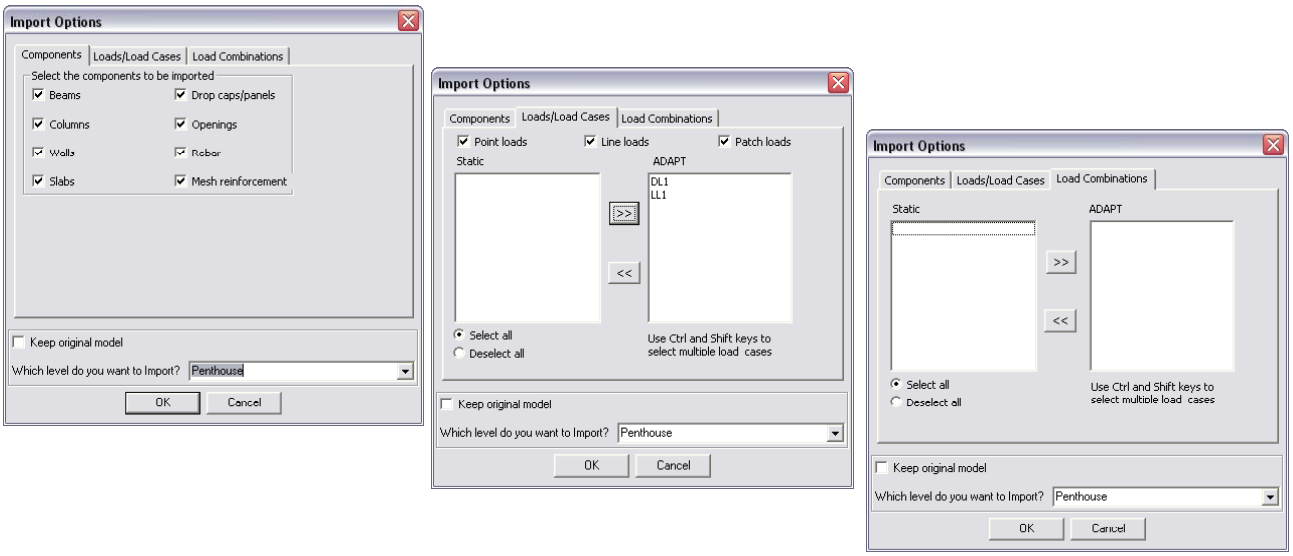
- Under File select Import | REVIT



- Import the saved *.inp file

Advanced Slab & Rebar Design in ADAPT

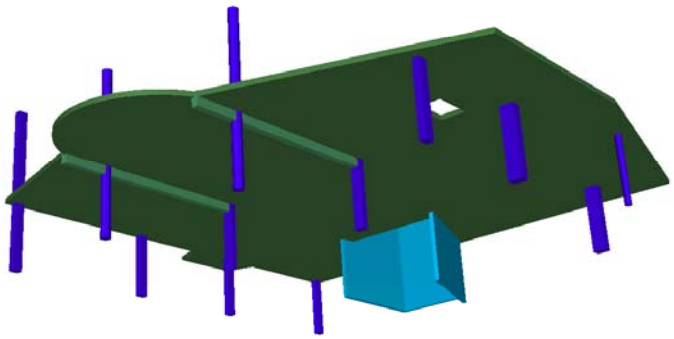
- Select Level and items you wish to import

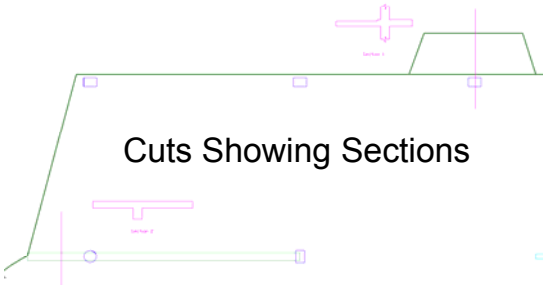


- A new model is created unless *Keep original model* is checked

Advanced Slab & Rebar Design in ADAPT

- A true 3D physical model of the level is created in ADAPT



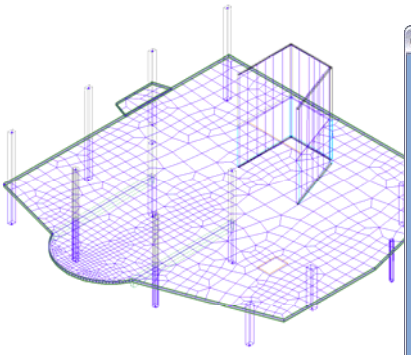


Cuts Showing Sections

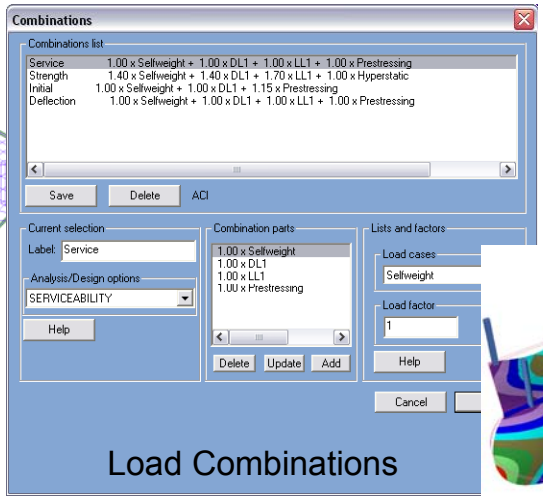
- All offsets and geometric details are maintained

Advanced Slab & Rebar Design in ADAPT

- Generate automatic 3D FEM mesh (analytic model)
- Update Load Combinations (use imported loads, if applicable)
- Analyze & view results

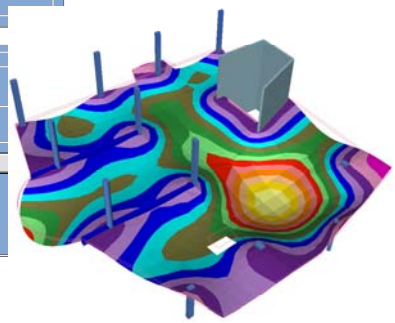


3D Finite Element Model



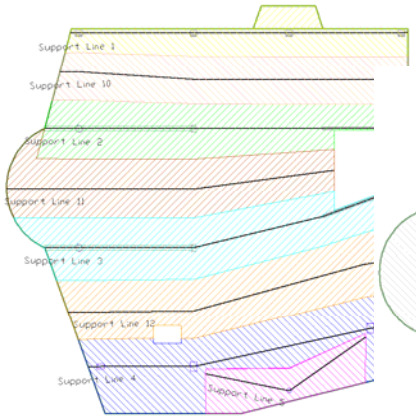
Load Combinations

Analysis Results

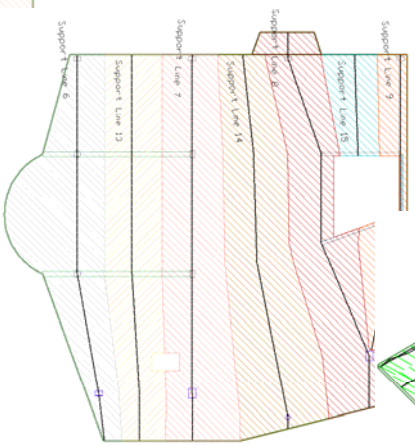


Advanced Slab & Rebar Design in ADAPT

- Define support lines (load path for placement of rebar)
- Design the slab

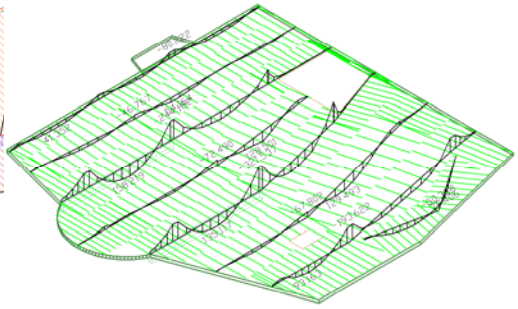


Support Lines X



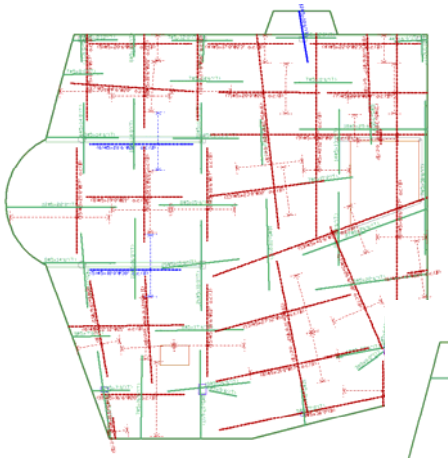
Support Lines Y

Design Moments X Direction

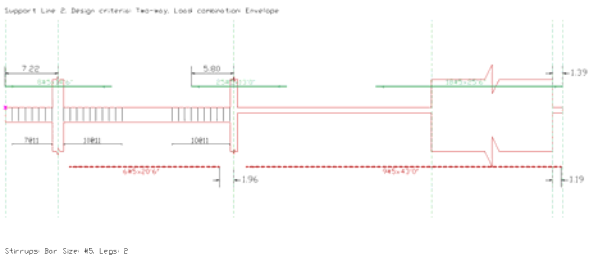


Advanced Slab & Rebar Design in ADAPT

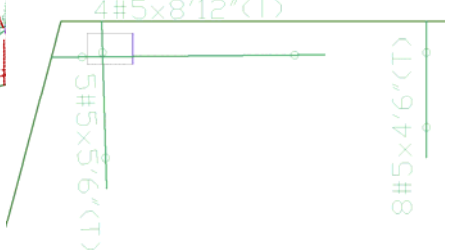
- Place designed reinforcement in slab
- Provides min amount of rebar needed at every location



Designed Rebar in Plan



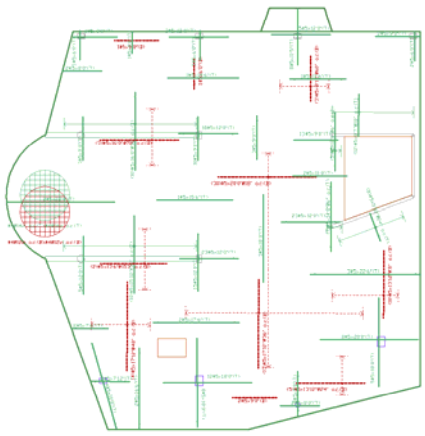
Designed Rebar in Elevation



Advanced Slab & Rebar Design in ADAPT

- Optimize rebar design and layout using Dynamic Rebar Design™ Technology
  - Add standard minimum reinforcement
  - Align rebar (orthogonal)
  - Extend to standardized bar lengths
  - Save modified rebar as Base reinforcement
- Redesign to verify and calculate any additional requirements

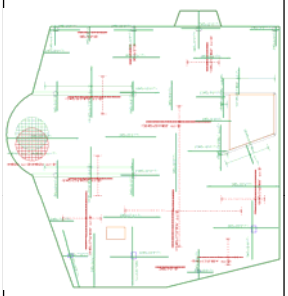
Final Optimized Rebar Design and Layout



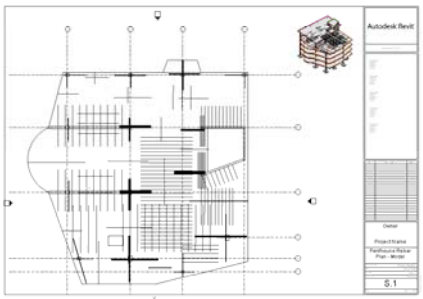
Generation of Structural Drawings

- Use BIM rebar information in ADAPT to produce structural drawings

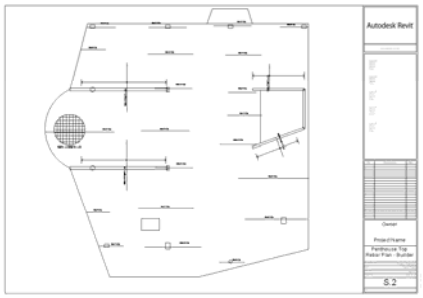
Rebar Information in ADAPT



Export 3D Rebar Model Information to RST



Export DWG of Rebar to RST and Link to Level

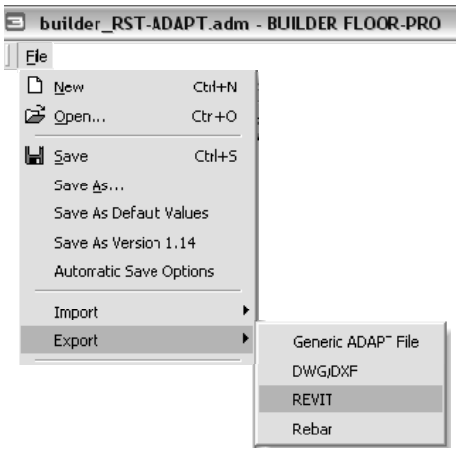


Export DWG of Rebar to AutoCAD

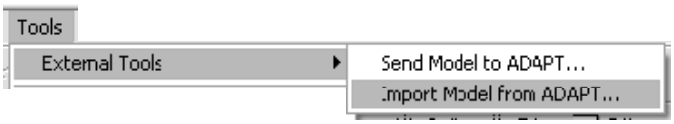
DWG/DXF Export

Synchronize RST and ADAPT Models

- Export structural and rebar model information from ADAPT

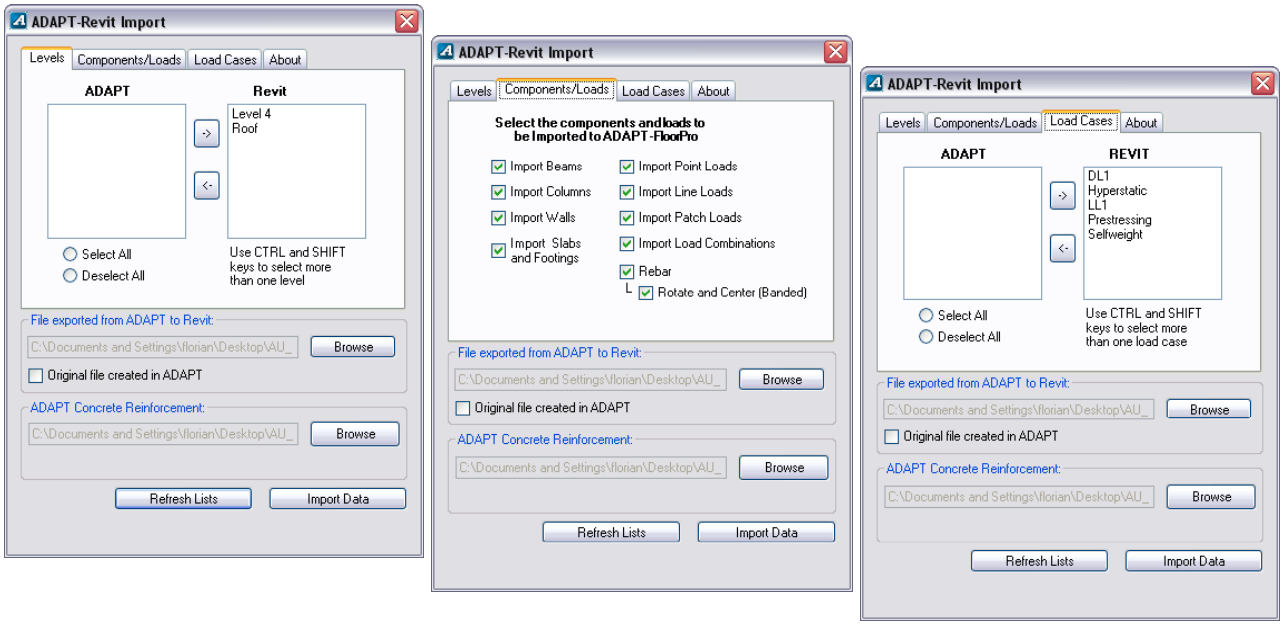


- To import model information into RST, under the Tools menu select External Tools | Import Model from ADAPT…



Synchronize RST and ADAPT Models

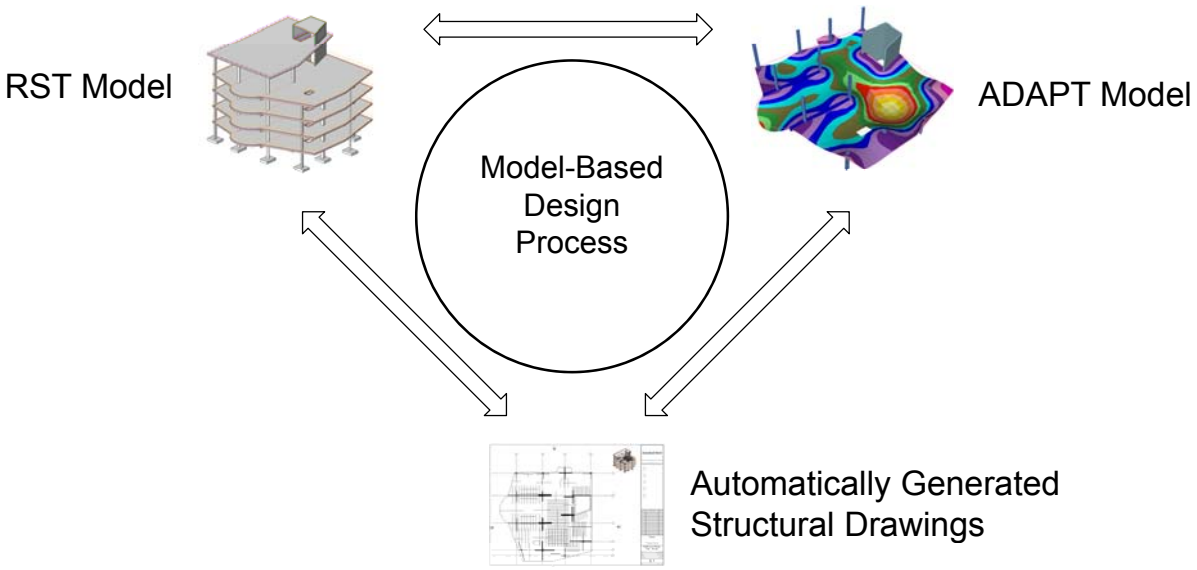
- Select which structural components and loads to synchronize



- You can update an existing RST model or create a new one

Model-Based Slab Design Process

- Manage and process design iterations more effectively using a combination of RST and ADAPT

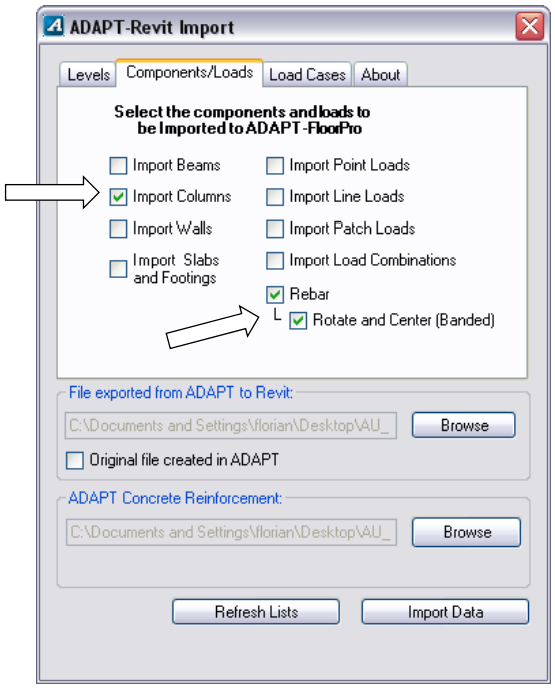


How to Incrementally Update Models

- You can incrementally update your RST or ADAPT models by only selecting those components types that have changed

- Tip: delete all components of the type you will update in your model before importing the new set

- Tip: agree up-front which component types will be managed in which software, then make changes and propagate based on your defined process



Model-Based Slab Design Process

- Benefits of design process using RST & ADAPT
  - Re-use model information to save time and reduce errors
  - Improve coordination by synchronizing RST & ADAPT models
  - Respond to design changes faster
  - Spend less time generating and updating structural drawings
  - Deliver / archive complete electronic asset of your design

ADAPT
Structural Concrete Software

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