Energy Modeling with Revit and Insight

Andrew Leavitt

Digital Practice Specialist / Electrical Designer

Leo A Daly

AUTODESK. UNIVERSITY

About the speaker

Andrew Leavitt

Andrew Leavitt is a Digital Practice Specialist and Electrical Designer at Leo A Daly in Minneapolis, Minnesota. He graduated from Tufts University with a degree in Mechanical Engineering and Astrophysics and has had a passion for learning ever since. He has worked closely with engineers and architects for his entire career and his breadth of knowledge has allowed him to develop strategies for bridging the gap between disciplines.

Session Description

Insight is a component of Revit software offering powerful energy-modeling capabilities through all stages of design. This course will cover the use of Insight to analyze Revit models, from the very earliest conceptual stages all the way through issuing construction documents. By using these methods, attendees can achieve their Architecture 2030, B3, and even net-zero goals. Attendees will learn how to use this powerful software to predict and optimize energy use, evaluating factors affecting both architects and engineers. With Insight, it is possible to analyze a wide range of potential design choices and chart a clear course toward reducing overall energy use, designing sustainable buildings with an easy-to-use and intuitive process.

Learning Objectives

- Use Revit and Insight to design more-sustainable buildings, optimize energy use, and meet Architecture 2030 goals
- Analyze and compare the energy use and impact of a range of HVAC and electrical systems
- Model schematic constructions or detailed thermal constructions to guide decisions regarding materials and methods
- Analyze and reduce energy use from the early design stages through the entire course of a project

Sustainability

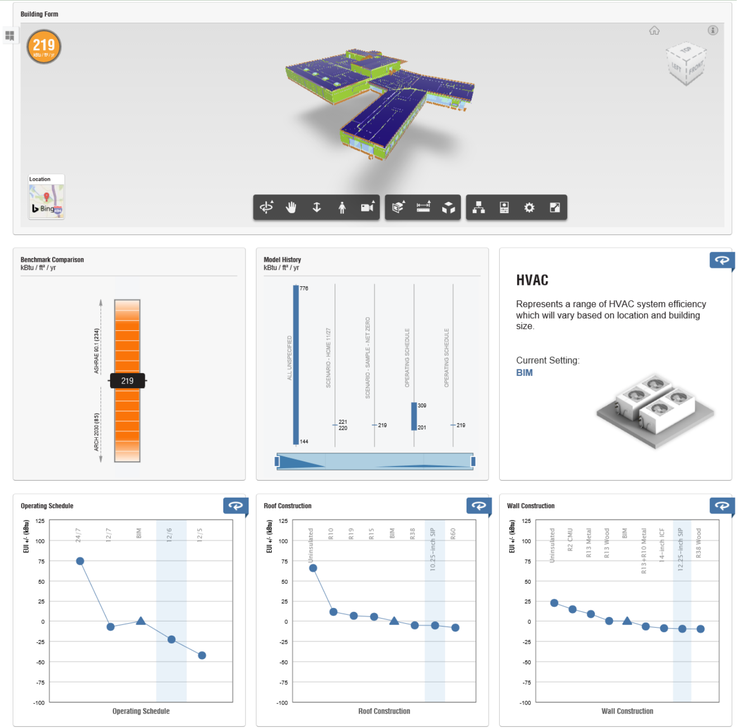
- Building operations account for 40% of energy use
- Architecture 2030, B3, and Net Zero provide guidelines and challenges
- Collaboration is key – all disciplines contribute

LEO A DALY

What Is Insight?

Autodesk® Insight is a powerful guide to Better Building Energy and Environmental Performance

- Create an Energy Model in Revit
  - Building Location
  - Masses or Building Elements
  - Energy Settings
- Analyze the Energy Model in the Cloud (A360)
- Calculate EUI and Annual Operating Cost
- Review Results by Category (Widgets)
- Compare Designs and Scenarios
- **Modify Criteria to Optimize EUI in Real-Time**

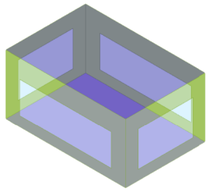


ASHRAE Standard 209-2018

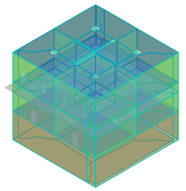
Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings

ASHRAE recently published an energy modeling process providing clearly-defined, discrete stages for analyzing and documenting building energy use, from the earliest conceptual design stages through construction and post occupancy. Using Revit and Insight, it is possible to perform and document the analysis defined in this standard.

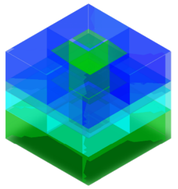
Modeling Cycle #1
Simple Box Modeling



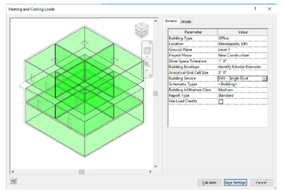
Modeling Cycle #2
Conceptual Design Modeling



Modeling Cycle #3
Load Reduction Modeling

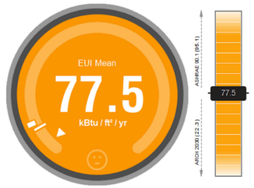


Modeling Cycle #4
HVAC System
Selection Modeling



Modeling Cycle #5
Design Refinement

Modeling Cycle #6
Design Integration
and Optimization



Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #1
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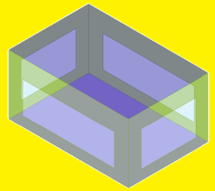

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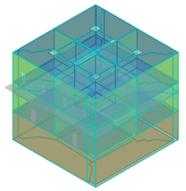

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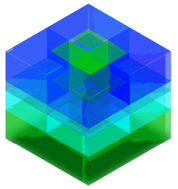

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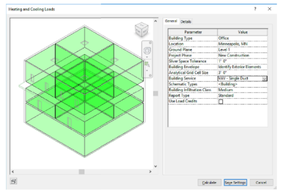

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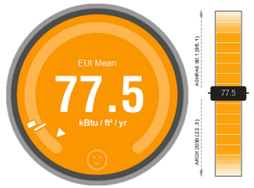

Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #1 – Simple Box Modeling

REVIT

- Set Site Location
- Conceptual Mass Model or Building Element Model
  - Exterior Surfaces
  - Glazing and Openings
  - Shades
- Model and compare concepts
- Optimize building form and orientation based on building type and location

INSIGHT

- Vary:
  - Window-to-Wall Ratio
  - Orientation on Site
  - Thermal Performance of Envelope

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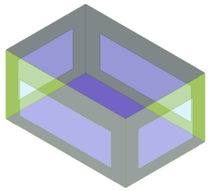
Simple Box Modeling



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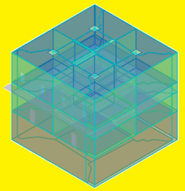

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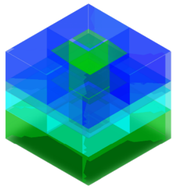

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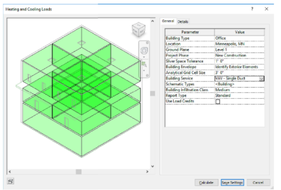

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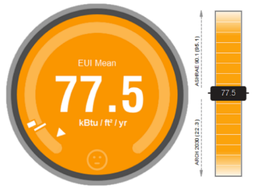

Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #2 – Conceptual Design Modeling

REVIT

- Refine building concepts based on results of Modeling Cycle #1
- Generate and Optimize Energy Models
  - Rapid prototyping
  - Quickly see what choices are more sustainable
  - Make decisions while it's still possible to make big changes

INSIGHT

- Compare building designs
  - Create an *Insight* (category)
  - Compare designs with the same *Scenario* (widget settings)
  - Determine necessary changes to meet ASHRAE 90.1, Architecture 2030, or Net Zero

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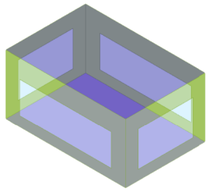
Simple Box Modeling



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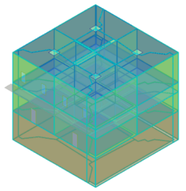

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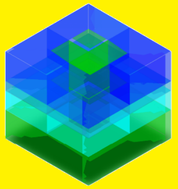

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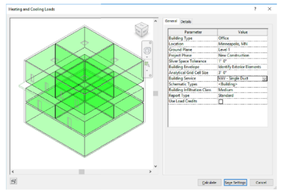

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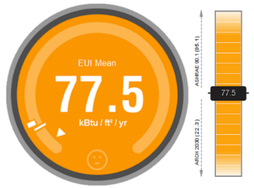


Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #3 – Load Reduction Modeling

INSIGHT

- Analyze Heating and Cooling Loads
- Calculate EUI and Annual Cost
- Develop Load Reduction Strategies
  - Building Envelope
  - Lighting and Daylighting
  - Internal equipment loads

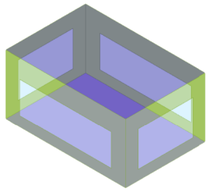
REVIT

- Apply Load Reduction Strategies to building model
- Heating and Cooling Loads Report
- Analyze and further optimize with Insight

REVIT SYSTEMS ANALYSIS

- New feature of Revit 2020.1
- Load calculations, equipment sizing, analysis, and more!

Modeling Cycle #1
Simple Box Modeling



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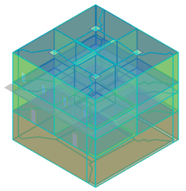

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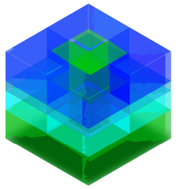

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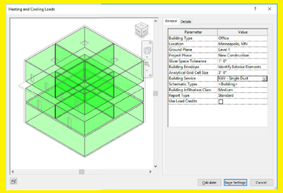

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Design Refinement

Modeling Cycle #6
Design Integration
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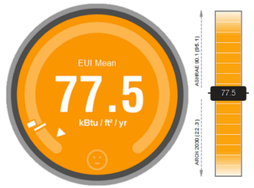


Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #4 – HVAC System Selection Modeling

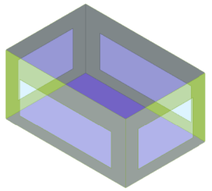
REVIT

- Select HVAC System (Energy Settings)
  - Predefined systems
  - Detailed information available through the Autodesk Knowledge Network
- Refine Building and Space Type Settings
  - Energy Settings
  - Construction Type
  - Operating Schedule

INSIGHT

- HVAC Systems Widget
- Evaluate impact of HVAC System on EUI and cost
  - Relationship varies based on energy costs

Modeling Cycle #1
Simple Box Modeling



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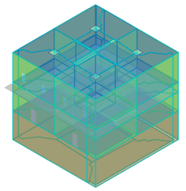

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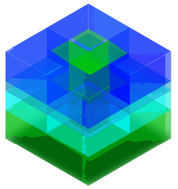

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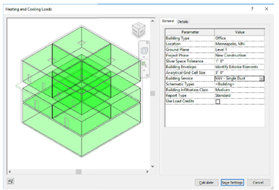

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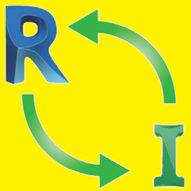

Modeling Cycle #6
Design Integration
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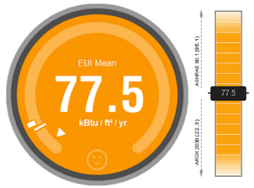


Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #5 – Design Refinement

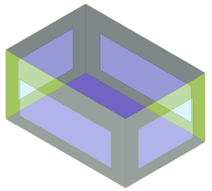
REVIT

- Accurately model building elements
  - Schematic Types
  - Detailed Elements
- Apply Energy Analysis Properties to Spaces
  - Condition Type
  - People Loads
  - Electrical Loads

INSIGHT

- Ongoing analysis
  - Quick
  - Informative
  - Cloud-based – doesn’t tie up your computer

Modeling Cycle #1
Simple Box Modeling



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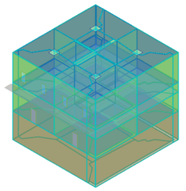

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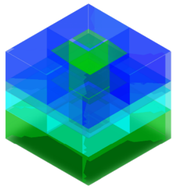

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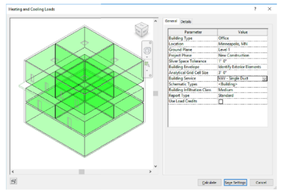

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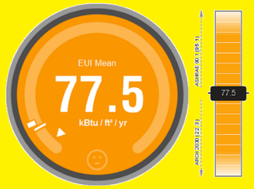


Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

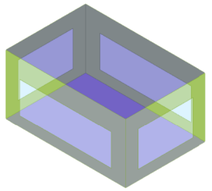
Next Project

Modeling Cycle #6 – Design Integration and Optimization

INSIGHT

- Optimize building energy use
  - Identify *Optimization Objectives*
    - ASHRAE 90.1, Architecture 2030, and Net Zero are easy to recognize
  - Vary at least two *design variables*
    - More than 20 Widgets to play with
- Save Scenarios
- Predict EUI and cost based on design decisions and variables
- Review history

Modeling Cycle #1
Simple Box Modeling



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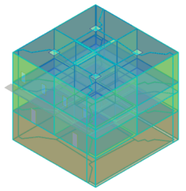

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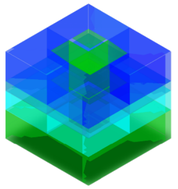

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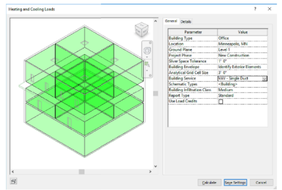

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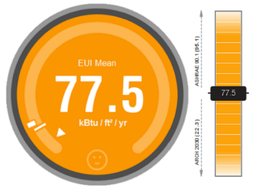

Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Modeling Cycle #7 – Energy Simulation-Aided Value Engineering

REVIT

- Make difficult decisions
- Reduce costs
- Try not to compromise design intent

INSIGHT

- Analyze design decisions
- Mitigate increases in up-front costs with reduction in annual energy costs

RECAP – From Simple to Complex

START SIMPLE

- Analyze building form and orientation
- Masses or building elements
- Generalized assumptions (Energy Settings)

ADD COMPLEXITY

- Conceptual Types → Schematic Types → Detailed Elements
- Building and Space Types
  - Load Assumptions
  - Construction Types
  - Operating Schedule
- Spaces
  - Energy Analysis Properties

RECAP – Optimize with Insight

QUICK AND EASY

- Analyze energy use throughout the design process
  - Compare to benchmarks and previous results
- Make design decisions based on analysis results

DATA AND REPORTS

- ASHRAE 140 Verified
- Export data compatible with other energy modeling software
  - gbXML
  - DOE-2.2
  - EnergyPlus
- Graphical benchmarks for reports and marketing

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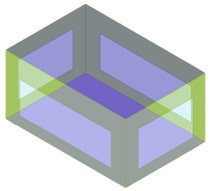
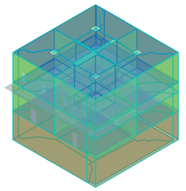
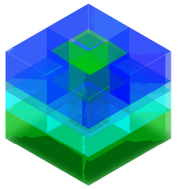


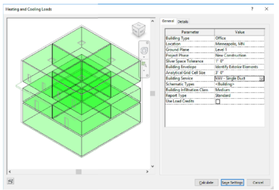
Modeling Cycle #2
Conceptual Design Modeling



Modeling Cycle #3
Load Reduction Modeling

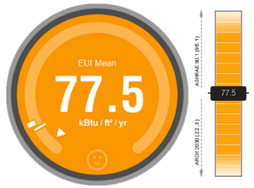


Modeling Cycle #4
HVAC System
Selection Modeling



Modeling Cycle #5
Design Refinement

Modeling Cycle #6
Design Integration
and Optimization



Modeling Cycle #7
Energy Simulation-Aided
Value Engineering

Next Project

Thank You!

Questions?

Contact Me!

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LINKEDIN (MIGHT GET LOST)

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