

Early Collaboration Between Engineers and Architects

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

presented to

SimBuild 2008

by

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July 30, 2008 through August 1, 2008

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Summary

- ✓ Oregon Energy Code Compliance – 3 methods
 - u Prescriptive
 - u Simplified Trade-off Approach (STA) – CodeComp
 - u Whole Building Approach
- ✓ Envelope analysis
- ✓ Efficiency vs. costs
- ✓ Overall building efficiency

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Different ways of looking at the world

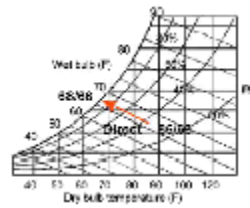
Physical world (visual images)



Numbers (quantitative)

Energy = Mass \times (speed of light in vacuum)²

$$\frac{1}{2} V^2 = P + \rho g Z + Const$$



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Simplified Trade-off Approach with CodeComp

Balancing the envelope components for an efficient,
code-compliant building



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Glass, Glass, and More Glass...

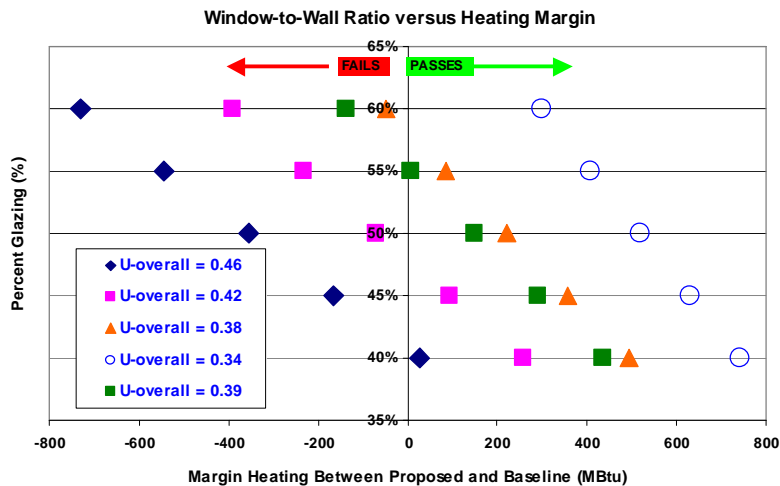


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How window to wall ratio affects the design



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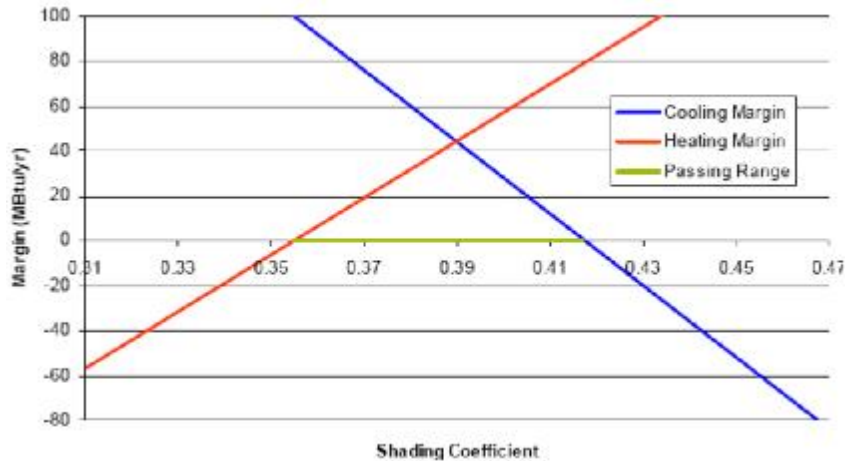
More window to wall ratio problems

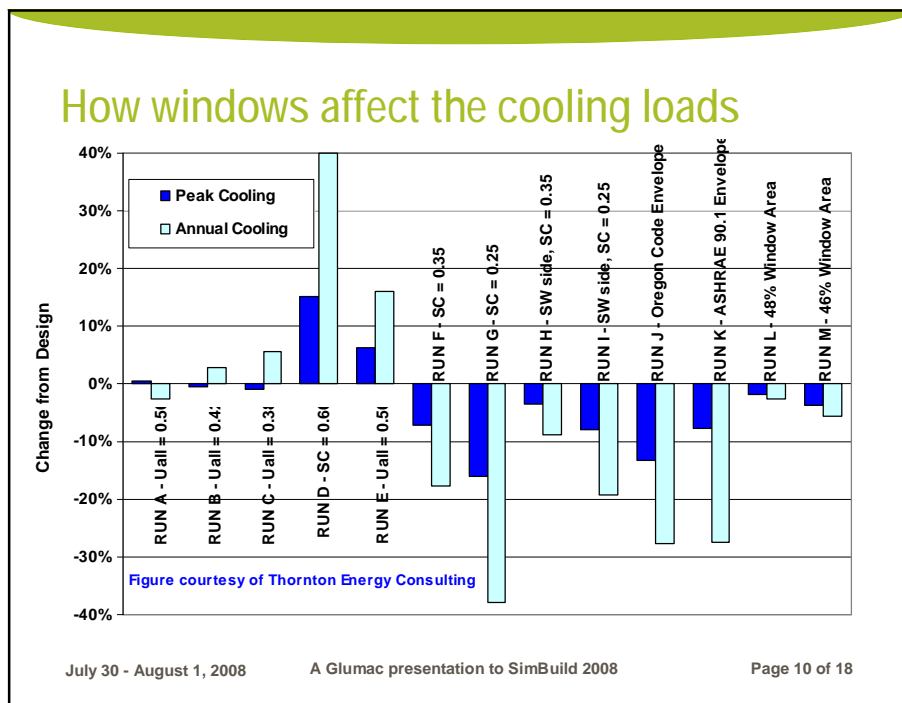
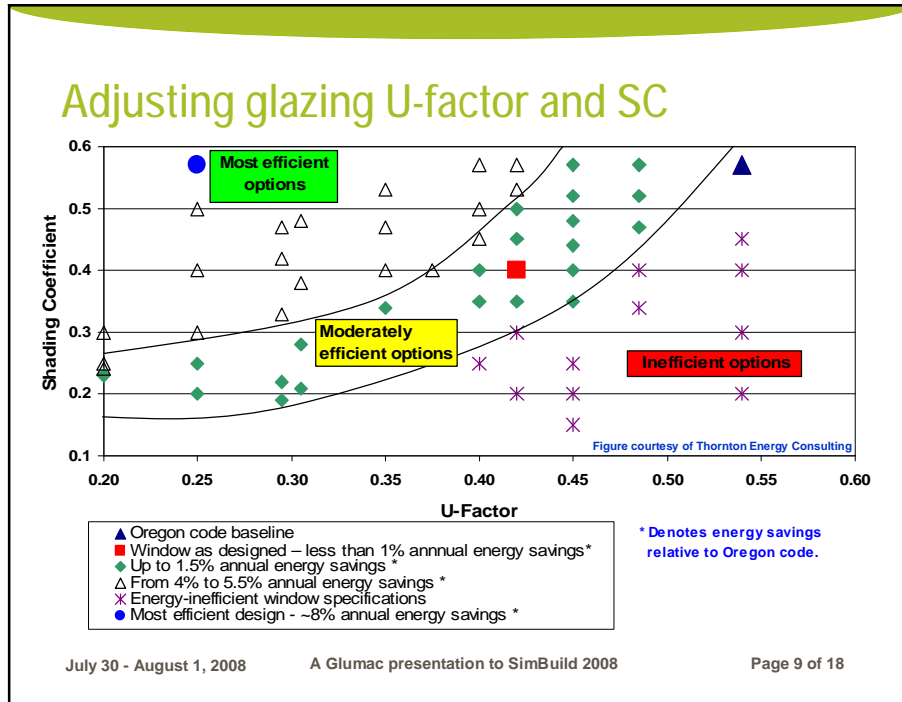
North & East Window Shading Coefficient	North & East Window Shading Coefficient																							
	0.33	0.36	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75														
0.55	-81	-86	FAIL	-179	118	FAIL	-80	95	FAIL	-205	107	FAIL	-243	57	FAIL	-291	95	FAIL	-339	288	FAIL	-387	328	FAIL
0.50	-36	-42	FAIL	-72	75	FAIL	-110	112	FAIL	-147	147	FAIL	-184	181	FAIL	-221	215	FAIL	-258	249	FAIL	-295	285	FAIL
0.45	10	1	PASS	-17	38	FAIL	-53	75	FAIL	-88	107	FAIL	-125	141	FAIL	-161	174	FAIL	-197	209	FAIL	-233	241	FAIL
0.40	14	-2	FAIL	-28	-1	FAIL	4	32	PASS	-21	57	FAIL	-65	103	FAIL	-101	135	FAIL	-137	169	FAIL	-173	203	FAIL
0.35	174	75	FAIL	92	41	FAIL	61	7	FAIL	27	77	PASS	7	61	FAIL	41	25	FAIL	75	129	FAIL	109	163	FAIL
0.30	184	-19	FAIL	161	-81	FAIL	118	-47	FAIL	65	-19	FAIL	52	21	PASS	18	-55	FAIL	-34	89	FAIL	-47	129	FAIL

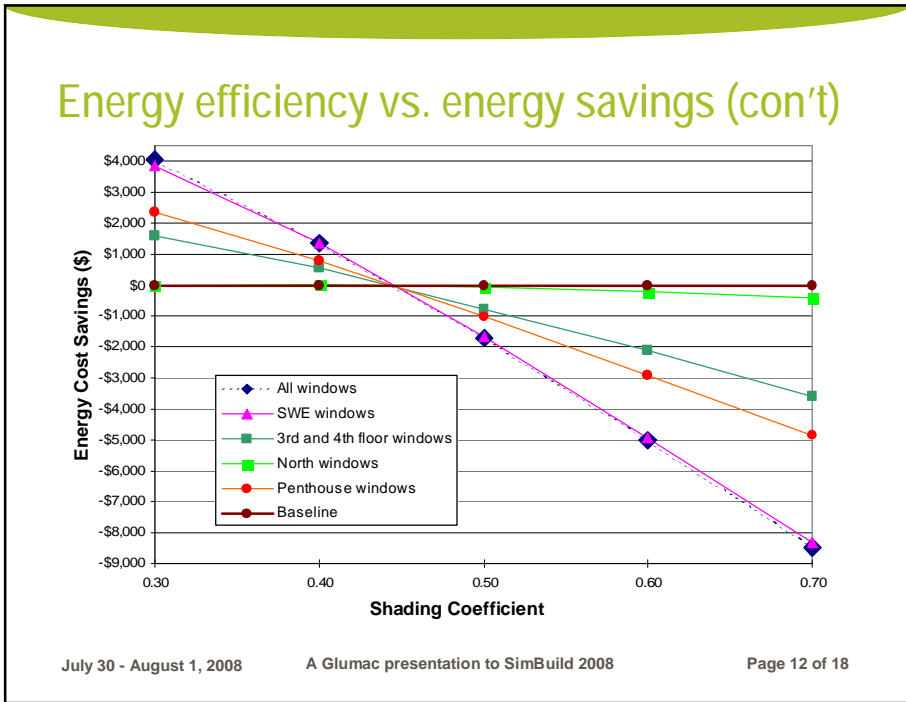
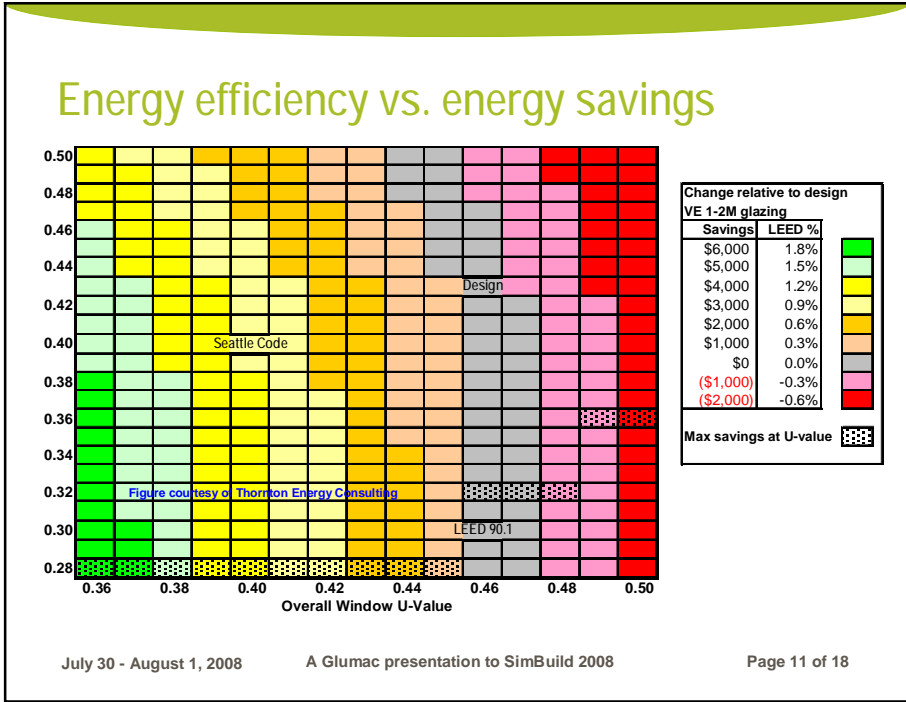
North & West Window Shading Coefficient	North & West Window Shading Coefficient																							
	0.33	0.36	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75														
0.55	52	2	PASS	75	42	PASS	-17	16	FAIL	-41	128	FAIL	-87	164	FAIL	-114	188	FAIL	-149	237	FAIL	-187	292	FAIL
0.50	57	-18	FAIL	83	24	PASS	29	10	PASS	-2	62	FAIL	-39	120	FAIL	-72	165	FAIL	-107	194	FAIL	-141	224	FAIL
0.45	63	-46	FAIL	89	-14	FAIL	75	20	PASS	34	64	PASS	2	85	PASS	-32	122	FAIL	-66	150	FAIL	-100	194	FAIL
0.40	171	-85	FAIL	145	-52	FAIL	111	-18	FAIL	77	18	PASS	43	60	PASS	6	84	PASS	-25	110	FAIL	-59	152	FAIL
0.35	221	-124	FAIL	188	-88	FAIL	152	-58	FAIL	116	-22	FAIL	84	12	PASS	58	46	PASS	16	82	PASS	-16	114	FAIL
0.30	261	-155	FAIL	227	-128	FAIL	188	-88	FAIL	158	-58	FAIL	125	-25	FAIL	91	8	PASS	-27	47	PASS	-29	70	PASS

North & West Window Shading Coefficient	North & West Window Shading Coefficient																							
	0.33	0.36	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75														
0.65	98	-32	FAIL	67	-46	FAIL	39	-13	FAIL	-2	217	FAIL	-42	307	FAIL	-74	384	FAIL	-108	480	FAIL	-147	553	FAIL
0.60	122	-50	FAIL	66	-12	FAIL	65	65	PASS	31	105	PASS	-3	224	FAIL	-37	388	FAIL	-71	382	FAIL	-105	459	FAIL
0.55	173	-84	FAIL	84	-25	FAIL	100	20	PASS	68	102	PASS	34	162	PASS	6	223	PASS	-34	290	FAIL	-68	359	FAIL
0.50	207	-109	FAIL	172	-52	FAIL	136	8	FAIL	100	45	PASS	71	100	PASS	37	154	PASS	3	202	PASS	-31	292	FAIL
0.45	244	-143	FAIL	210	-98	FAIL	173	-55	FAIL	142	-11	FAIL	158	22	PASS	74	77	PASS	42	121	PASS	6	102	PASS
0.40	281	-175	FAIL	247	-136	FAIL	213	-100	FAIL	179	-68	FAIL	145	-34	FAIL	111	0	FAIL	73	30	FAIL	42	-86	FAIL

Adjusting the glazing shading coefficient

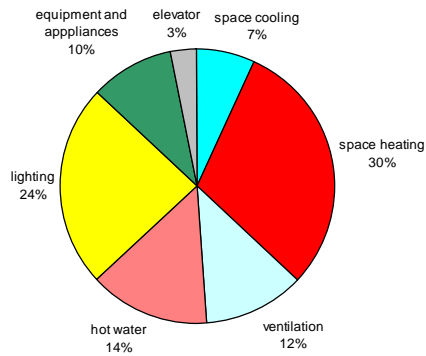




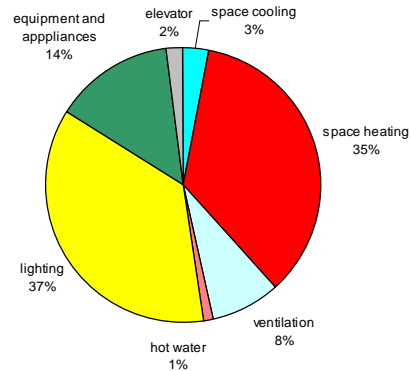


Identifying energy efficiency measures (EEMs)

Energy End Uses for a Typical High Rise Apartment



Energy End Uses for a Typical Office Building



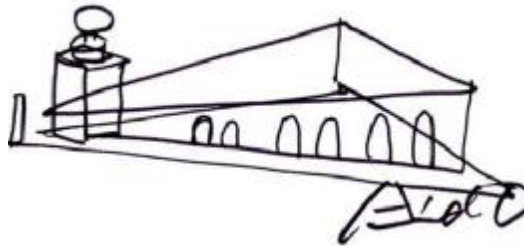
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Solution: Start compliance work early!

Preliminary CodeComp models are easy to create and provide direction for the building's compliance



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Energy Efficient Building – From the Start

A building cannot meet the 2030 challenge
without an integrated design



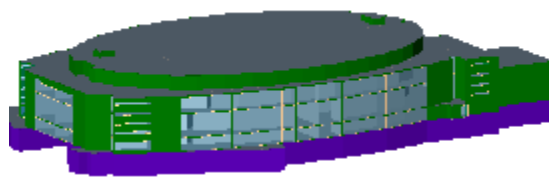
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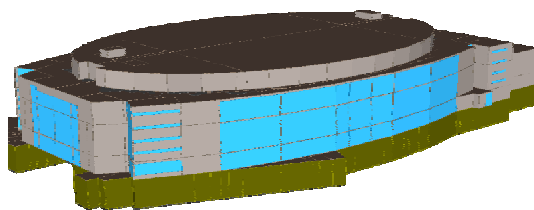
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Making early collaboration easier

From Revit...



...to eQUEST

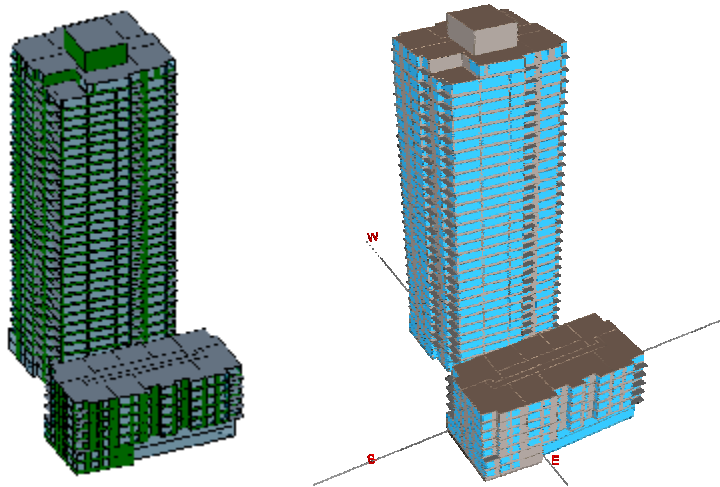


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More Revit to eQUEST



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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

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