

MICRODESK



S113 - Introduction to Autodesk Green Building Studio
Peter Marchese

8:30 – 9:30
Rm 155

What is it?



An Energy Analysis Tool that does not require you to be an engineer

A web based way to check your energy, carbon and water for your building

A relatively simple way to get the information you need to make sustainable design decisions when its easier to do so.

Early in the process

What is it used for?



To help create sustainable design solutions by making more informed decisions about your building in the early design phases and proactively planning for LEED

Performing whole building analysis to work towards carbon neutral design.

Giving the Designer a chance to be more informed in the dialogue with their engineers or energy consultants

What it does it work with?



- With plug-in:
 - Revit Architecture 2009
 - Revit MEP 2009

- Via Export:
 - Revit Architecture 2008
 - Revit MEP 2008
 - AutoCAD Architecture 2008
 - AutoCAD MEP 2008

- Currently in Development
 - Graphisoft ArchiCAD

Who uses this?



Mostly Architects and Designers, Engineers tools are more powerful.
But also more complex.

Anyone looking for estimates on:

- Annual energy cost
- Lifecycle energy costs (30 year)
- Annual energy consumption (electric and gas)
- Peak electric energy demand (kW)
- Lifecycle energy consumption (electric and gas)
- Onsite energy generation from photovoltaic and wind systems
- Water use analysis
- Assistance with daylighting using glaze factor calculations
- Natural ventilation potential calculations
- Carbon emission calculations

Why would you want it?



You are looking for a competitive edge

You want to aim for LEED credits early on in a project

You want to work with energy consultants more closely

Can this help with LEED?



Yes

Green Building Studio gives you data and information for Water Efficiency 1, 2, and 3 and Glazing that ties into Energy and Atmosphere 1, and 2 for Leed credits.

Much of the other data can be used to help lead your design in the right direction as well, although it does not produce the required documentation.

Can this help with GSA?

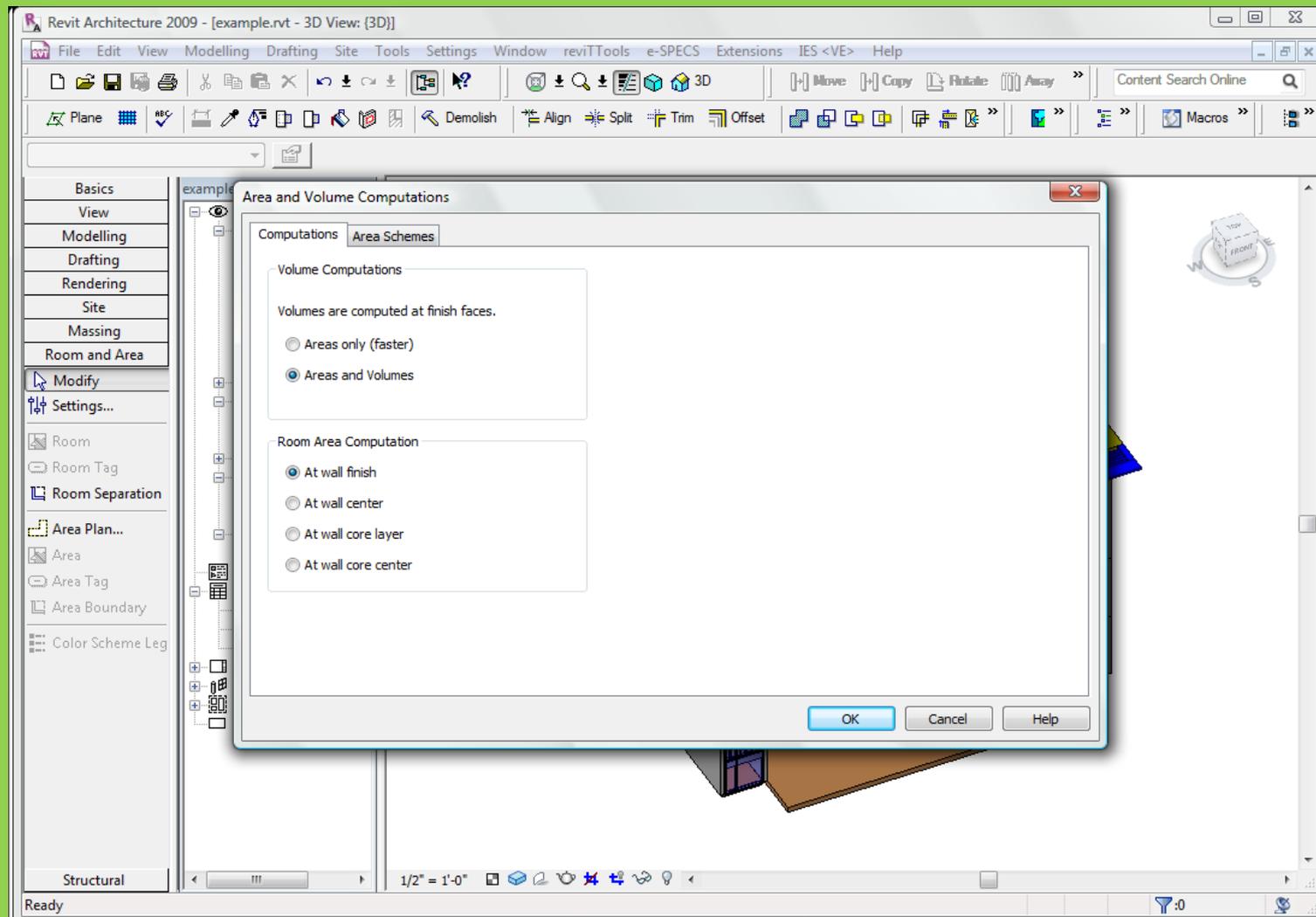


Yes

The GSA has created the National 3D-4D BIM Program to allow for Advanced and Superior cost effective management of Federal buildings and Facilities.

One of the components of this is the Energy Performance and Operations section. Using GBS can help use your BIM model towards getting more complete and accurate energy estimates earlier in the design process. Leading to meeting their executive order to reduce their annual energy consumption.

Preparing the Revit Model



Getting the Model to GBS



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Autodesk Green Building Studio Run Status

Welcome gbs ma

Project:	EcoBuild Tradeshow Example
Run Title:	example
Run Status:	Populating file with defaults

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Energy & Carbon Results

Annual Electric End Use

HVAC 94.3%

Building Summary

Quick Stats

If values are red or blue they appear to be higher or lower than typical ranges, respectively.

Number of People	26 people
Average Lighting Power Density	0.11 W/ft²
Average Equipment Power Density	1.44 W/ft²
Specific Fan Flow	1.6 cfm/ft²
Specific Fan Power	0.900 W/cfm
Specific Cooling	209 ft²/ton
Specific Heating	15 ft²/kBtu
Total Fan Flow	11,600 cfm
Total Cooling Capacity	36 tons
Total Heating Capacity	501 kBtu

Constructions

U-Value: Btu/(hr-ft²-F°)

Roofs

R15 over Roof Deck	371 ft²
U-value: 0.06	1

Exterior Walls

R13 Metal Frame Wall	10,525 ft²
U-value: 0.16	1

Interior Walls

R0 Metal Frame Wall	6,263 ft²
U-value: 0.16	1

LEED Daylight⁵

Area w/ Glazing Factor > 2%: 3.7% - No LEED Credit

5. Glazing Factor is the ratio of exterior illumination to interior illumination and is calculated using floor area, window geometry (area and height) and visible transmittance of the glass. The project qualifies if glazing factor is > 2% in a minimum of 75% of all regularly occupied areas.

Wind Energy Potential⁶

Annual Electric Generation: 543 kWh

6. A single 15 ft diameter turbine, with cut-in and cut-out winds of 6 mph and 45 mph respectively, and located at the coordinates of the weather data.

Natural Ventilation Potential⁷

Total Hours Mech. Cooling Required:	5,028 Hours
Possible Natural Ventilation Hours:	1,857 Hours
Possible Annual Electric Energy Savings:	15,213 kWh
Possible Annual Electric Cost Savings:	\$2,206
Net Hours Mech. Cooling Required:	3,171 Hours

7. Assumes natural ventilation only during comfort zone periods and air changes per hour are less than 20 ACH. Building form & opening design must be able to allow stack effect or cross ventilation.

Done
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Our Results



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Energy & Carbon Results **US EPA ENERGY STAR** Water Usage PV Analysis LEED Daylight Weather 3D VRML View

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Energy & Carbon Results
Annual Electric End Use

Category	Percentage
Electric	100%
Gas	0%
Oil	0%
Other	0%

Design
This column displays estimated energy use, costs, rating and % energy reduction "better than average" for a building design.

Top 10%
This column displays energy use, costs, rating and % energy reduction "better than average" for a design intended to perform among the top 10% of similar US commercial buildings.

EPA Energy Performance Rating (1-100)
A design rating for the project uses a 1-100 scale (expressed as a percentage). A 90 design rating would indicate that the energy design intent is in the top 10% as compared to the US commercial building population of similar buildings. EPA's national energy performance rating is calculated using source energy. Source energy is a measure that accounts for the energy consumed on site in addition to the energy consumed during generation and transmission in supplying the energy to your site.

Energy Reduction %
The energy reduction is a measure of how much better your facility performs as compared to an average building (target rating of 50). It is calculated by comparing the design or target energy consumption against the consumption for that facility with a rating of 50. The energy reduction is calculated using source energy. Source energy is a measure that accounts for the energy consumed on site in addition to the energy consumed during generation and transmission in supplying the energy to your site.

Site Energy Use Intensity (kBtu/Sq. Ft./yr)
The annual on-site energy intensity estimate for your building design which accounts for all energy consumed at the building location.

Total Annual Energy Cost (\$)
The total annual energy cost. If an energy rate is not entered, the rate is derived from the DOE-EIA State Average Fuel Rate based on the zip code for your design.

CO2 Emissions
The amount of carbon dioxide emitted due to the facility's energy consumption. Carbon dioxide emissions are calculated using source energy. Source energy is a measure that accounts for the energy consumed on site in addition to the energy consumed during generation and transmission in supplying the energy to your site.

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Gal/day

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Energy & Carbon Results
Annual Electric End Use

2014-2015

Building Summary

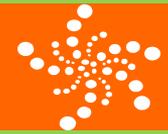
	Total	Male	Female	Employee Only	Efficiency	Percent of Indoor Usage (%)	Gallons per Year	Annual Cost Savings (\$)	
Toilets:	4	1	1	2	Standard	0	0	0	
Urinals:	2	1		1	Standard	0	0	0	
Sinks:	4	1	1	2	Standard	0	0	0	
Showers:	0	0	0		Standard	0	0	0	
Clothes Washers:	0				Standard	0	0	0	
Dishwashers:	0				Standard	0	0	0	
Cooling Towers:	1				Standard	0	0	0	
<input checked="" type="checkbox"/> Include cooling tower blowdown in sewer costs						Total Efficiency Savings:	0%	0	\$0

Source: 2000 Uniform Plumbing Code of the IAPMO, Tables 4-1 and 4-3.

Net-Zero Measures

		Annual Rainfall (in)*	Catchment Area (ft ²)	Surface Type	Gallons per Year	Annual Cost Savings (\$)		
Rainwater Harvesting:	No	39.35	371	Gravel/Tar	0	0		
Native Vegetation Landscaping:	No				0	0		
Greywater Reclamation:	No				0	0		
Site Potable Water Sources:	No	Yield:	50	Gal/day	0	0		
*Source: National Climactic Data Center, #CLIM81.						Total Net-Zero Savings:	0	\$0

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Project: example Items per Page: 10 Page: 1 of 4

Surface ID	Surface Type	Direction	Tilt	Sunlit Area	Cumulative Area	Percent Shaded	Annual Energy (kWh)	Annual Energy Savings	Cumulative Annual Energy Savings	Annual Savings per sq.ft. (Baseline)
su- 335	Exterior Wall	S	90	133	133	16	1,236	\$179	\$179	\$1.35
su- 2	Exterior Wall	W	90	106	239	51	1,105	\$160	\$339	\$1.51
su- 194	Exterior Wall	W	90	106	345	51	1,105	\$160	\$500	\$1.51
su- 319	Exterior Wall	W	90	106	451	51	1,105	\$160	\$660	\$1.51
su- 228	Exterior Wall	W	90	74	525	52	774	\$112	\$772	\$1.52
su- 50	Exterior Wall	W	90	73	598	53	771	\$112	\$884	\$1.53
su- 113	Exterior Wall	W	90	68	666	61	748	\$108	\$992	\$1.60
su- 329	Exterior Wall	W	90	52	718	54	570	\$83	\$1,075	\$1.59
su- 203	Exterior Wall	W	90	46	764	59	511	\$74	\$1,149	\$1.60
su- 337	Exterior Wall	W	90	47	811	51	486	\$70	\$1,220	\$1.51

Payback Indicators

Panel Type: Installed Panel Cost per Watt: Applied Electric cost per kWh: Max Payback Period per Surface, yrs:

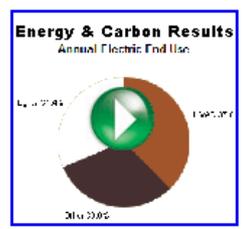
Total Installed Panel Cost	Total Panel Area (Sq.Ft.)	Price per Sq.Ft.	Total Annual Energy	Applied Elec Cost	Annual Energy Cost Savings	Payback
\$147,486	1,434	\$103	15,497 kWh	\$0.14	\$2,247	42 yrs

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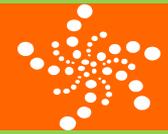
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Energy & Carbon Results

Annual Electric End Use

Building ID: bldg-1

Total Occupied Area Minimum 2% Glazing Factor: 285 Sq.Ft. Items per Page 10 Page: 1 of 4

Total Occupied Area: 7,694 Sq.Ft. << >>

LEED Percentage: 3.7% Does Not Qualify

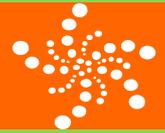
Regularly Occupied Space ID	Regularly Occupied Space Type	Regularly Occupied Space Area	Sidelighting Vision Glazing		Sidelighting Daylight Glazing		Toplighting Sawtooth Monitor		Toplighting Vertical Monitor		Toplighting Horizontal Skylight		Glazing Factor
			Area	Tvis	Area	Tvis	Area	Tvis	Area	Tvis	Area	Tvis	
sp- 13- Lobby	*Note1	1,077	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0.000
sp- 11- Lobby	*Note1	843	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0.000
sp- 38- Living	*Note1	441	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0.000
sp- 21- Living	*Note1	441	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0.000
sp- 31- Living	*Note1	429	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0.000
sp- 10- Living	*Note1	428	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0.000
sp- 14- Room	*Note1	288	45	0.44	5	0.44	0	N/A	0	N/A	0	N/A	0.015
sp- 32- Room	*Note1	288	45	0.44	5	0.44	0	N/A	0	N/A	0	N/A	0.015
sp- 4- Bed	*Note1	285	45	0.44	24	0.44	0	N/A	0	N/A	0	N/A	0.021
sp- 25- Bed	*Note1	285	45	0.44	14	0.44	0	N/A	0	N/A	0	N/A	0.018

Note 1: The US Green Building Council defines Regularly Occupied Spaces as "areas where workers are seated or standing as they work inside a building". LEED Daylight credit 8.1 does not consider Non-Occupied and Non-Regularly Occupied Spaces, such as corridors, hallways, lobbies, break rooms, copy rooms, stairwells, storage areas, mechanical rooms, and restrooms, for this calculation.

Green Building Studio uses the "Space Type" attribute to determine the type of space and whether it is Regularly Occupied. If the "Space Type" attribute is missing the space is considered regularly occupied. This may increase the overall occupied area for the Daylighting calculation. Since some of these spaces may not be well daylight, the LEED score is likely to be lower. For a more accurate LEED score, the "Space Type" attribute should be specified in your BIM model (also found under the Spaces tab of the Project Template) for each space.

Please refer to U.S. Green Building Council LEED Credit 8.1 documentation for more information.

Our Results

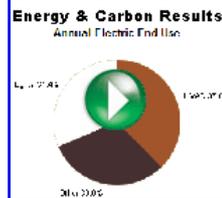


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Energy & Carbon Results | US EPA ENERGY STAR | Water Usage | PV Analysis | LEED Daylight | **Weather** | 3D VRML View

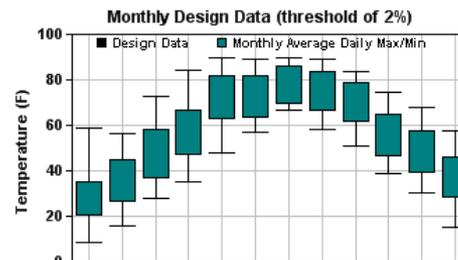
Weather Summary | Weather Frequency | Wind Roses | Design Conditions

Weather Station: GBS_04R20_244112
 Distance to your project 4.3 mi (6.9 km)
 Latitude= 38.8821 , Longitude= -76.9681

Cooling Degree Day		Heating Degree Day	
Threshold	Value	Threshold	Value
65 °F	1461	65 °F	4518
70 °F	774	60 °F	3520
75 °F	271	55 °F	2618
80 °F	34	50 °F	1844

IP SI

Threshold	Annual Design Conditions			
	Cooling		Heating	
	Dry Bulb (°F)	MCWB (°F)	Dry Bulb (°F)	MCWB (°F)
0.1%	91.6	77.2	6.8	4.1
0.2%	91.0	73.9	9.0	6.2
0.4%	90.1	74.1	11.8	8.0
0.5%	89.8	74.1	12.2	8.4
1%	88.7	78.2	14.9	11.4
2%	87.1	75.5	17.6	14.2
2.5%	86.4	69.5	18.9	14.5
5%	83.7	76.9	23.2	20.0



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su-109

Roof Color
Exterior Wall Color
Northern Facing Exterior Wall Color
Eastern Facing Exterior Wall Color
Southern Facing Exterior Wall Color
Western Facing Exterior Wall Color
Interior Surface Color
Underground Surface Color
Shade Surface Color
Window, Door, and Skylight Color

Up
N
E

Cortona3D

Done www.greenbuildingstudio.com

Finished?



Design Alternatives

Select parameters from tabs below, enter alternative name, then Add. After all alternatives added, click Submit to run them.

Project: EcoBuild Tradeshow Example		Run List	Base Run: example, Energy Cost: \$24,843		Project settings	
General	Lighting	Roof	Northern Walls	Southern Walls	Western Walls	Eastern Walls
Rotation +15	Lighting Efficiency LPD 10% less than base run	Construction Wood Frame Roof with Super High Insulation	Construction No Change	Construction No Change	Construction No Change	Construction No Change
HVAC No Change	Lighting Control Daylighting sensors & controls		Glazing Type No Change	Glazing Type Insulated Blue Low-e	Glazing Type No Change	Glazing Type No Change
			Glass Amount No change	Glass Amount No change	Glass Amount No change	Glass Amount No change

1. Select Changes Below. 2. Enter Alternative Name:

3. Add Alternative

4. Run Added Alternatives

Reset Dropdown Selections Below

Save Added & Unrun Alternatives

Cancel & Don't Save Added Alternatives

General Lighting Roof Northern Walls Southern Walls Western Walls Eastern Walls

Alternatives	Annual Energy Cost	Rotation	HVAC	Delete
		0	No Change	<input type="checkbox"/>
Take 2	\$25,263	+15		<input type="checkbox"/>

Take 2... and 3... and...



Run List [EcoBuild Tradeshow Example](#)



Previous Next										
Runs	Date	User	Floor Area (ft²)	Annual Elec Cost	Annual Fuel Cost	Annual Elec Demand (kW)	Annual Elec Use (kWh)	Annual Fuel Use (MBtu)	EUI (kBtu/ft²)	Delete
<input type="checkbox"/> example <input type="checkbox"/>	Dec 10 08 4:55 AM	gbsma	7694	\$17,041	\$7,801	32.4	117,526	570	126.2	<input type="checkbox"/> a
<input type="checkbox"/> Take 2	Dec 10 08 5:24 AM	gbsma	7694	\$17,386	\$7,877	33.9	119,902	576	128.0	<input type="checkbox"/>
Previous Next										

For Version 2- adjacent run.

Run List [EcoBuild Tradeshow Example](#)



Previous Next										
Runs	Date	User	Floor Area (ft²)	Annual Elec Cost	Annual Fuel Cost	Annual Elec Demand (kW)	Annual Elec Use (kWh)	Annual Fuel Use (MBtu)	EUI (kBtu/ft²)	Delete
<input type="checkbox"/> example <input type="checkbox"/>	Dec 10 08 4:55 AM	gbsma	7694	\$0	\$0	0.0	0	0	0.0	<input type="checkbox"/> a
<input type="checkbox"/> Take 2	Dec 10 08 5:24 AM	gbsma	7694	\$345	\$76	1.5	2,376	6	1.8	<input type="checkbox"/>
Previous Next										

For Version 2+ runs this icon is displayed and allows you to add design alternatives to the adjacent run.

Thank you for your time
Questions?



Peter Marchese
pmarchese@microdesk.com