Early Collaboration Between Engineers and Architects

“Ways of working effectively, together, to create successful energy-efficient designs”

presented to

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by

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Summary

- Oregon Energy Code Compliance – 3 methods
  - Prescriptive
  - Simplified Trade-off Approach (STA) – CodeComp
  - Whole Building Approach
- Envelope analysis
- Efficiency vs. costs
- Overall building efficiency
Different ways of looking at the world

Physical world (visual images)

Numbers (quantitative)

\[ \text{Energy} = \text{Mass} \times \text{(speed of light in vacuum)}^2 \]

\[ \frac{1}{2} v^2 = P + \rho g z + \text{Const} \]

Simplified Trade-off Approach with CodeComp

Balancing the envelope components for an efficient, code-compliant building
Glass, Glass, and More Glass...

How window to wall ratio affects the design
More window to wall ratio problems

Adjusting the glazing shading coefficient
Adjusting glazing U-factor and SC

![Graph showing the relationship between U-factor and shading coefficient for different window efficiency options.]

- Most efficient options
- Moderately efficient options
- Inefficient options

Legend:
-三角形: Oregon code baseline
-红色圆圈: 窗口设计 - 低于1%年度能源节省
-红色X: 4%到5.5%年度能源节省
-绿色三角形: 能源效率低的窗户规格
-绿色圆圈: 最高效设计 - 接近8%年度能源节省

*Denotes energy savings relative to Oregon code.

How windows affect the cooling loads

![Graph showing the impact of different window specifications on peak and annual cooling loads.]

- Peak Cooling
- Annual Cooling

Legend:
-蓝色柱状图: Peak Cooling
-绿色柱状图: Annual Cooling

-红色柱状图代表不同的窗口规格选项，如Uall = 0.50, SC = 0.38等。

*Figure courtesy of Thornton Energy Consulting*
Energy efficiency vs. energy savings

Energy efficiency vs. energy savings (con’t)
Identifying energy efficiency measures (EEMs)

Energy End Uses for a Typical High Rise Apartment
- lighting: 24%
- ventilation: 12%
- hot water: 14%
- space heating: 30%
- space cooling: 7%
- elevator: 3%
- equipment and appliances: 10%

Energy End Uses for a Typical Office Building
- lighting: 37%
- ventilation: 8%
- hot water: 1%
- space heading: 35%
- space cooling: 3%
- elevator: 2%
- equipment and appliances: 14%

Solution: Start compliance work early!

Preliminary CodeComp models are easy to create and provide direction for the building’s compliance
Energy Efficient Building – From the Start

A building cannot meet the 2030 challenge without an integrated design

Making early collaboration easier

From Revit...

...to eQUEST
More Revit to eQUEST

By Collaborating with Engineers Early...

- Avoid costly redesign and change orders
- Make code compliance easy (and fun?)
- Optimize and design an energy efficient envelope, not just building systems
- Obtain that higher window-wall ratio you always wanted
- Track all energy efficiency measures from the start
- Makes it easier to get all 10 LEED EAc1 points