



2017建筑模拟新技术与应用研讨会

Autodesk在建筑性能分析领域的研究与应用

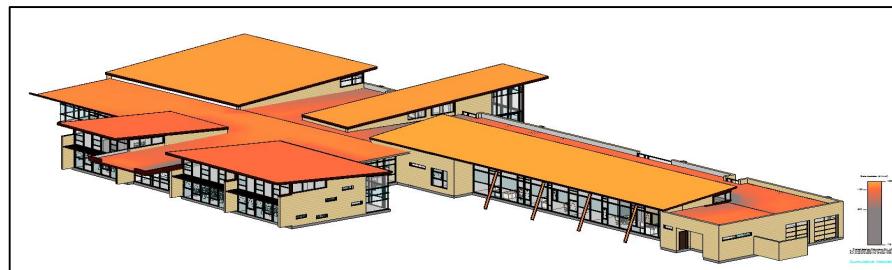
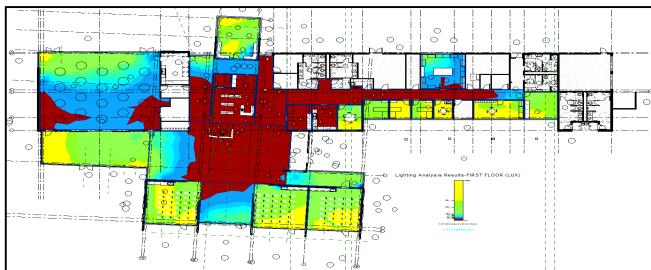
兰静

产品主管&高级测试工程师
欧特克中国研究院 BPA系列产品



内容

- Autodesk BPA相关产品简介
- Autodesk BPA相关产品研究
- Autodesk BPA相关产品应用

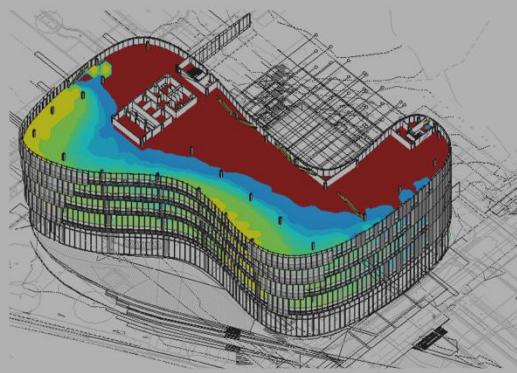


BPA相关产品简介

AUTODESK.

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BPA 产品



All of your building performance information in One Place

BIM Integrated Performance Analysis from Concept to Detail and Design to Operation

Guidance and Recommendations throughout the process to help make decisions with greater confidence

Collaborate with team members and assign responsibilities for key performance factors

Revit Energy Optimization

Autodesk

Energy Analysis for Revit

Light Analysis for Revit

Insight 360

Solar Analysis for Revit

EnergyPlus Cloud

FormIt360 Pro

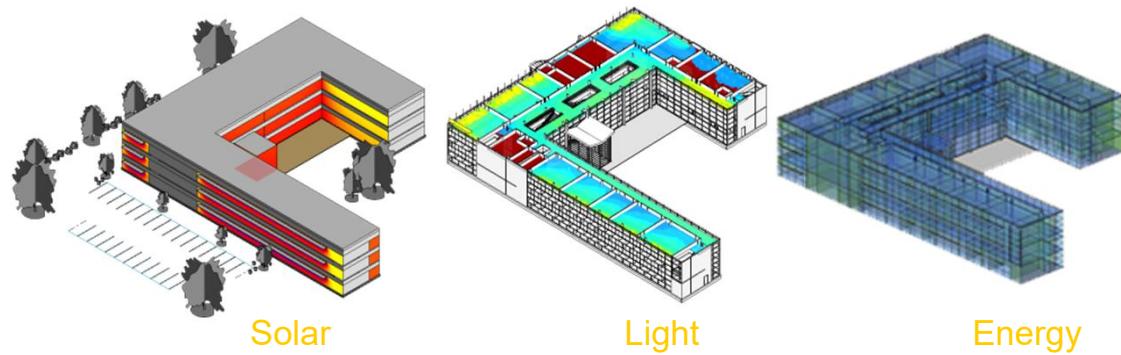
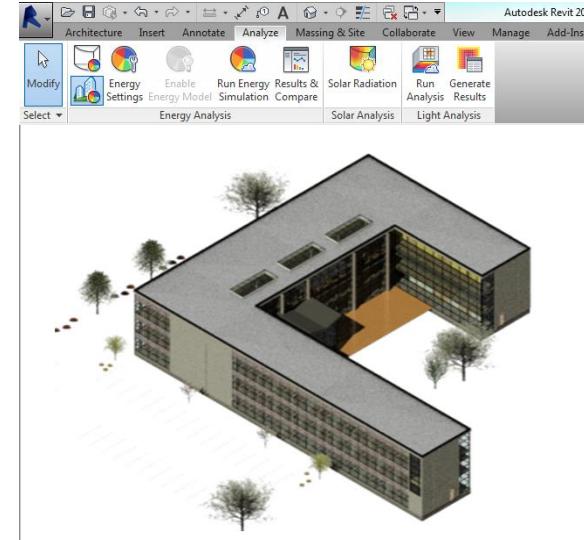
Energy Cost Range

Green Building Studio

Project Solon

分析 + 设计

BIM integration and automation engage analysis with the design process



Better building energy design solution

A Fast, Intuitive Outcome Driven Guide to Better Building Energy & Environmental Performance.

Factors & Ranges, Heating, Cooling, Lighting & Solar

Scenario Comparison
kWh/m² per year

Scenario	Value (kWh/m ²)
US Climate 2010	~20
US Off Grid	~15
Europe	~12
Asia	~8

Use insights to save design package
LOW PERFORMANCE → HIGH PERFORMANCE

Energy / Cost & Benchmarks

Energy Cost Mean
24.0
MNR

Energy Cost Mean
11.6
INTERIOR

Energy Cost Mean
5.77
MAN

Benchmarks Comparison
USD/m²/yr

Category	Value (USD/m ²)
Architecture 2010	315.82
US Climate 2010	27.90
Europe	51.87

Model History
USD/m²/yr

Model	Value (USD/m ²)
Architecture 2010	315.82
US Climate 2010	27.90
Europe	51.87

Lighting Efficiency
W/foot²

Efficiency Level	Percentage
1.0 - 1.5	~10%
1.5 - 2.0	~20%
2.0 - 2.5	~30%
2.5 - 3.0	~20%
3.0 - 3.5	~10%
3.5 - 4.0	~5%

Plug Load Efficiency
W/foot²

Efficiency Level	Percentage
1.0 - 1.5	~10%
1.5 - 2.0	~20%
2.0 - 2.5	~30%
2.5 - 3.0	~20%
3.0 - 3.5	~10%
3.5 - 4.0	~5%

Daylight & Occupancy Controls

Control Type	Percentage
Daylight Harvesting	~10%
Occupancy Sensors	~20%
Natural Light	~30%
Artificial Light	~40%

Infiltration
ACH

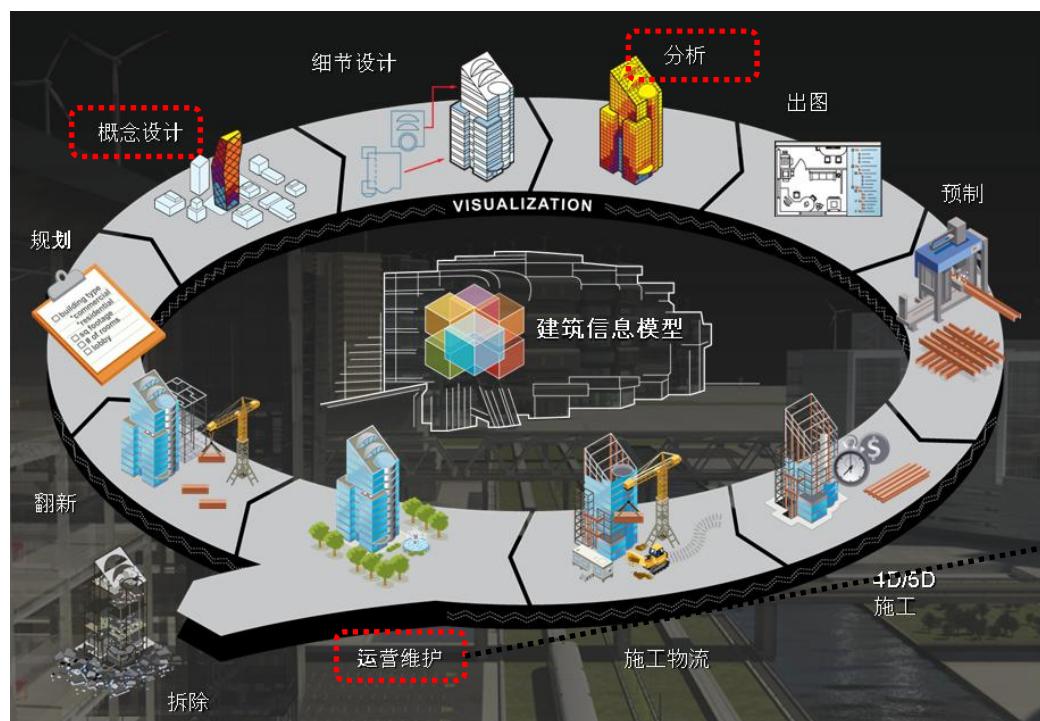
Infiltration Level	Percentage
1.0 - 1.5	~10%
1.5 - 2.0	~20%
2.0 - 2.5	~30%
2.5 - 3.0	~20%
3.0 - 3.5	~10%
3.5 - 4.0	~5%

Insights & Models

Autodesk Insight 360

Revit and FormIt 360

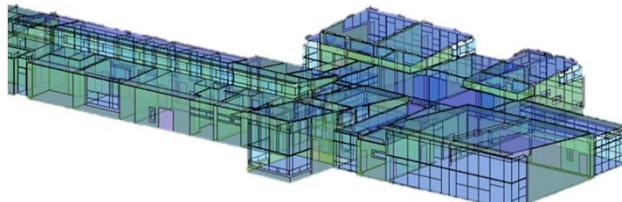
BIM生态圈 – 关于已有建筑



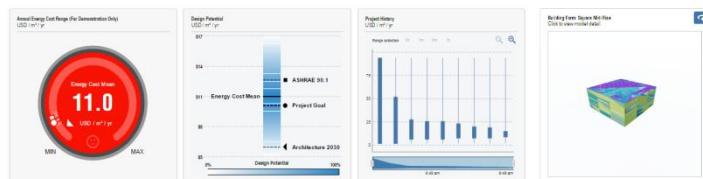
3Tier
气象数据
精确到每天



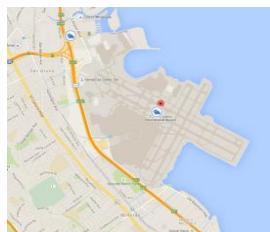
Energy Analysis



Energy Optimization



Location & Climate



Weather Station ID: 59387
SW 0.1 miles away

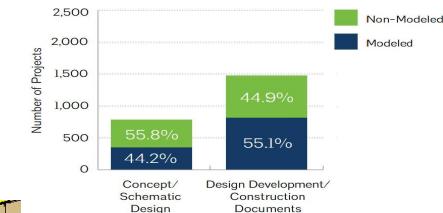
Month	Average (°F)	Minimum (°F)	Maximum (°F)
Jan	15.0	0.0	20.0
Feb	16.0	0.0	22.0
Mar	17.0	0.0	23.0
Apr	18.0	0.0	24.0
May	19.0	0.0	25.0
Jun	20.0	0.0	26.0
Jul	21.0	0.0	27.0
Aug	22.0	0.0	28.0
Sep	21.0	0.0	27.0
Oct	19.0	0.0	25.0
Nov	17.0	0.0	23.0
Dec	15.0	0.0	20.0

Lighting Analysis

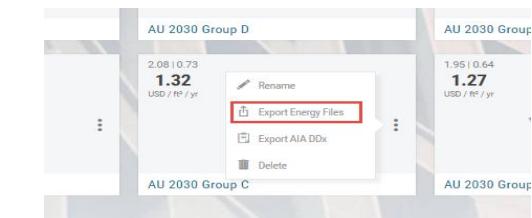


Solar Analysis

Generate AIA DDX Report



[Download IDF, INP, gbXML file](#)



Heating & Cooling



BPA相关产品研究

AUTODESK.

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BPA研发团队

- US
 - TIGER
 - Globant
- ACRD
 - HohXil



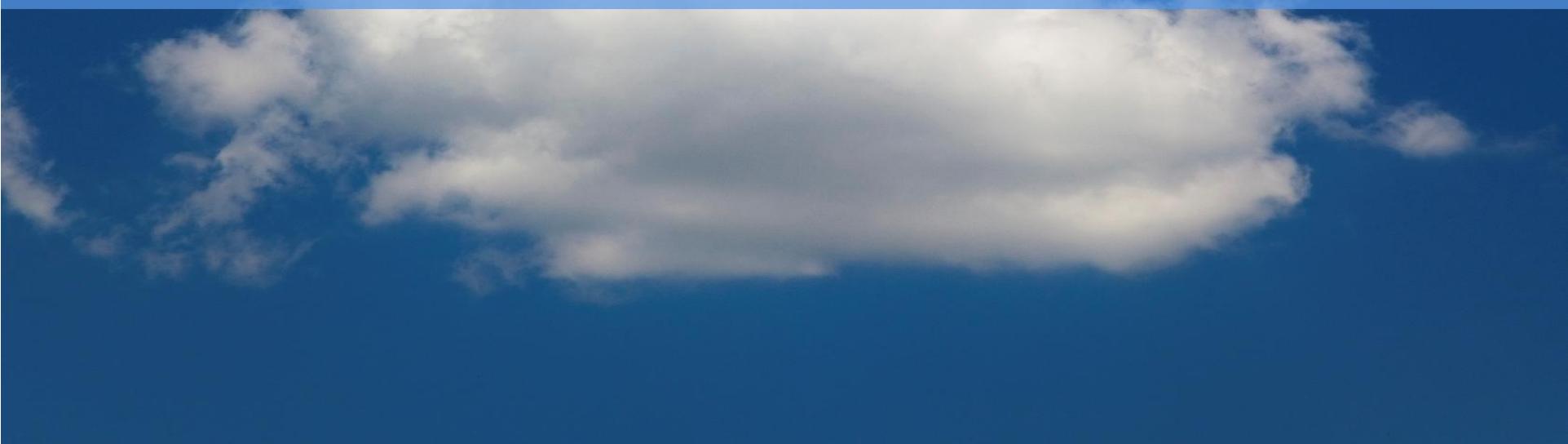
Vision

MAKE THE BUILT ENVIRONMENT BETTER

创造更好的建筑环境



BIM + 云 + 前沿IT技术： 科技推动跨越全生命周期的多维度创新



引领行业迈向云计算

云端
桌面

地理信息技术

结构分析

人流疏散

热能分析

能耗分析

应力分析

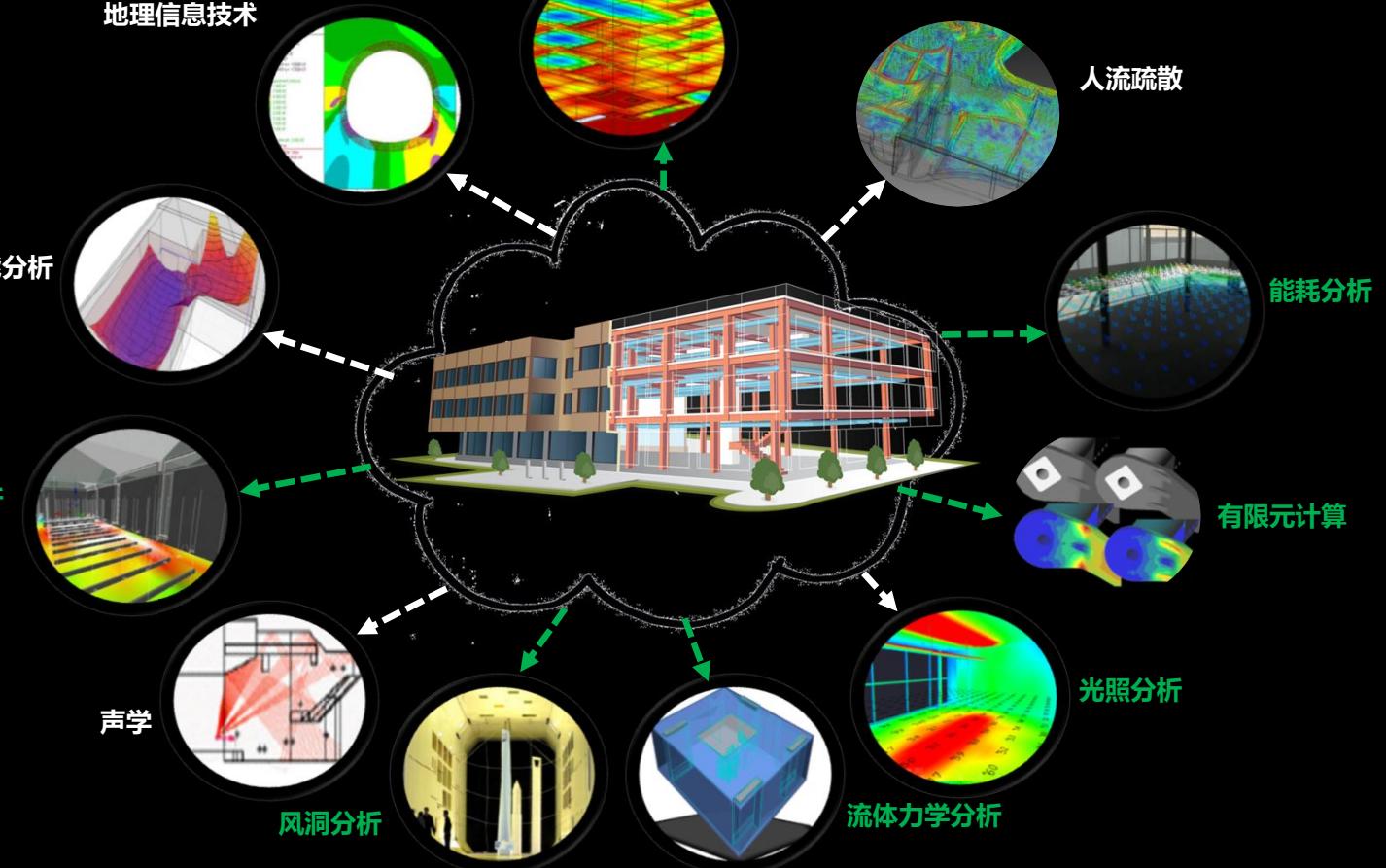
有限元计算

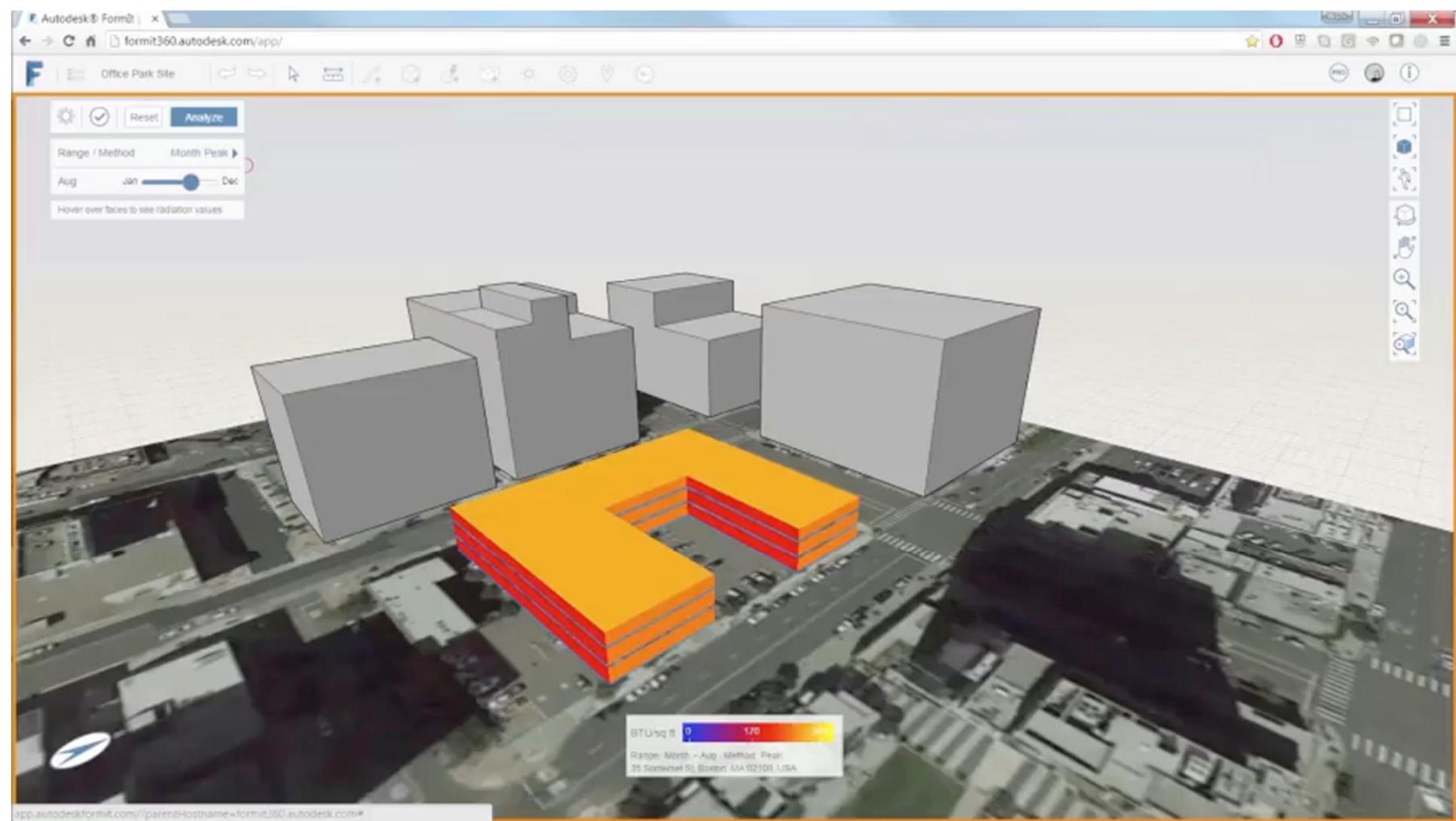
声学

光照分析

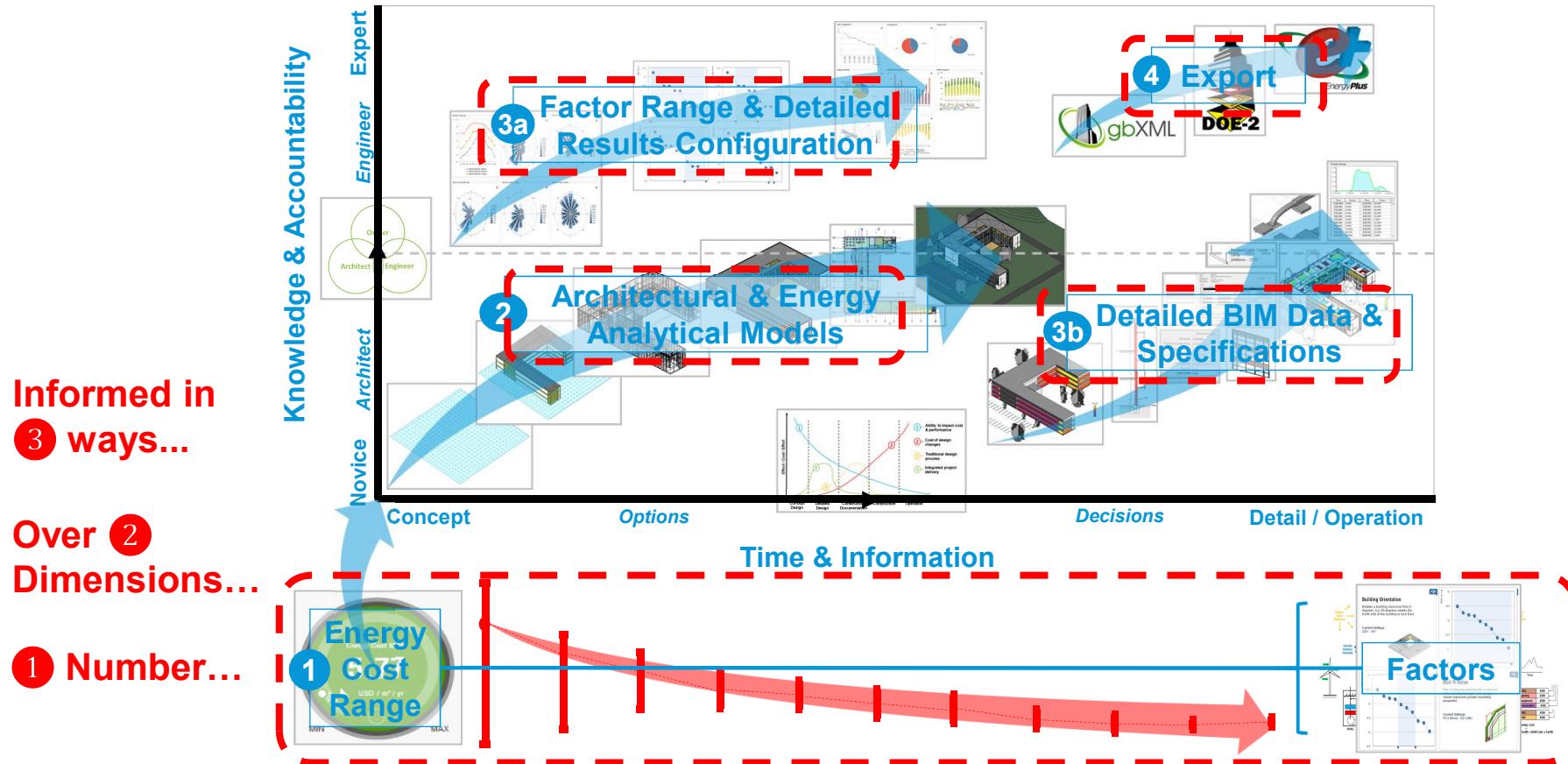
风洞分析

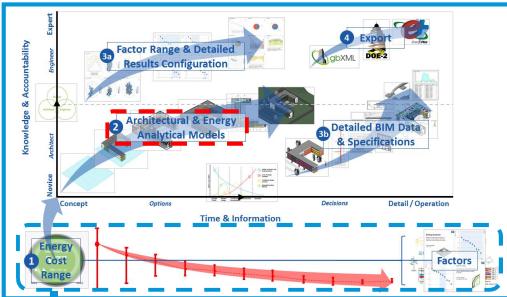
流体力学分析





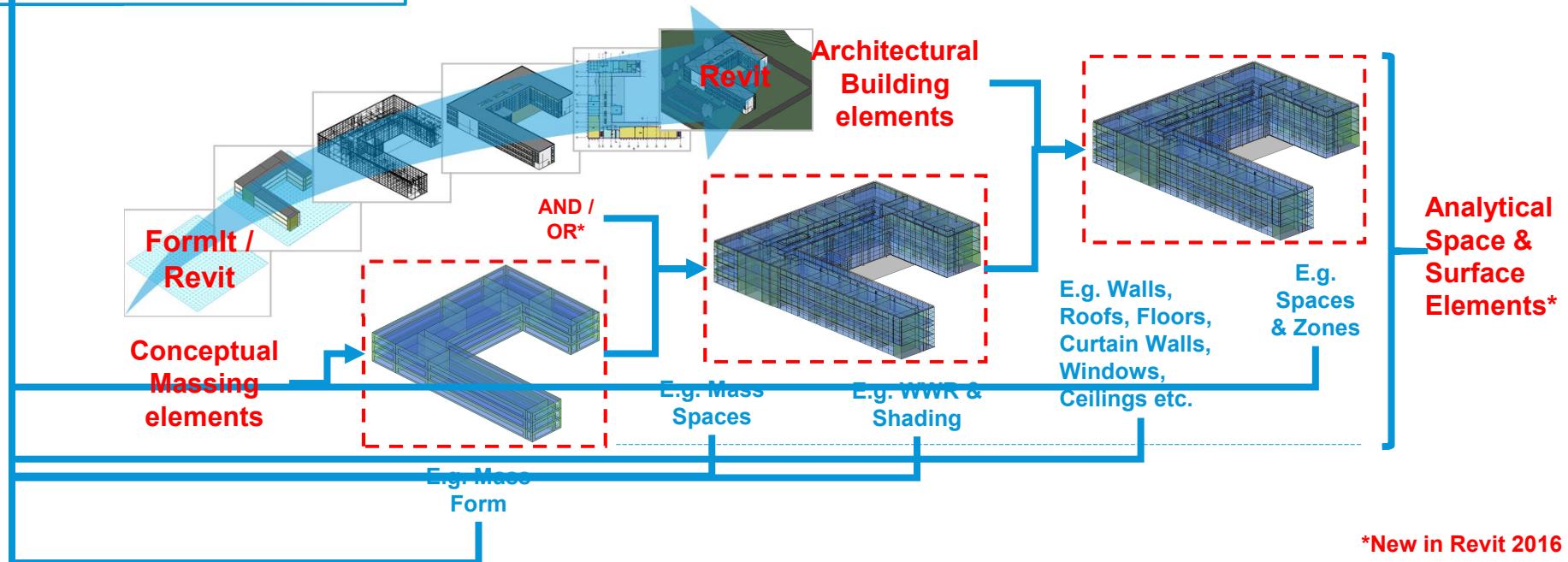
A New and Better Way... '1, 2, 3'



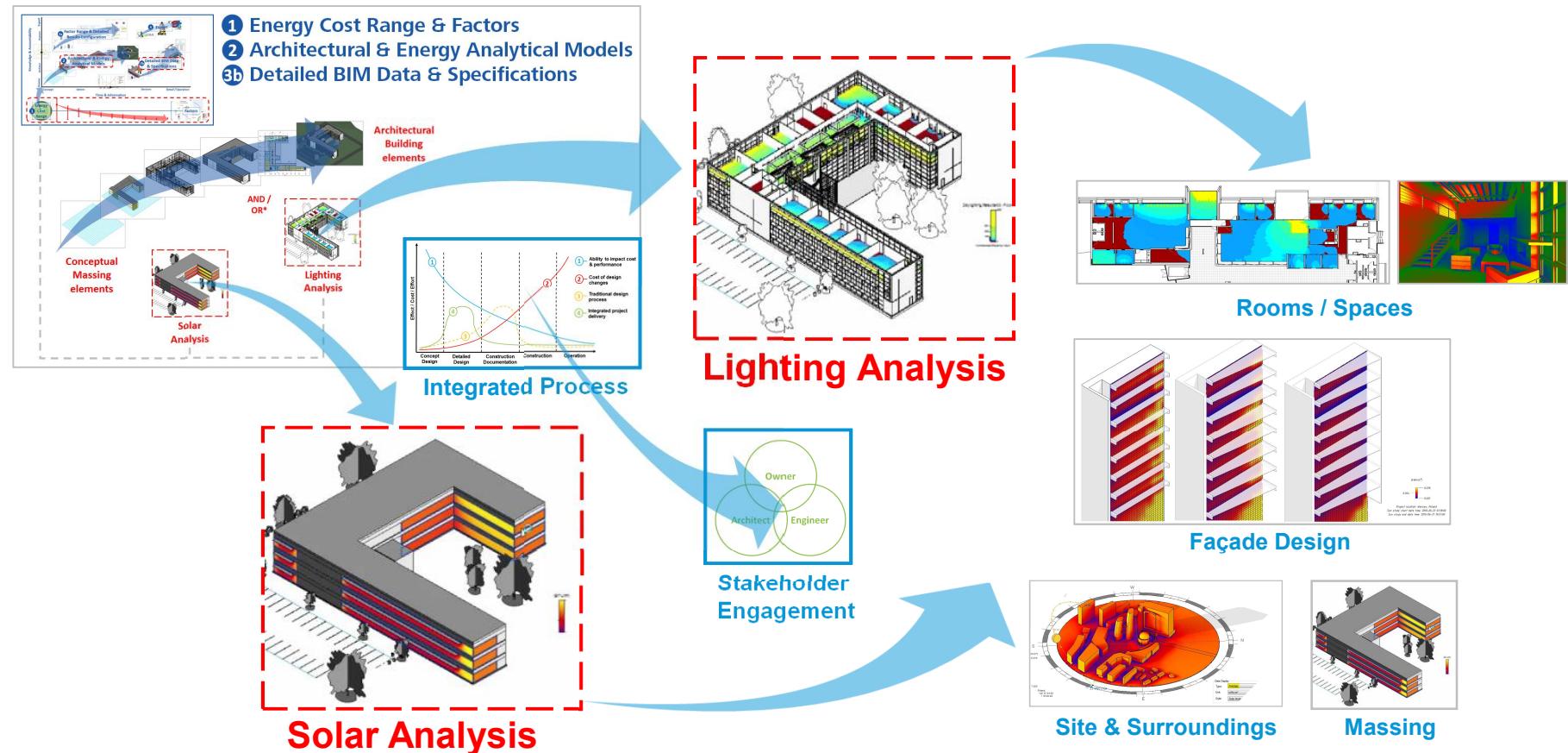


2 Architectural & Energy Analytical Models

- Fast, accurate, automatic EAM creation directly from and within BIM
- Little to no ‘cleaning’ or ‘rebuilding’ of the architectural model required
- Works continuously and consistently from concept to detailed design modeling



Integrated Energy & Environmental Performance...



One Culture

We continuously strive to...

Engage.

We hire the smartest, most committed people who are able to work as a team and who believe deeply in our mission to imagine, design, and create a better world.

Prioritize.

We ensure that for every decision we make the customer is first, the company is second, and the individual product is third.

Simplify.

We enable team velocity and organizational efficiency by reducing complexity wherever possible.

Quantify.

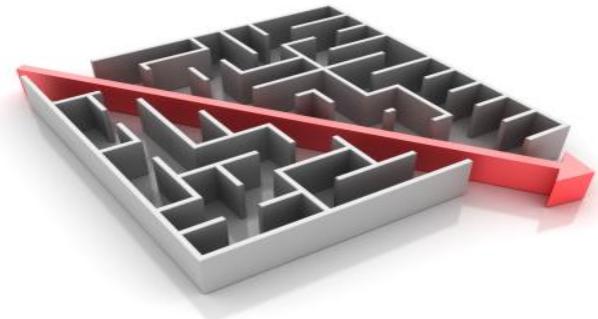
We instrument our products and seek to understand customers deeply; measure ourselves on customer adoption as the leading indicator of success.

Solutions over silos.
We break down silos, collaborate radically, and engage in constructive conflict to reach the best decisions.

Experiences over technology.
We integrate products into fluid experiences and align them with the subscription and consumption business models.

Platform over product.
We develop coherent, world-class cloud services for our teams and external developers; we put data at the center of our world and our customer's world.

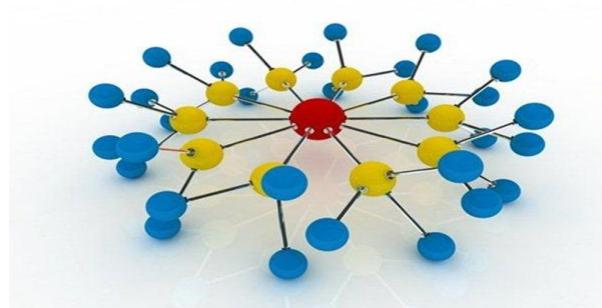
Performance over features.
We build our offerings to be secure, scalable, available, and cost efficient; we view performance as a principle of all teams, not just operations.



产品易用性



一致的用户体验



适应和改进行业工作流程



产品独特性和差异性

重视用户参与研发过程

GBS 2015 backlog

All sprints Switch sprint ▾

QUICK FILTERS: 2016.2 2105 GB3 2015 GB2 2015 GB1 Only My Issues Recently Updated

Test View ▾ Board ▾

Backlog	In Progress	Done
GBSSCRUM-15376 Click user icon	GBSSCRUM-15382 Research on Quest - Feature [J]	GBSSCRUM-15338 Review developer's design plan, modify component design [1]
GBSSCRUM-15379 Documented API, comment with Do and Right... Integration	GBSSCRUM-15383 [FramingApp] Implement various and varied authentication in Framing App [M]	GBSSCRUM-15344 Implement gateway code in the Insight Service (not service) [5]
GBSSCRUM-15313 Develop front-end application using angular 2 framework	GBSSCRUM-15312 As developer, I want to use SSO so that you can login easily. [U]	GBSSCRUM-15343 As a developer, I want to clone a sharepoint site to S3 DB and in [3] [5]
GBSSCRUM-15314 Spikes on ADD/DELETE user requirement [U]	GBSSCRUM-15380 Develop front-end application using angular 2 framework [U]	GBSSCRUM-15345 As a developer I want to add contextual information to the gateway hash [0.5]

Idea Station

The screenshot shows the Autodesk Community : Insight 360 : Ideas : Hot Ideas page. The main header features a large green 'I' icon followed by the text 'INSIGHT 360 IDEAS'. Below the header, a sub-header reads 'Share ideas for future product features directly with the Insight 360 team and collaborate on existing suggestions with your peers.' The page has a navigation bar with tabs: 'SUBMIT AN IDEA', 'NEWEST' (selected), 'HOT IDEAS', and 'TOP VOTED'. On the right, there are 'Options' and 'Show: All Statuses' dropdowns. A sidebar on the right contains sections for 'Submit Your Ideas', 'Search This Ideas Board', 'My Toolbox', and 'Idea Guidelines'.

add Peak Cooling/ Heating Load, kW

8 mdengusiak | 10-31-2016 02:08 PM | 3 Comments (0 New)

I am missing one benchmark, peak Cooling/ Heating Load, kW. This very important and useful value. We need this value at early stage to think about systemand base load etc..

Editing Window Glass

8 mdengusiak | 10-23-2016 10:46 AM | 1 Comment (0 New)

Break down
glazing factor
properties
36

Change glazing
materials
36

Adjust utility rate
units
34

High quality vector
printing for factors
33

Change wall &
roof construction
options
32

Option to add
your now
benchmark
32

Change infiltration
rates
31

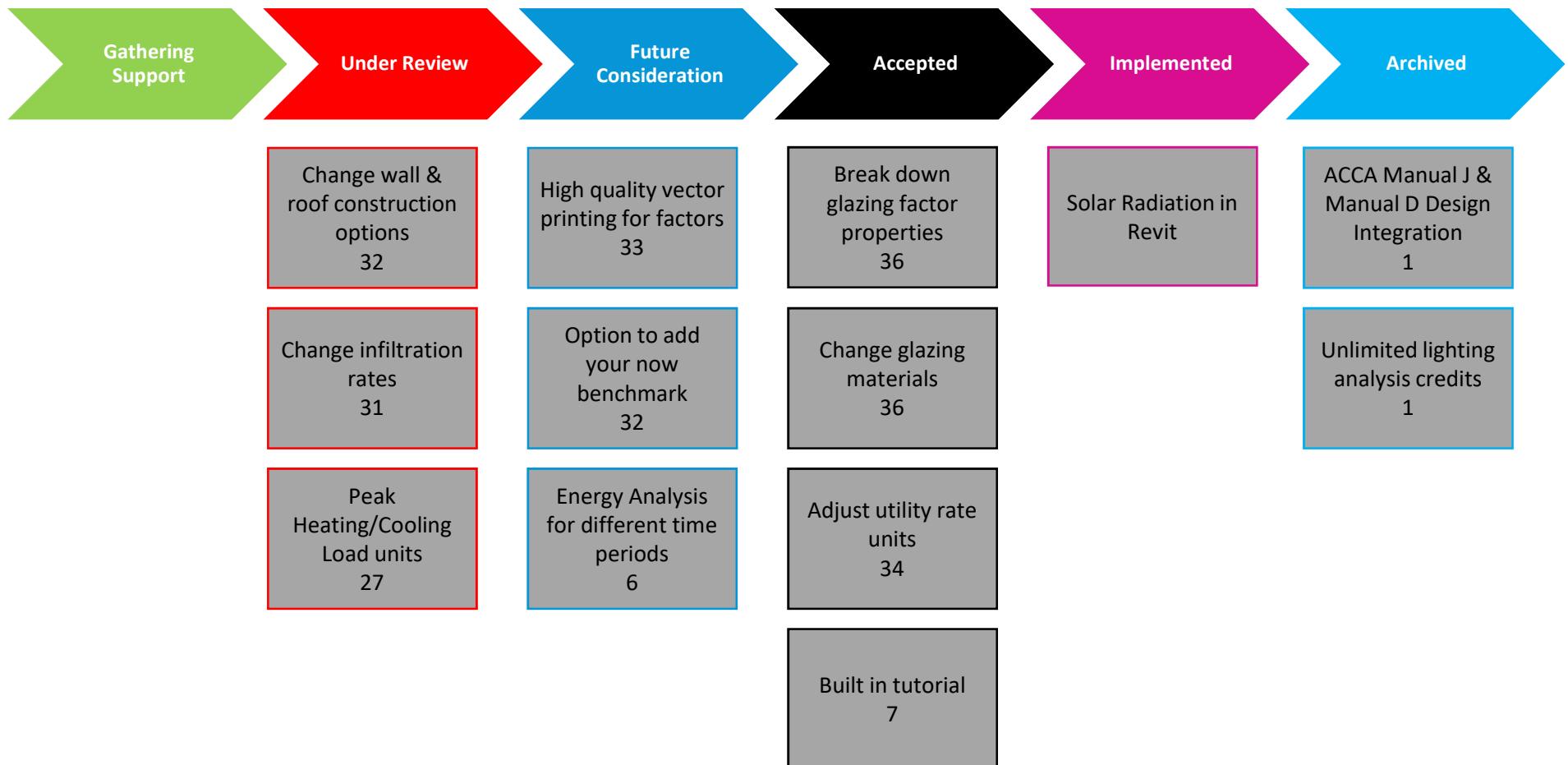
Peak
Heating/Cooling
Load units
27

Built in tutorial
7

Energy Analysis
for different time
periods
6

ACCA Manual J &
Manual D Design
Integration
1

Unlimited lighting
analysis credits
1





ASHRAE 90.1



EPA Target Finder



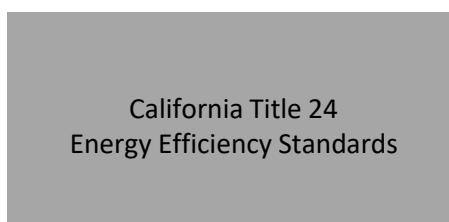
ASHRAE 62.1



Architecture 2030

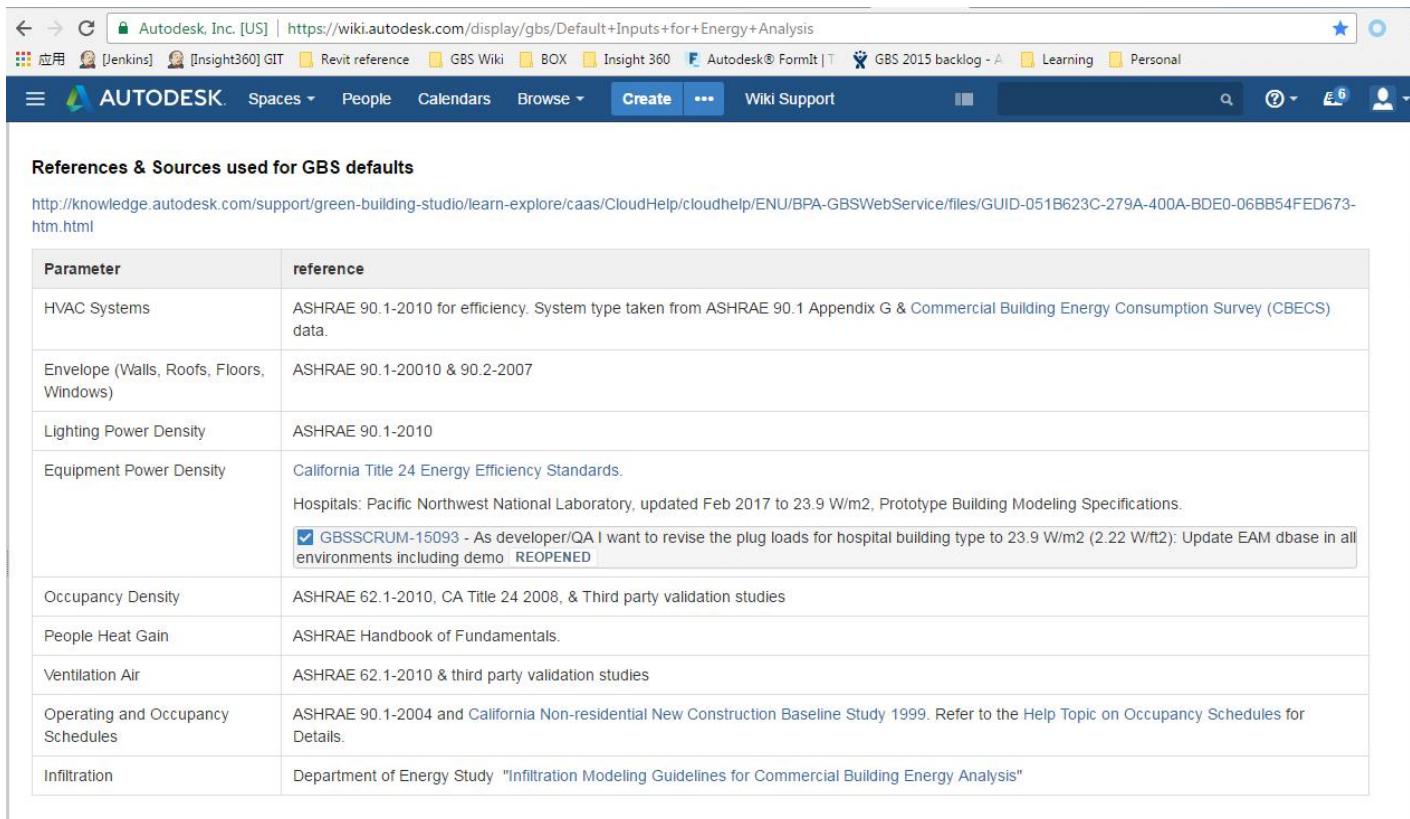


ASHRAE Standard 140



California Title 24
Energy Efficiency Standards

默认参数参考ASHRAE90.1



The screenshot shows a web browser window for Autodesk, Inc. [US] at <https://wiki.autodesk.com/display/gbs/Default+Inputs+for+Energy+Analysis>. The page title is "References & Sources used for GBS defaults". Below the title is a table listing parameters and their references. A note at the bottom of the table indicates a pending update related to hospital building plug loads.

Parameter	reference
HVAC Systems	ASHRAE 90.1-2010 for efficiency. System type taken from ASHRAE 90.1 Appendix G & Commercial Building Energy Consumption Survey (CBECS) data.
Envelope (Walls, Roofs, Floors, Windows)	ASHRAE 90.1-2010 & 90.2-2007
Lighting Power Density	ASHRAE 90.1-2010
Equipment Power Density	California Title 24 Energy Efficiency Standards. Hospitals: Pacific Northwest National Laboratory, updated Feb 2017 to 23.9 W/m ² , Prototype Building Modeling Specifications. <input checked="" type="checkbox"/> GBSSCRUM-15093 - As developer/QA I want to revise the plug loads for hospital building type to 23.9 W/m ² (2.22 W/ft ²): Update EAM dbase in all environments including demo REOPENED
Occupancy Density	ASHRAE 62.1-2010, CA Title 24 2008, & Third party validation studies
People Heat Gain	ASHRAE Handbook of Fundamentals.
Ventilation Air	ASHRAE 62.1-2010 & third party validation studies
Operating and Occupancy Schedules	ASHRAE 90.1-2004 and California Non-residential New Construction Baseline Study 1999. Refer to the Help Topic on Occupancy Schedules for Details.
Infiltration	Department of Energy Study "Infiltration Modeling Guidelines for Commercial Building Energy Analysis"

<https://knowledge.autodesk.com/support/green-building-studio/learn-explore/caas/CloudHelp/cloudhelp/ENU/BPA-GBSSWebService/files/GUID-051B623C-279A-400A-BDE0-06BB54FED673-htm.html>

各种建筑类型的基本默认参数

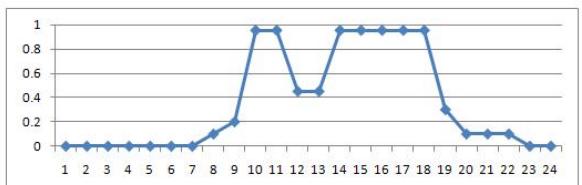
Office

Parameter	Value
Occupancy Schedule	Office
People/100 sq. M.	4
People Sensible Heat Gain (W/person)	73.3
People Latent Heat Gain (W/person)	58.6
Lighting Load Density (W/sq. M.)	9.7
Equipment Load Density (W/sq. M.)	14.4
Infiltration Flow (ACH)	0.4
Outside Air (ventilation air) Flow Per Person (liters per second)	NULL
Outside Air (ventilation air) Flow Per Area (cubic meters per hour per square meter)	2.5
Unoccupied Cooling Set Point (C)	29.4

<http://help.autodesk.com/view/RVT/2017/ENU/?guid=GUID-7A1AFEA-E3EA-404A-B17E-B24BCBBB8726>
34种建筑类型

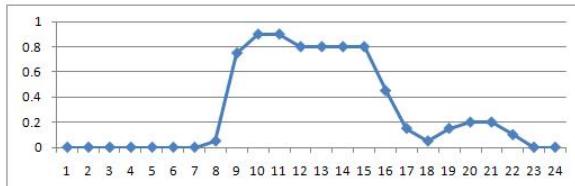
建筑运行时间表

Occupancy-Office



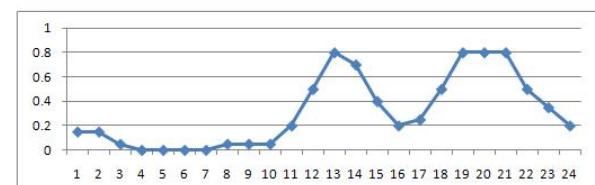
Office schedule on weekdays

Occupancy-School



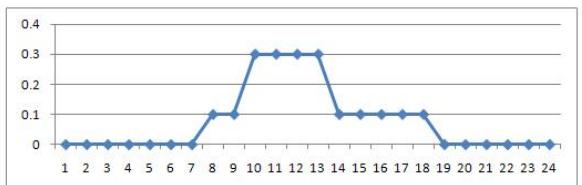
School schedule on weekdays

Occupancy-Restaurant



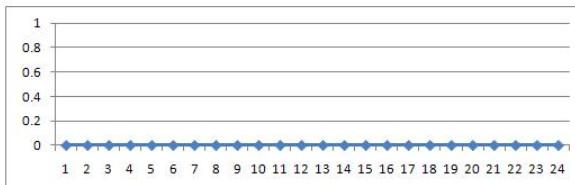
Restaurant schedule on weekdays

Office schedule on Saturday

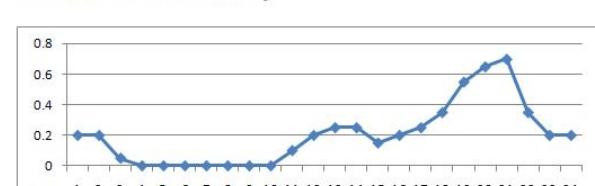


School schedule on Saturday

Restaurant schedule on Saturday



Office schedule on Sunday

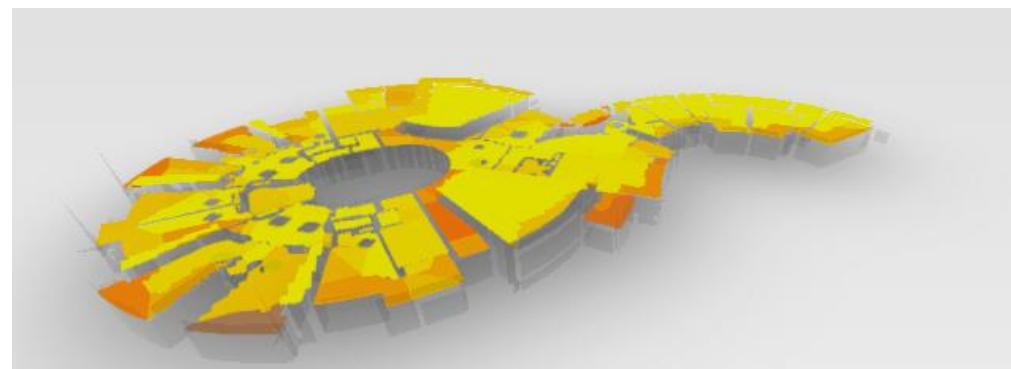
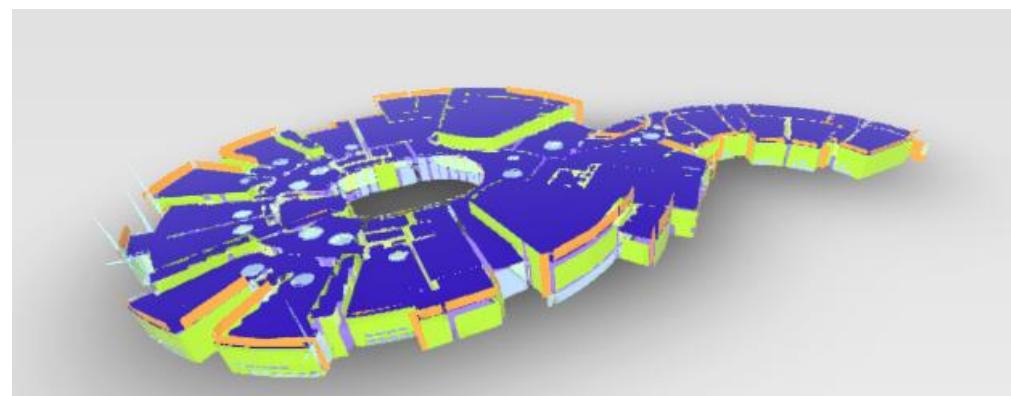
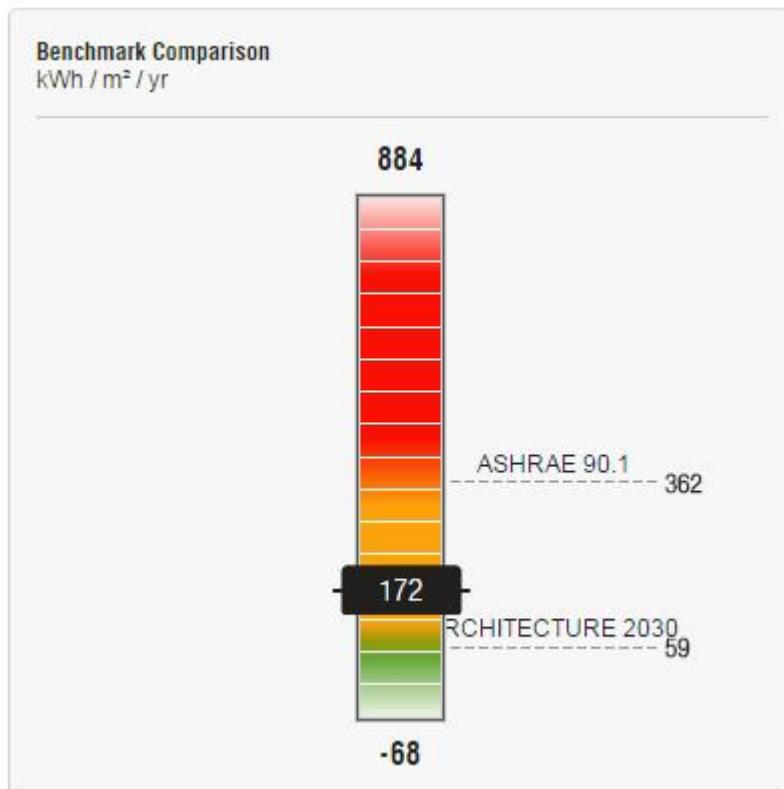


Restaurant schedule on Sunday

School schedule on Sunday

<http://help.autodesk.com/view/RVT/2017/ENU/?guid=GUID-D72DDB68-621C-4258-96FE-BEAD337B960E>
各种建筑类型对应的运行时间表

比较标准参考ASHRAE90.1和Arch2030



ANSI/ASHRAE Standard 140

ANSI/ASHRAE Standard 140-2007, *Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs*

 U.S. Department of Energy
Energy Efficiency and Renewable Energy

Building Technologies Program

Tax Deduction Qualified Software
Green Building Studio Web Service version 3.4
On this page you'll find information about the Green Building Studio Web Service version 3.4 [qualified computer software](#) (www.buildings.energy.gov/qualified_software.html), which calculates energy and power cost savings that meet federal tax incentive requirements for commercial buildings.

Date Documentation Received by DOE: 16 October 2008

Statements in quotes are from the software developer.

Internal Revenue Code §179D (c)(1) and (d) Regulations Notice 2006-52, Section 6 requirements as amplified by Notice 2008-40, Section 4 requirements.	
(1) The name, address, and (if applicable) web site of the software developer;	Autodesk, Inc. 444 Tenth Street, Suite 300 Santa Rosa, California 95401 http://www.autodesk.com
(2) The name, email address, and telephone number of the person to contact for further information regarding the software;	John F. Kennedy Autodesk, Inc. info@greenbuildingstudio.com +1 (707) 569-7373
(3) The name, version, or other identifier of the software as it will appear on the list;	Green Building Studio web service version 3.4 (based on DOE-2.2-44e4)
(4) All test results, input files, output files, weather data, modeler reports, and the executable version of the software with which the tests were conducted; and	Provided to DOE.
(5) A declaration by the developer of the software, made under penalties of perjury, that—	"Autodesk's Green Building Studio development team certifies the following:"

Test sections

There are 4 Standard 140 sections that need to be evaluated.

- **Sec5-2:** Building Thermal Envelope and Fabric Load tests (Sections 5.2)
- **Sec5-3A:** Space Cooling Equipment Performance (Sections 5.3.1 and 5.3.2)
- **Sec5-3B:** Space Cooling Equipment Performance Comparative Tests (Sections 5.3.3 and 5.3.4)
- **Sec5-4:** Space Heating Equipment Performance tests (Sections 5.4)

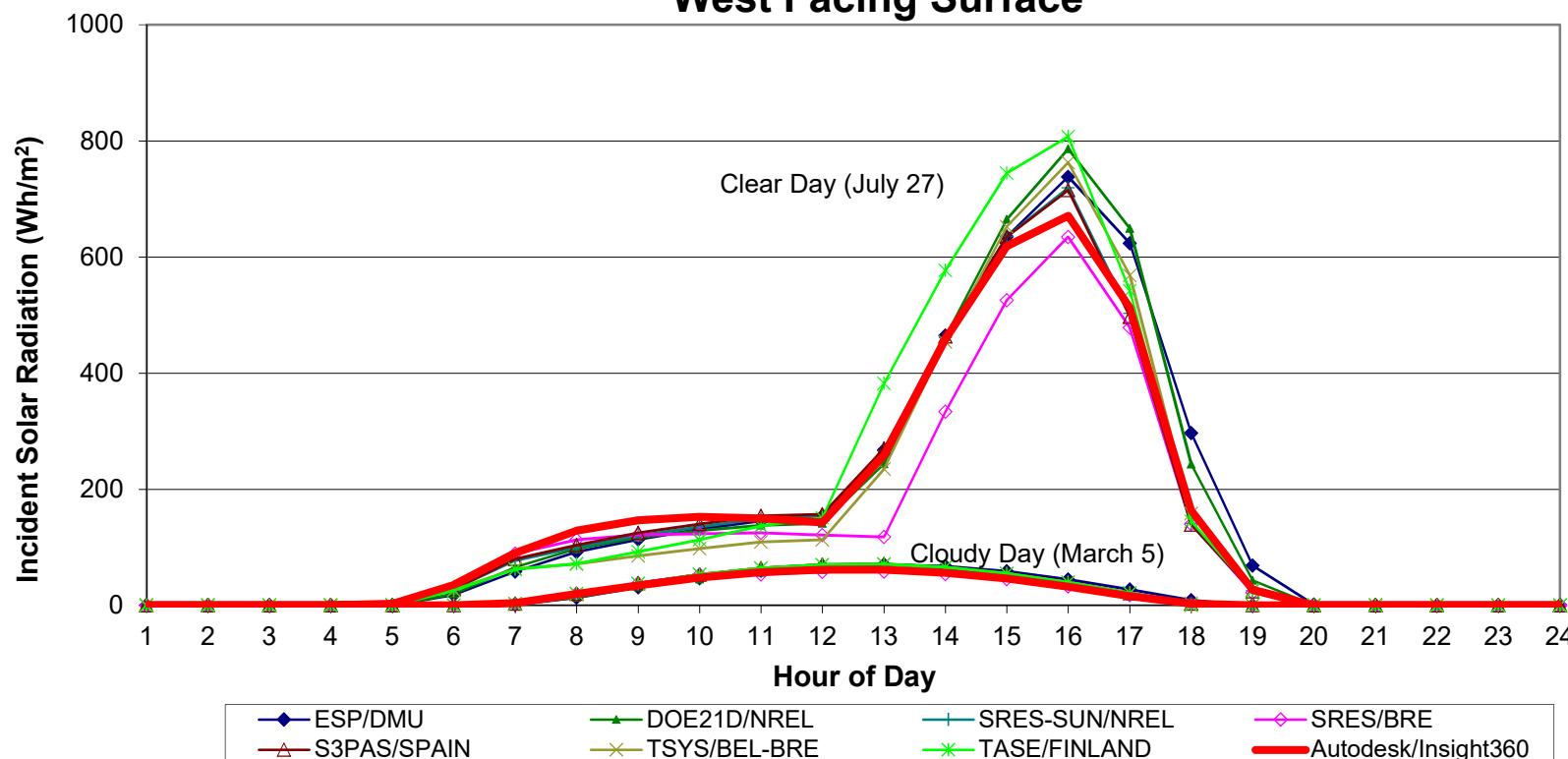
Standard output

The standard output reports consists of five forms

- a. **Sec5-2out.xls** Output results for cases of Section 5-2
- b. **Sec5-3Aout.xls** Output results for cases of Section 5-3A
- c. **Sec5-3Bout.xls** Output results for cases of Section 5-3B
- d. **Sec5-4out.xls** Output results for cases of Section 5-4
- e. **S140outNotes.txt** (modeling notes)

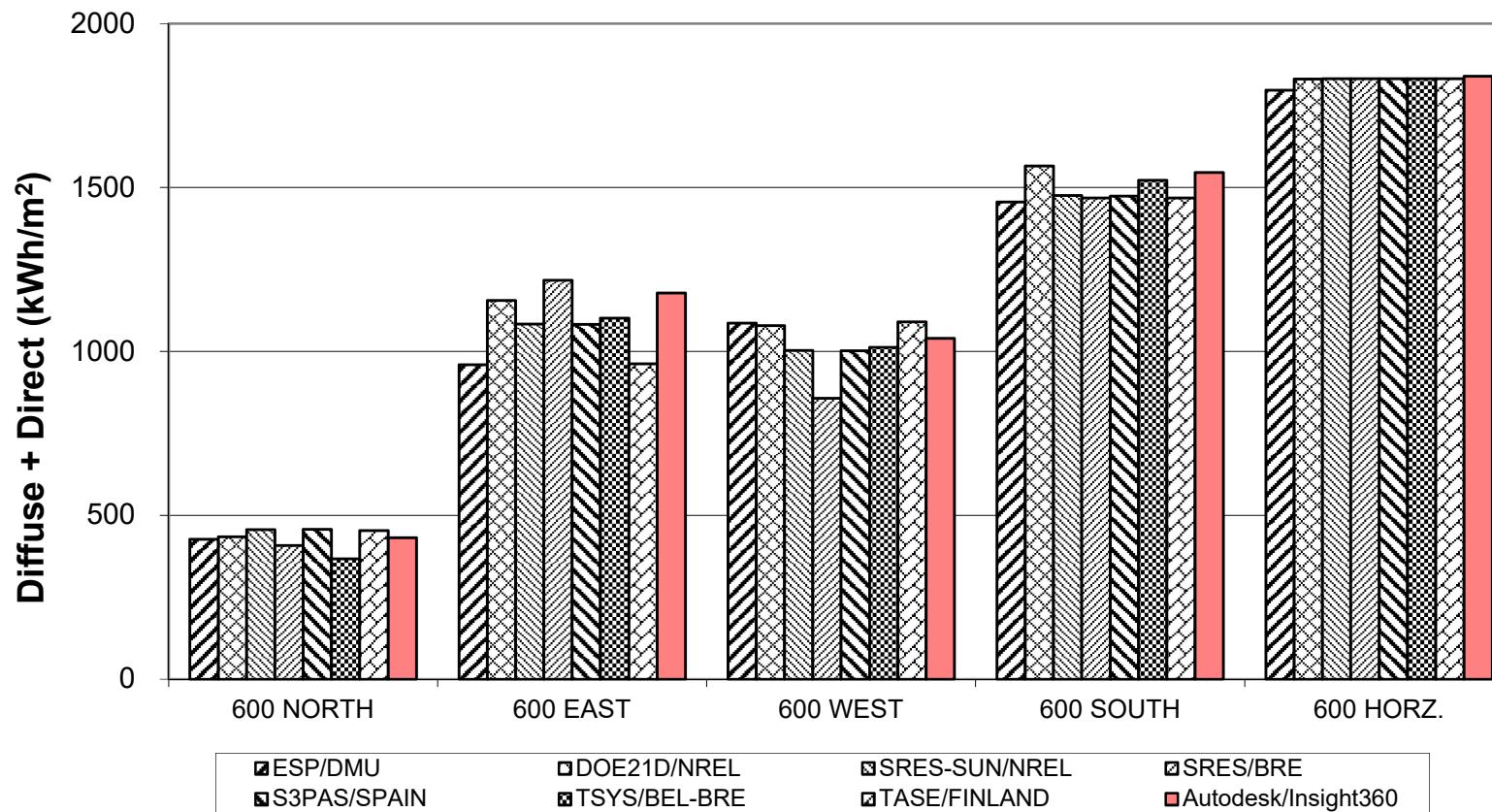
ASHRAE Standard 140-2011, Informative Annex B8, Section B8.1

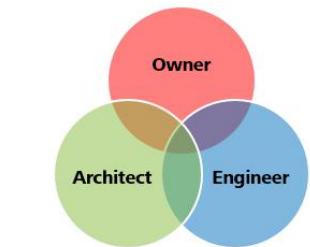
**Figure B8-55. BESTEST Case 600
Cloudy & Clear Day Hourly Incident Solar
West Facing Surface**



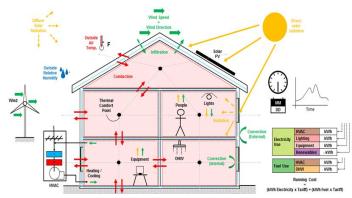
ASHRAE Standard 140-2011, Informative Annex B8, Section B8.1

Figure B8-1. BESTEST BASIC Annual Incident Solar Radiation

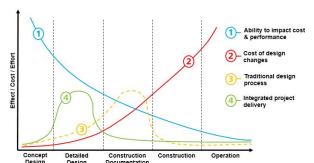




Stakeholder
Engagement



Whole System
Optimization



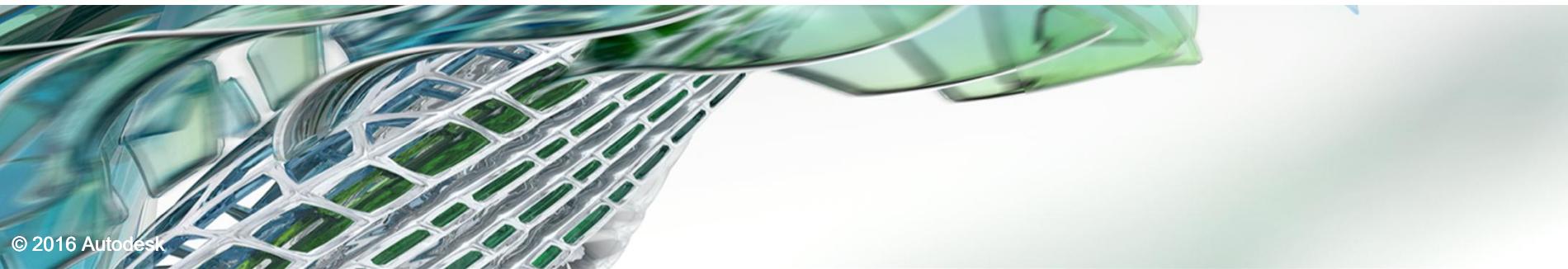
Lifecycle & Process
Continuity

All the right people with all the right information at all the right times.



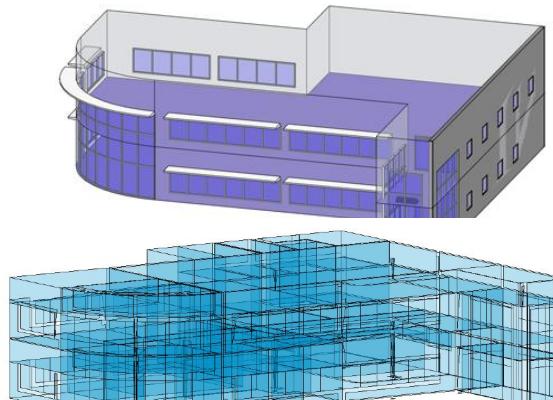
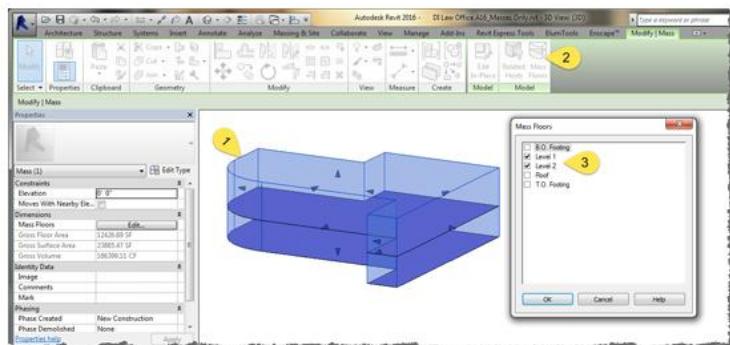
BPA相关产品应用

AUTODESK.

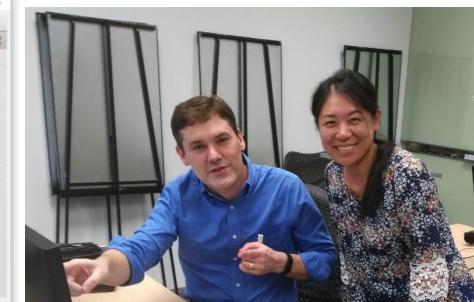
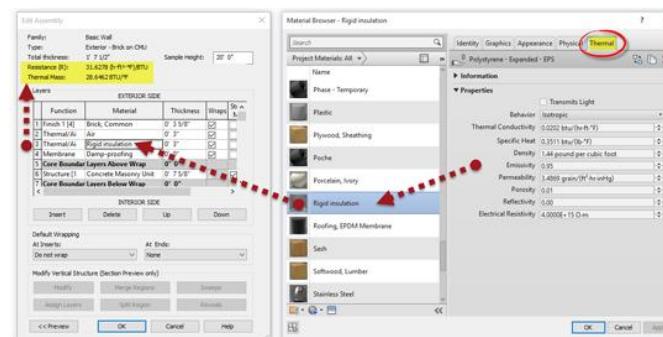
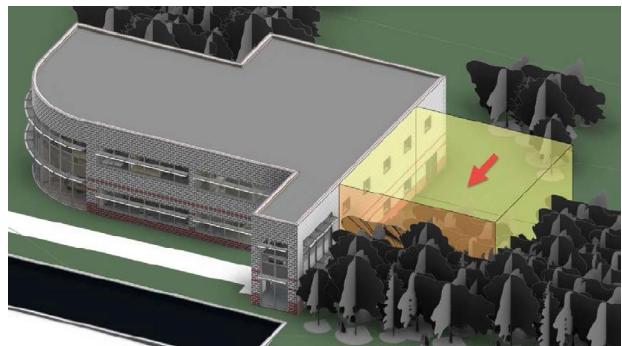


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<http://aecbytes.com/tipsandtricks/2015/issue76-revit.html>

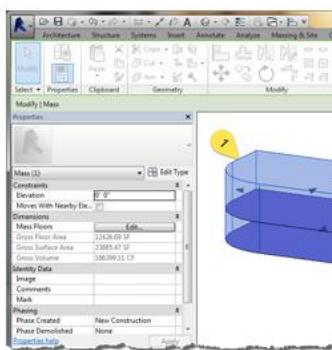


1. Create a Revit model using masses, building elements, or both
2. [Energy Settings dialog \(Analysis tab\)](#)
 - o Set Location
 - o Review Energy Analytical Model settings
 - o All other settings are optional
3. [Create Energy Model](#)
 - o Views created: 3D Energy Model, Analytical Spaces (Schedule), Analytical Surfaces (Schedule)
 - o Use this tool to delete and recreate the Energy Analysis Model (EAM) anytime the Revit model changes
4. [Visually Review Energy Model](#)
5. Launch [Insight 360](#) for interactive project exploration
6. AIA 2030 Commitment Firms: Upload results to DDX
7. [Optional Settings and Workflows](#)



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<http://aecbytes.com/>



1. Revit model properties (Mass Properties dialog)

2. Energy Settings dialog (Analysis tab) - Set Location

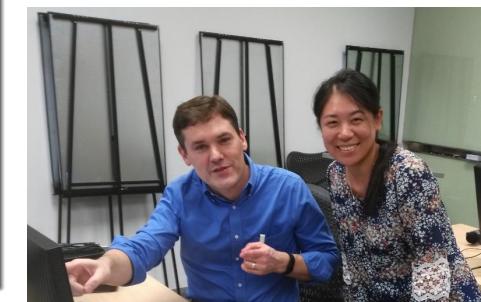
3. Building Form tool (AIM16193 selected)

4. Create Energy Model

5. Visualize tool (3D Energy Model, Analytical Spaces (Schedule))

6. Building Orientation (Current Setting: 45 - 180)

1. Create a Revit model using masses, building elements, or both
2. Energy Settings dialog (Analysis tab)
 - o Set Location
 - o Review Energy Analytical Model settings
 - o All other settings are optional
3. Create Energy Model
 - o Views created: 3D Energy Model, Analytical Spaces (Schedule)
 - o Use this tool to delete and recreate the Energy Analysis Model (EAM) anytime the Revit model changes
4. Visually Review Energy Model
5. Launch Insight 360 for interactive project exploration
6. AIA 2030 Commitment Firms: Upload results to DDX
7. Optional Settings and Workflows



ARCHITECT

Phil Bernstein, FAIA

http://www.architectmagazine.com/technology/the-technology-to-master-in-architecture-in-2017_o

Phil Bernstein, FAIA

Lecturer, Yale University School of Architecture; consultant, Autodesk

Recommendation: If I were running a firm, I would build capabilities in two areas: reality capture—using scanning, digital photography, and drones to create models of existing conditions, including construction underway; and analysis and simulation—using tools to reason about design as it is unfolding.

Lots of possibilities here, but in the Autodesk portfolio, **Recap 360** for reality capture and **Insight 360** for energy evaluation analysis are both available, easy to use, and BIM compatible.



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- RMI providing development recommendations for extending high performance building design capabilities
- Exploring thought leadership opportunities



- Development of API in support of Design Development Exchange (DDx) and AIA 2030 Commitment



- Ed Mazria was “thrilled” when his team told him about the latest Insight 360 capabilities
- Exploring opportunities to integrate Insight 360 into their AIA learning series

相关资料

- Insight 360官网：
<https://insight360.autodesk.com>
- Insight 360博客：
<http://blogs.autodesk.com/insight360/>
- Insight 360论坛：
<http://forums.autodesk.com/t5/insight-360/ct-p/2020>
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