- Structural Finite Element Analysis
- Lighting Natural / Glare Analysis
- Mechanical Energy Analysis

- Tools
- US DOE comparison of tools:
- <u>http://www.eere.energy.gov/</u> <u>buildings/tools_directory</u>











Notes

• The NRB facility (highlighted in red) will be generally unobstructed by adjacent site buildings in regard to solar exposure. The link partially obscures the west wing in the morning and the east wing in the afternoon.



Notes

• While a large, un-shaded area of glazing provides ample illumination of the interior, the brightest (red) interior surfaces are in stark contrast to the darkest areas. The result is glare. Occupants at the perimeter will tend to close the shades, thereby reducing available light throughout.



OVERAL ENERGY MODELING STRATEGY



- The Case Study Model is intended to demonstrate a variety of exposure and configuration variations in a single example.
- Simplicity is preferred, in the interest of facilitating experimentation

- The Curtain Wall and windows are modeled using the basic Revit tools.
- The skylights and atrium roof are modeled as a "sloped glazing" roof type.



- The Heating/Cooling Load Calculation took about 15 seconds. It includes this Room Summary as well as detail for each of the rooms.
- This calculation and report took approximately 20 seconds to compute

Building Analytical Volume:	15	2599.97 CF		
Room Summary				
Name	Area	Airflow	Cooling Load (Total)	Heating Load (Total)
1 Punch Corner	522 SF	756 CFM	17573.9 Btu/h	17050.1 Btu/h
2 Punch Deep	259 SF	324 CFM	7612.1 Btu/h	7485.2 Btu/h
3 Punch Square	533 SF	634 CFM	14977.9 Btu/h	14425.5 Btu/h
4 Punch Wide	1082 SF	1262 CFM	29868.0 Btu/h	28572.9 Btu/h
5 Punch Atrium	533 SF	656 CFM	15419.0 Btu/h	16022.8 Btu/h
6 Punch Sky Deep	305 SF	375 CFM	8826.3 Btu/h	8669.7 Btu/h
7 Punch Sky Square	533 SF	634 CFM	14982.4 Btu/h	14441.1 Btu/h
8 Punch Sky Wide	1082 SF	1264 CFM	29906.3 Btu/h	28612.4 Btu/h
9 Punch Sky Corner	522 SF	694 CFM	16214.9 Btu/h	17134.8 Btu/h
10 CW Corner	560 SF	1222 CFM	27719.0 Btu/h	23354.4 Btu/h
11 CW Deep	268 SF	386 CFM	8982.1 Btu/h	9307.3 Btu/h
12 CW Square	552 SF	738 CFM	17254.2 Btu/h	17787.1 Btu/h
13 CW Wide	1120 SF	1466 CFM	34334.3 Btu/h	35100.7 Btu/h
14 CW Atrium	576 SF	963 CFM	22114.9 Btu/h	18763.9 Btu/h
15 CW Sky Deep	316 SF	452 CFM	10513.5 Btu/h	12025.6 Btu/h
16 CW Sky Square	552 SF	738 CFM	17248.4 Btu/h	17824.8 Btu/h
17 CW Sky Wide	1120 SF	1470 CFM	34423.7 Btu/h	35222.9 Btu/h
18 CW Sky Corner	560 SF	1066 CFM	24282.8 Btu/h	23424.1 Btu/h
20 Sky Corridor	553 SF	691 CFM	16257.5 Btu/h	15824.8 Btu/h
22 Corridor	670 SF	833 CFM	19607.6 Btu/h	18973.9 Btu/h
23 Atrium	2664 SF	3228 CFM	76541.8 Btu/h	69600.9 Btu/h
Totals	14884 SF	19852 CFM	464660.7 Btu/h	449624.8 Btu/h

9

Cooling Loads Heating Loads **Orientation of CW ORIENTATION VARIATIONS** 457,334 North 310,774 By changing the • orientation of the South 480,024 310,774 104.96% 100.00% model in Revit and rerunning the energy analysis, it was easy to compare the effect of 580,565 310,774 East 126.95% 100.00% altering Curtain Wall exposure. 310,774 West 583,873 127.67% 100.00% This Technique allow ۲ one to optimize the orientation. NNE - 10 deg 310,774 470,868 102.96% 100.00% NE - 45 deg 550,594 120.39% 310,774 100.00% NW - 45 dge 519,812 113.66% 310,774 100.00% NNW - 10 deg 455,443 99.59% 310,774 100.00%









THERMAL MASS



SOLAR SHADING



DATLIGHTING



Project Case Study













concrete roof deck with 2% slope





ASHRAE 55 comfort chart (pg 7) Green – ASHRAE comfort boundary Red – conventional HVAC design boundary







Washington D.C. monthly average precipitation





Washington D.C. Hourly Temperature Distribution



Project Case Study

