
Good design
makes a difference™
AIA

Conceptual Energy Design Operations

- Timothy L Hemsath, AIA, LEED AP
- College of Architecture, University of Nebraska-Lincoln

Conceptual Energy Design Operations

- Utilize energy modeling tools in practice
- Understand abilities and limitations
- Increase use, adoption and intelligence
- Formal design massing for virtual design

- *Putting metrics on building energy performance is a required step to make any progress on low-energy use and/or "green" buildings.*
  - Building Science Digest

Why do we do Energy Simulations?

- Measure building performance
- Examples
  - LEED ASHRAE 90.1 compliance
  - California Title 24
  - Building America Benchmark
  - HERS index and Energy Star
- 2008 Drury et. al, Studied 20 major programs
  - Ambiguous language and no commonality
  - Different resolutions
  - Recommend a suite of tools
  - Trust
- Energy Modeling is aimed at experts

Metrics for Measurement

- Energy Usage Intensity
  - 2030 challenge
  - EPA Energy Star
  - Commercial Building Energy Consumption Survey (CBECS)

Flaws

- Many any times, the model does not—or cannot--capture the complexities and realities of the actual building.
- Effect of the occupant of a building can be tremendous

Building Science Digest 152 **Building Energy Performance Metrics** 2010-05 by

- Not everyone is an expert

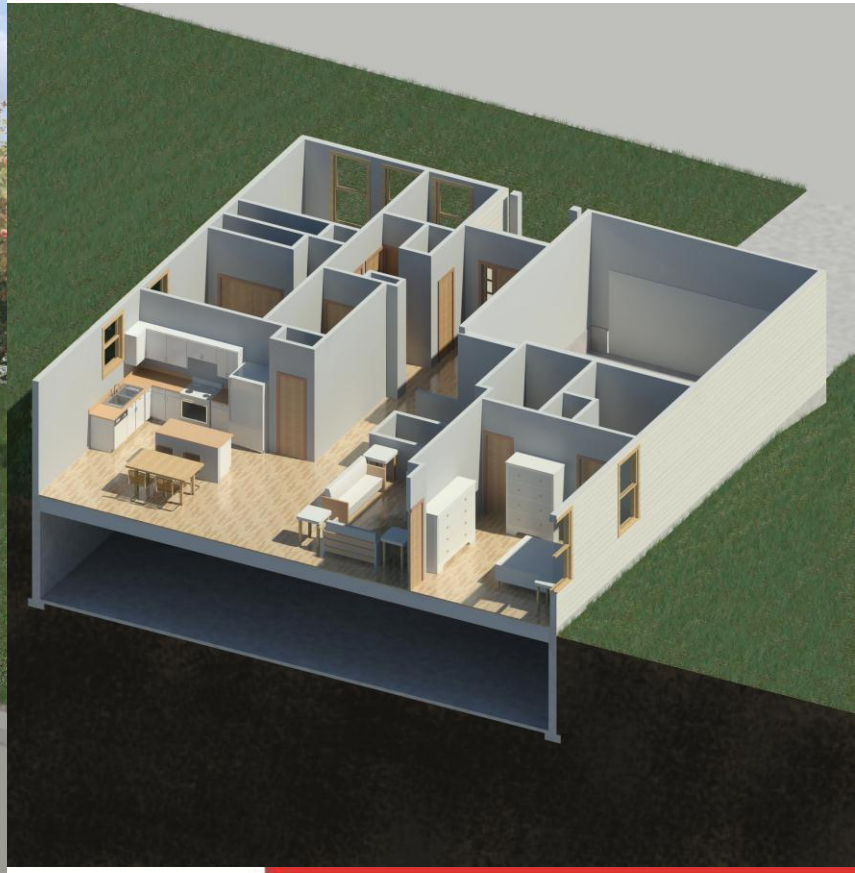
Precedent

- Low-Energy Architecture


University of Illinois at
Urbana-Champaign
120

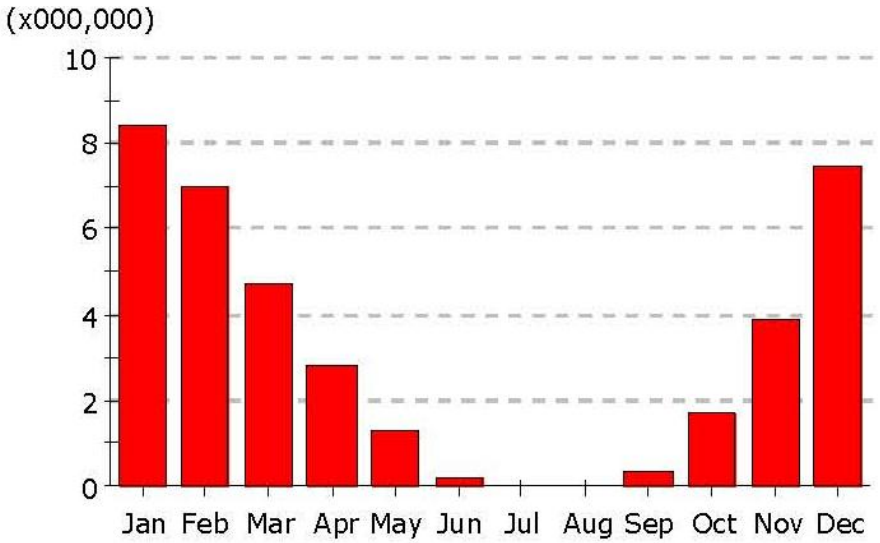
Validation

- Simulation Precedent

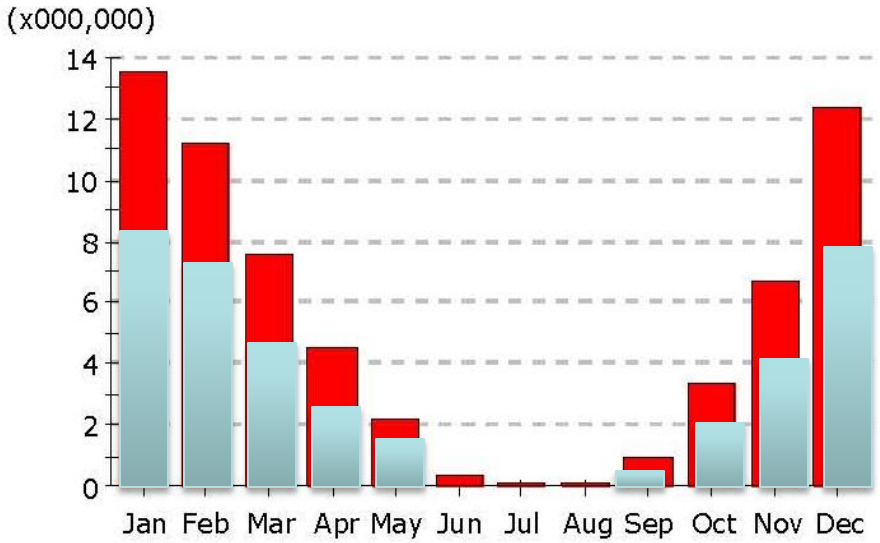


Gas Consumption (Btu)

Home - Albright

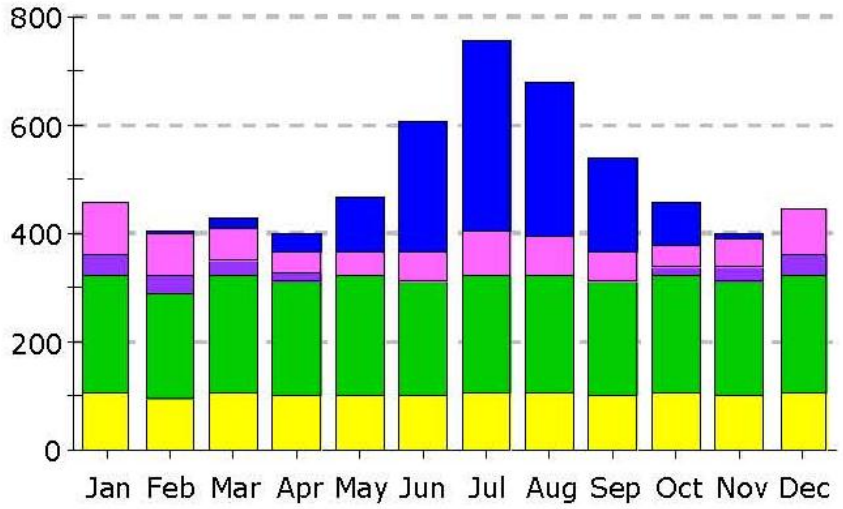


Building America Baseline

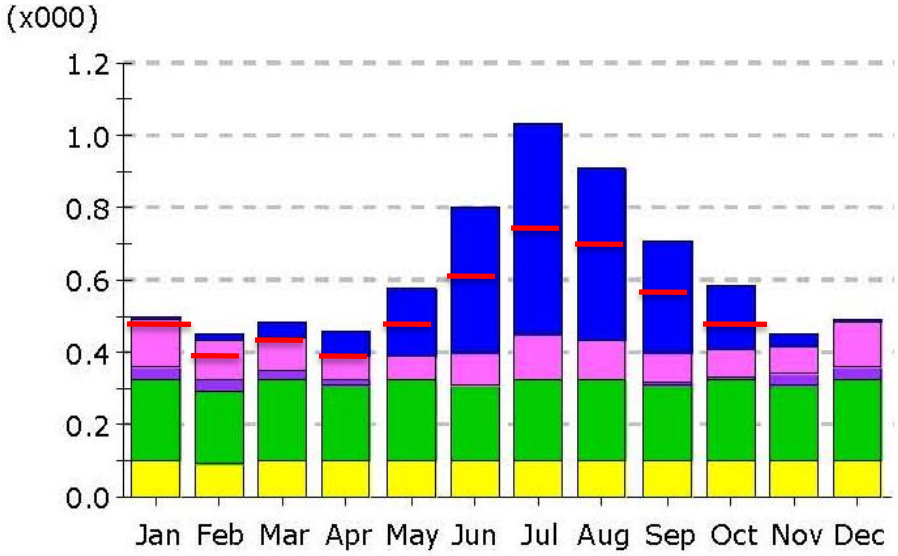


Electrical Consumption (kWh)

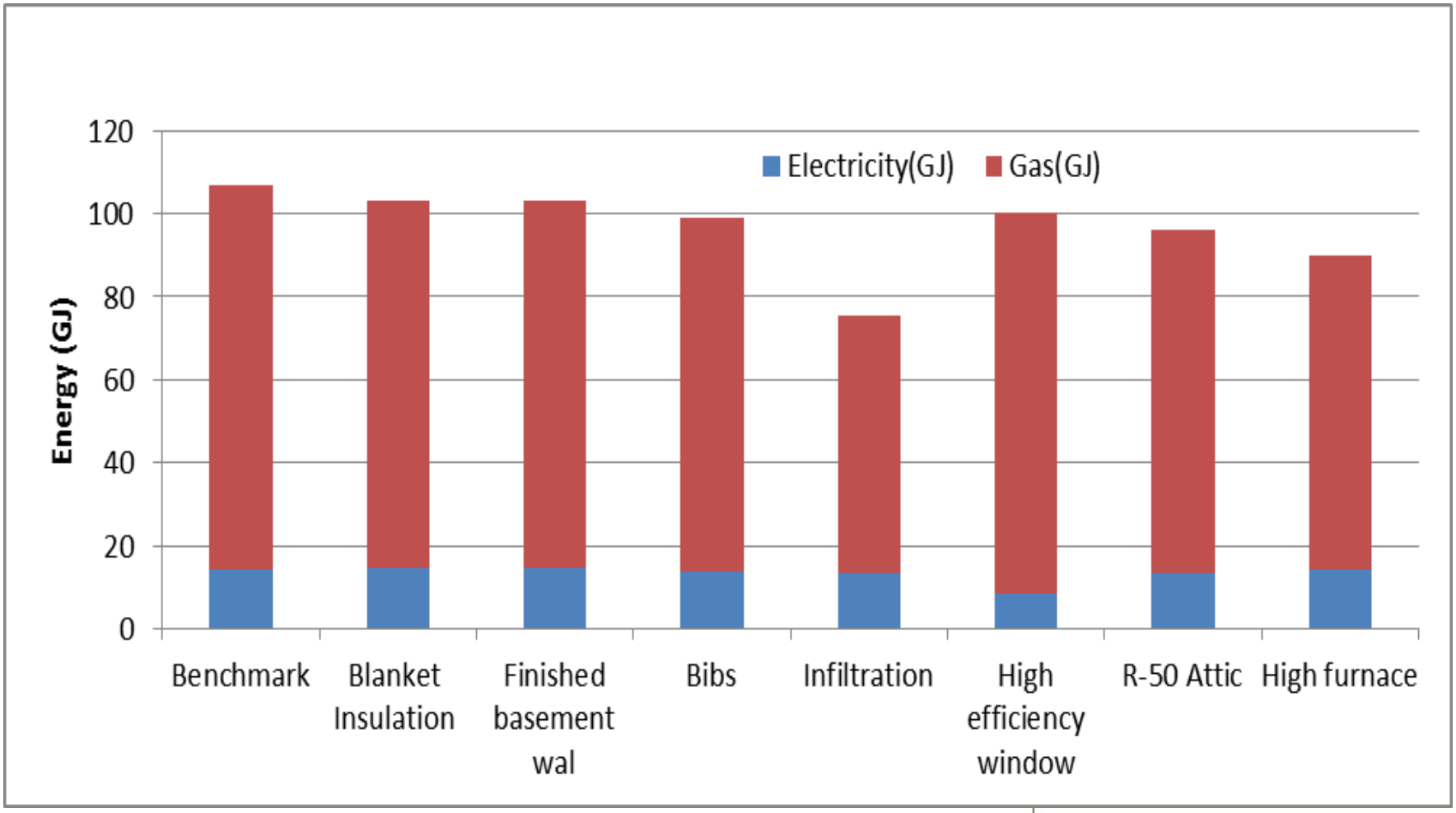
Home - Albright



Building America Baseline



Energy Consumption vs. Best Practice



⑤ *Whole House Energy Monitoring & Control System*

Using a real time monitoring system the ZNETH II home will obtain information on how much energy is being consumed and produced. Energy Star appliances, low-flow shower head, toilet and faucet conserve energy and water.

⑥ *R-50 Attic*

Loose fill insulation is blown into the attic at a uniform depth (approx. 17") to achieve an R-50 insulation factor.

⑦ *Roof truss with energy heel*

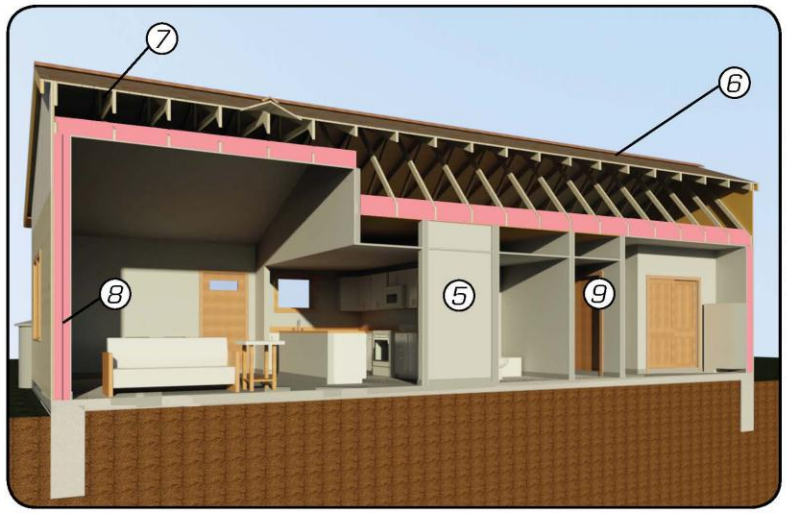
An energy heel lifts the roof to allow for additional insulation in the attic. Typical roof trusses narrow to 6" in thickness at the eave where the roof line meets the outer wall. As the roof gets narrower the effectiveness of the insulation is reduced due to less space. The advantage of including an Energy Heel in the roof trusses is it allows 14" of insulation versus the standard 6". This increases the R value of that area, and eliminates cold spots along the roof line.

⑧ *Double 2x4 studwall*

Double wall framing allows thermal isolation between inner and outer walls as well as eliminating the thermal bridging and air-barrier interruption of the floor deck. Using this technique along with insulation will achieve an R-30 value.

⑨ *Geothermal Heatpump*

Installed in the home is a 2 ton Geothermal heatpump, a two stage variable furnace blower combined with a hot water generator. A 5Kw backup heat and 6" fresh air intake. This system has an Energy Efficiency Rating of 26.



ZNETH II

NEBRASKA RESEARCH INITIATIVE FUNDING

Interdisciplinary Building Science Research Partners:

- University of Nebraska-Lincoln College of Architecture
- Department of Chemistry at the University of Nebraska-Omaha
- University of Nebraska-Lincoln College of Architectural Engineering and Construction
- University of Nebraska Medical Center College of Public Health

University of Nebraska Lincoln ZNETH II OMAHA

The ZNETH II project is collaboration between the City of Omaha, Parks and Recreation and researchers at the University of Nebraska-Lincoln, Peter Kiewit Institute Technology Development Corp. Director of Parks, Recreation and Public Property, Melinda Pearson, said, "This caretaker residence is a great public partnership between the educational/ research component at the University of Nebraska and the recreation/summer camp activities in the City of Omaha. The 1,000 square foot, two-bedroom, one-bath home will serve as a research test facility for the University and will provide a caretaker residence for year-round occupancy at Hummel Park." The project research goal is to provide the optimal energy efficiency at little to no additional construction cost.

City of Omaha, Nebraska — Incorporated February 2, 1857

City of Omaha Parks & Recreation

The Nebraska Environmental Trust

The Peter Kiewit Institute

OMAHA

ZNETH II

ero et nergy est ouse

OMAHA

1 Ridge Vent
A ridge vent was installed to allow the attic proper ventilation. During the summer months outside air flows through the soffit vents and exits the ridge vent, which aids in keeping the temperature and moisture down in the attic.

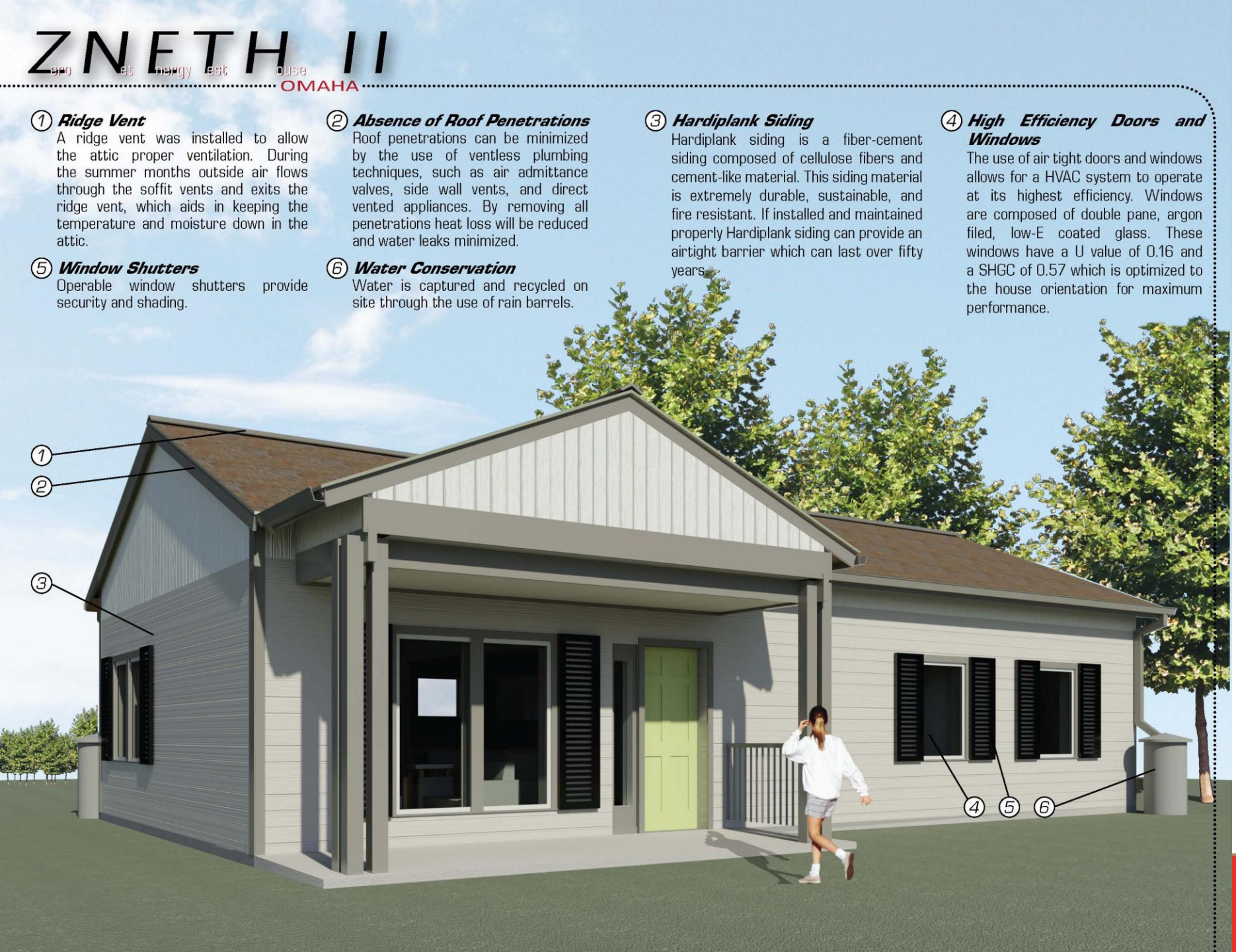
2 Absence of Roof Penetrations
Roof penetrations can be minimized by the use of ventless plumbing techniques, such as air admittance valves, side wall vents, and direct vented appliances. By removing all penetrations heat loss will be reduced and water leaks minimized.

3 Hardiplank Siding
Hardiplank siding is a fiber-cement siding composed of cellulose fibers and cement-like material. This siding material is extremely durable, sustainable, and fire resistant. If installed and maintained properly Hardiplank siding can provide an airtight barrier which can last over fifty years.

4 High Efficiency Doors and Windows
The use of air tight doors and windows allows for a HVAC system to operate at its highest efficiency. Windows are composed of double pane, argon filed, low-E coated glass. These windows have a U value of 0.16 and a SHGC of 0.57 which is optimized to the house orientation for maximum performance.

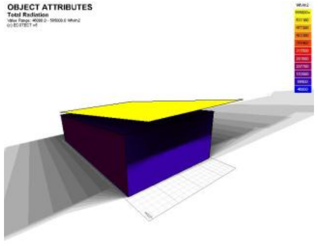
5 Window Shutters
Operable window shutters provide security and shading.

6 Water Conservation
Water is captured and recycled on site through the use of rain barrels.



Design

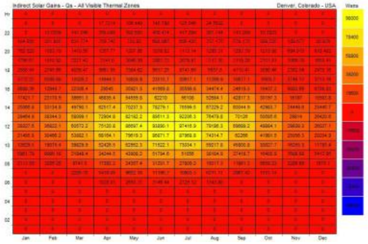
- Toolset of Ideas
- Bigger than added technology

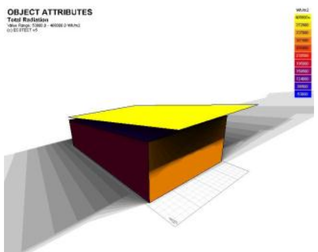


May 1 - August 31

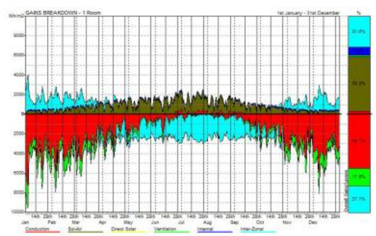
PARAMETERS

AREA: 4800 SQ. FT.
LOCATION: CPBS, OGALLALA, NE
PROGRAM: CONFERENCE CENTER





October 1 - March 31

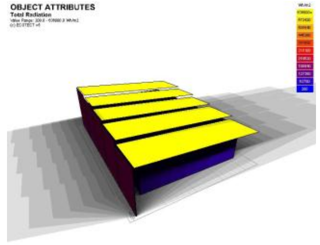


GAINS BREAKDOWN - 1 Room
FROM: 1st January to 31st December

CATEGORY	LOSSES	GAINS
FABRIC	55.1%	3.1%
SOL-AIR	0.0%	55.9%
SOLAR	0.0%	0.0%
VENTILATION	17.8%	1.0%
INTERNAL	0.0%	8.4%
INTER-ZONAL	27.1%	31.6%

ANALYSIS AND CONCLUSIONS

The single double roof provides adequate shade to the core structure during the summer months and allows sunlight to warm the southern facade during the winter months. However, the roof of the core structure remains shaded during the winter months, failing to capitalizing on an opportunity to increase the total solar gain of the structure during the region's cold winters. A more dynamic approach should be studied that is able to provide the core's roof and southern facade with shade in the summer and a significant amount of sun in the winter.



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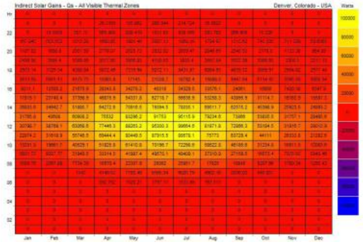
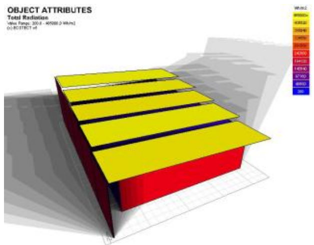
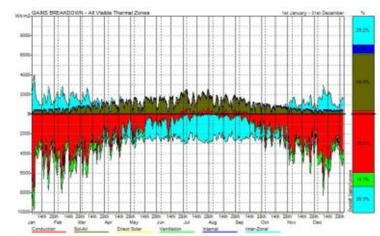




October 1 - March 31

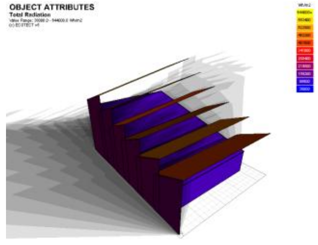


GAINS BREAKDOWN - All Visible Thermal Zones
FROM: 1st January to 31st December

CATEGORY	LOSSES	GAINS
FABRIC	59.6%	3.4%
SOL-AIR	0.0%	58.0%
SOLAR	0.0%	0.0%
VENTILATION	14.1%	0.8%
INTERNAL	0.0%	8.6%
INTER-ZONAL	26.3%	29.2%

ANALYSIS AND CONCLUSIONS

The multiple panels of the double-roof / double-wall system provide adequate shading in the summer months and allow significant amounts of sunlight to strike the southern facade in the winter months. In addition, the gaps placed between each individual panel allow the low winter sun to penetrate to the interior of the shading device. This allows a greater amount of sunlight to strike the core's roof in the winter, but the increase is still only slight, and a more dramatic approach could produce a great deal of improvement.



May 1 - August 31

PARAMETERS

AREA: 4800 SQ. FT.
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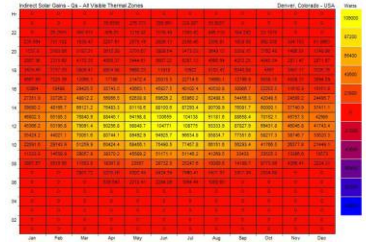

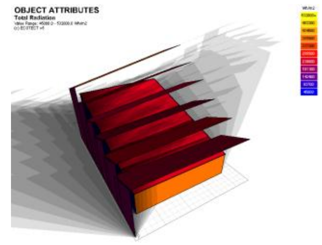

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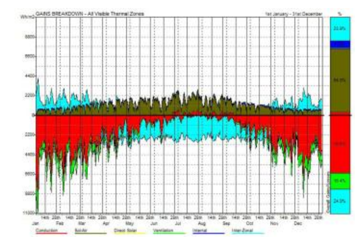
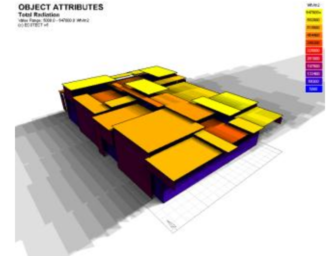


GAINS BREAKDOWN - All Visible Thermal Zones
FROM: 1st January to 31st December

CATEGORY	LOSSES	GAINS
FABRIC	58.6%	3.2%
SOL-AIR	0.0%	64.5%
SOLAR	0.0%	0.0%
VENTILATION	16.4%	0.9%
INTERNAL	0.0%	7.5%
INTER-ZONAL	24.9%	23.9%

ANALYSIS AND CONCLUSIONS

The multiple panels of this design result in adequate shading during the summer months as well as adequate solar exposure during the winter months. The careful placement and angle of each panels allows the assembly to completely shade the roof and southern facade during summer while still allowing the low winter sunlight to reach the roof and southern face of the core during winter. In addition, the angle of the core's roof allows the winter sunlight to strike the roof more directly, resulting in a more efficient heat transfer process. The eastern facade remains unprotected and could be studied further.



May 1 - August 31

PARAMETERS

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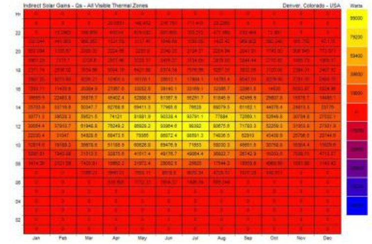
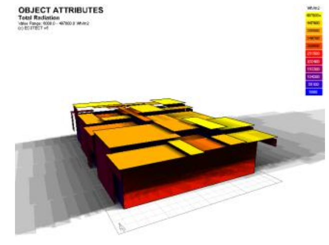
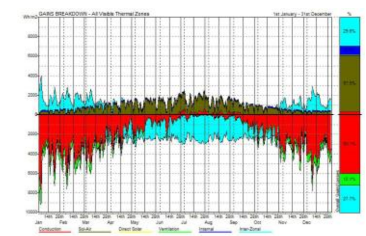




October 1 - March 31



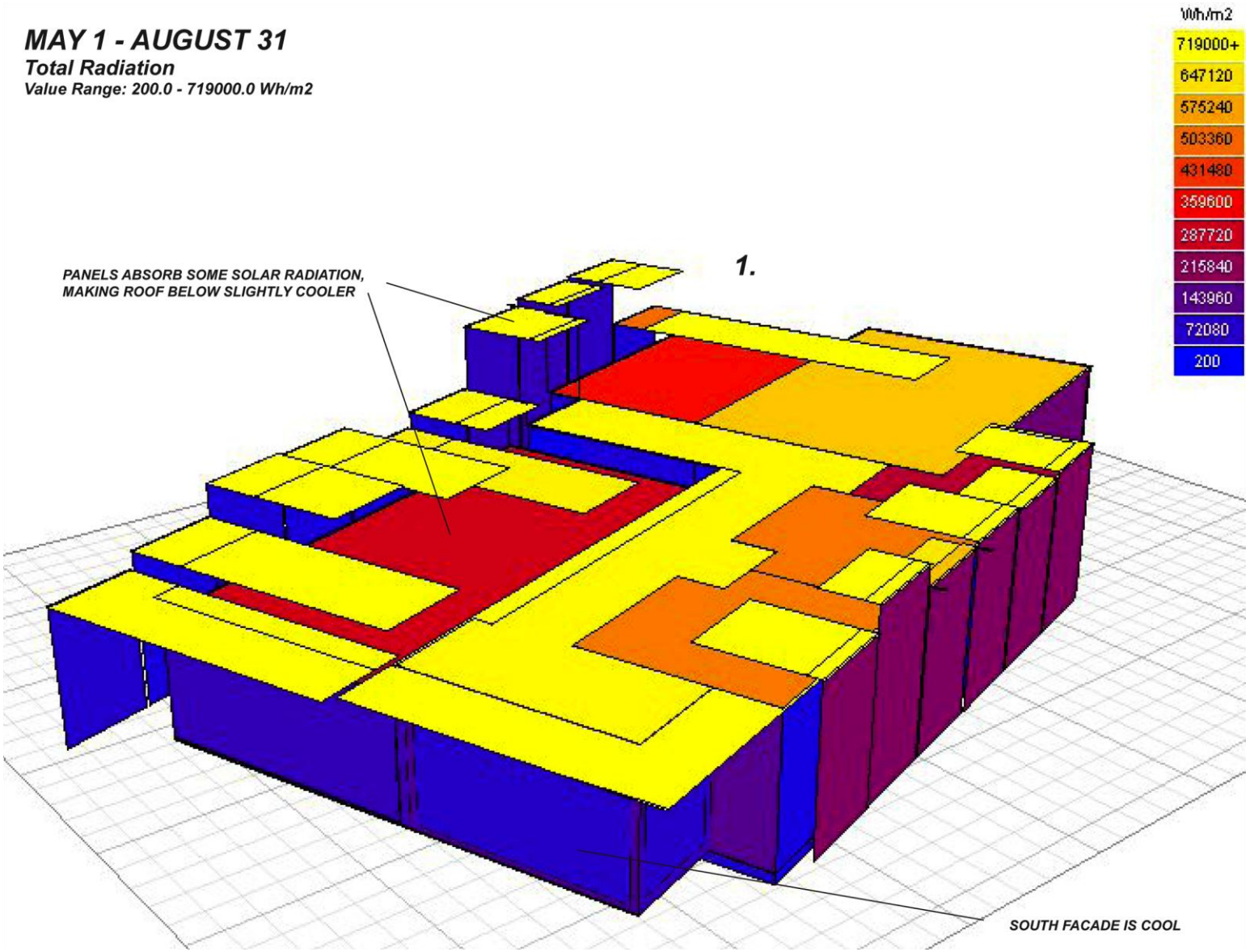
GAINS BREAKDOWN - All Visible Thermal Zones
FROM: 1st January to 31st December

CATEGORY	LOSSES	GAINS
FABRIC	60.1%	3.4%
SOL-AIR	0.0%	57.5%
SOLAR	0.0%	0.0%
VENTILATION	12.1%	0.7%
INTERNAL	0.0%	8.7%
INTER-ZONAL	27.7%	29.6%

ANALYSIS AND CONCLUSIONS

The divided double-roof structure of this design provides adequate shade in the summer and allows significant amounts of sunlight to strike the southern facade in the winter. Yet, despite the gaps between each double-roof panel, the roof of the core structure remains almost fully shaded during the winter months, making the design less dynamic and poorly suited for year-round habitation. In addition, the orthagonal composotion of the core's walls result in high radiant gains. A more dynamic and fluid design could be explored to eliminate this problem.

MICHAEL HARPSTER / ARCH 310 / PROFESSOR T. HEMSATH / 24 SEPTEMBER 2010


MAY 1 - AUGUST 31
Total Radiation
Value Range: 200.0 - 719000.0 Wh/m2
Wh/m2
719000+
647120
575240
503360
431480
359600
287720
215840
143960
72080
200
1.
PANELS ABSORB SOME SOLAR RADIATION, MAKING ROOF BELOW SLIGHTLY COOLER
SOUTH FACADE IS COOL

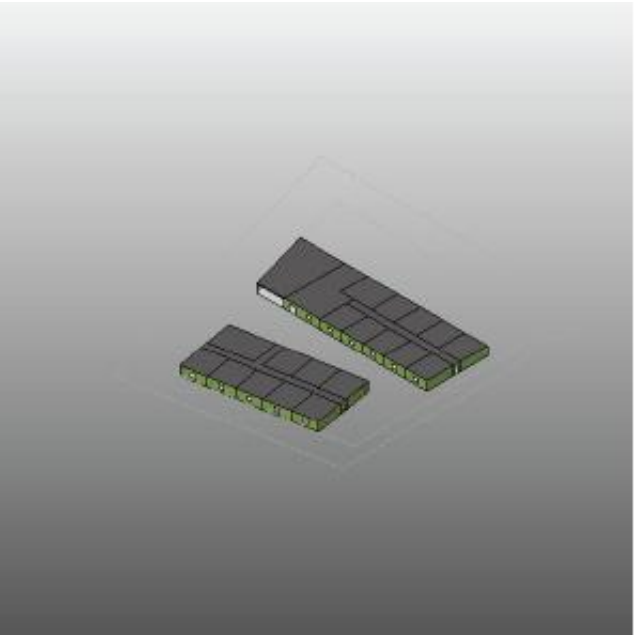
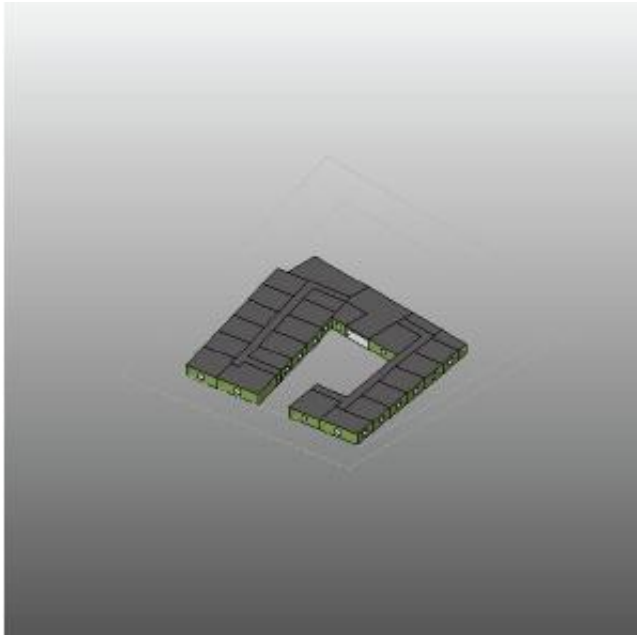
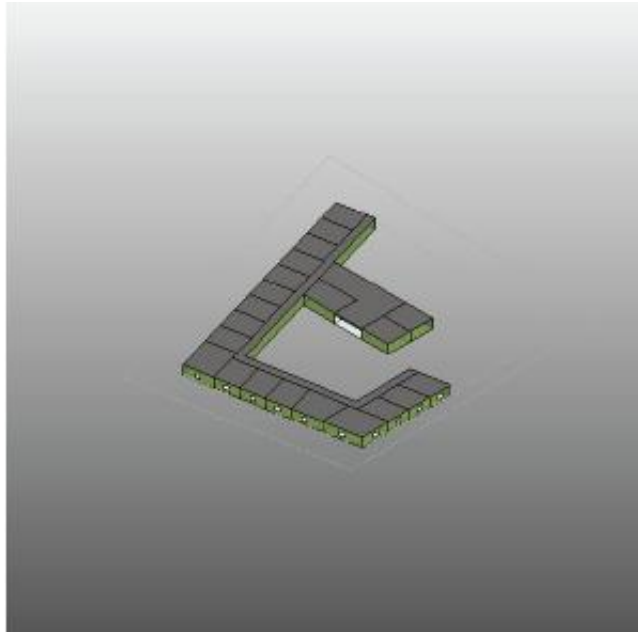
Comparing

- Design Simulations

Energy Model Comparison

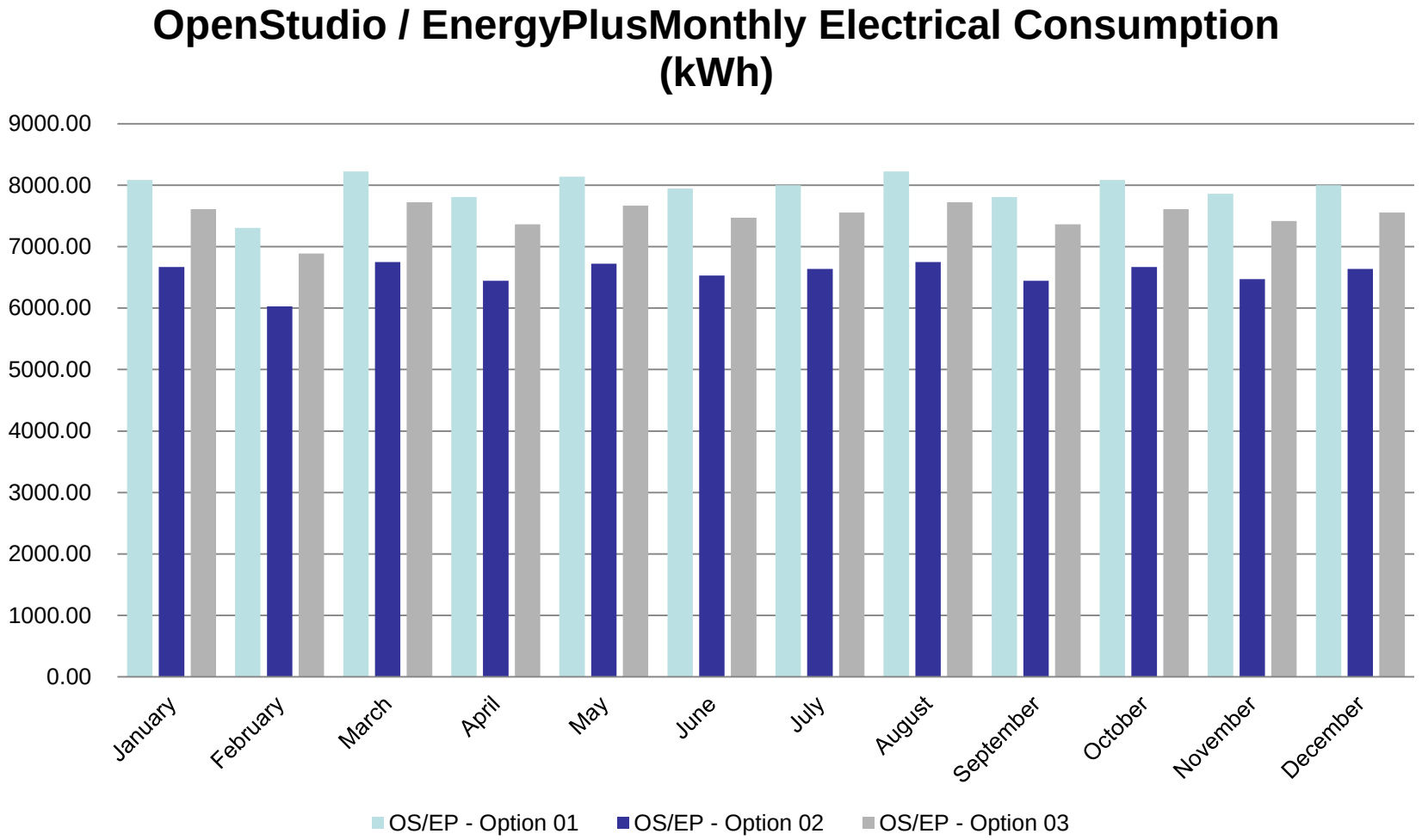
	Vasari	**OpenStudioEnergyPlus**
Location	Omaha, NE	Bellevue, NE
Weather Station	30149	Bellevue Offut. AFB 725540
Building Type	Multi-Family	Mid-Rise Apartment
Exterior Wall	Lightweight Construction - High Insulation	Gypsum Board, 154mm Insulation, Plywood, High Density Hardboard
Interor Wall	Lightweight Construction - No Insulation	Gypsum Board, Air Space, Gypsum Board
Roof	Typical Insulation - Cool Roof	Gypsum Board, 244mm Batt Insulation, Air Space, Sheathing, Building Paper, Asphalt Shingles
Floor	Lightweight Construction - No Insulation	Insulation, Lightweight Concrete, Carpet
Glazing	Double pane Clear - No Coating	2009 - LowEnergyCase_ExtWindow_ClimateZone3
Building Operating Schedule	24/7 Facility	Always On
HVAC System	Residential 14 SEER/8.3 HSPF Split Packaged Heat Pump	Autosized

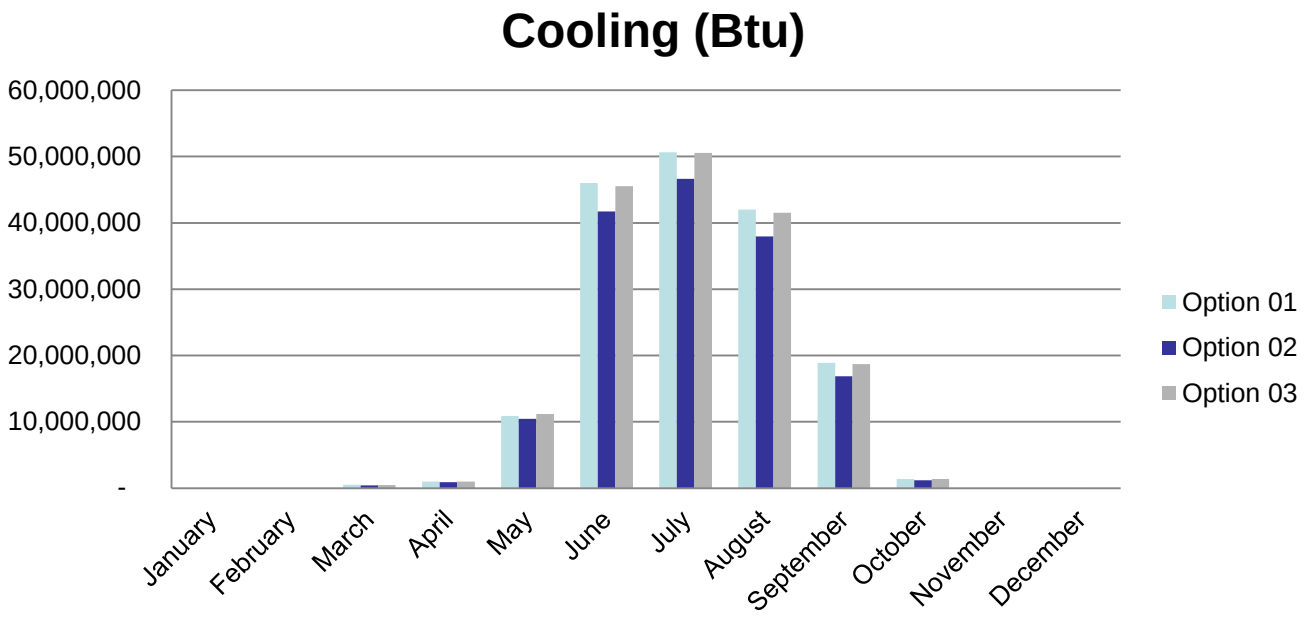
Energy Model Comparison

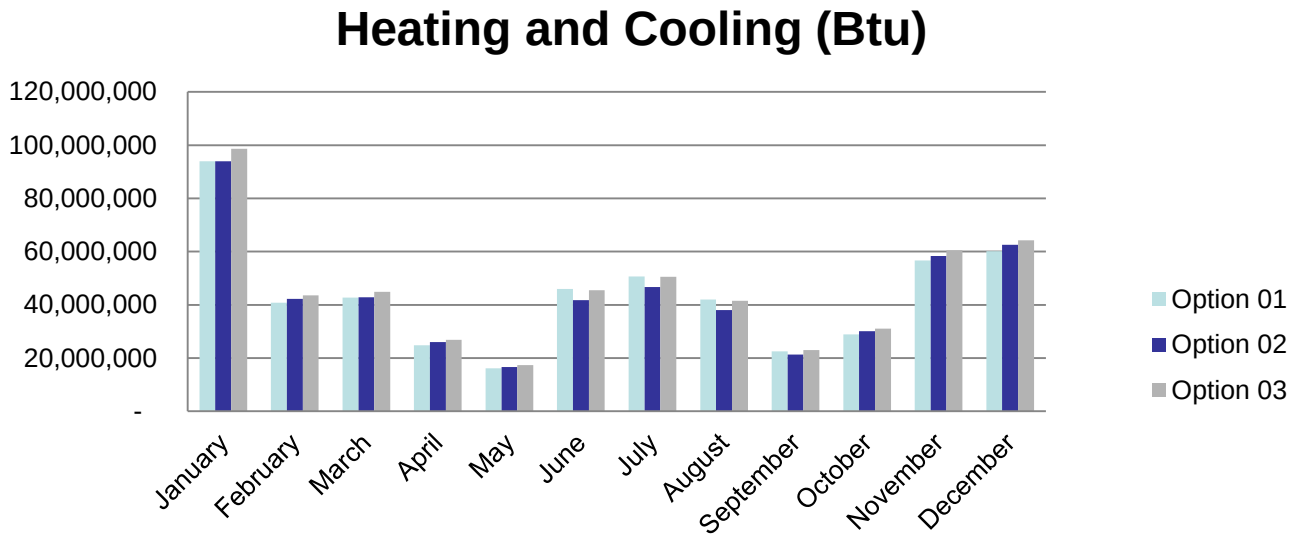
Opt 1	Opt 2	Opt 3
		
☺ Performance ☺ Cost ☹ Function	😐 Performance 😐 Cost ☺ Function	☹ Performance ☹ Cost 😐 Function

Intuitive guess

Results


OpenStudio / EnergyPlusMonthly Electrical Consumption (kWh)
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
January
February
March
April
May
June
July
August
September
October
November
December
OS/EP - Option 01
OS/EP - Option 02
OS/EP - Option 03


Cooling (Btu)
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
-
January
February
March
April
May
June
July
August
September
October
November
December
Option 01
Option 02
Option 03


Heating and Cooling (Btu)
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
-
January
February
March
April
May
June
July
August
September
October
November
December
Option 01
Option 02
Option 03

EUI comparison

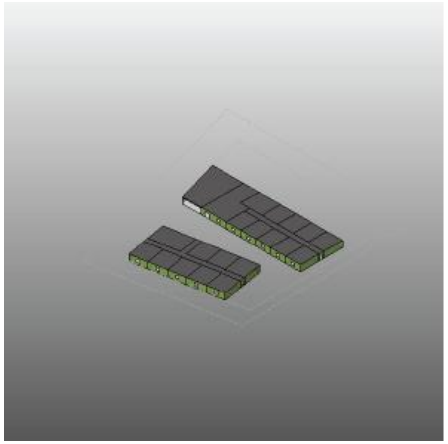
Energy Use Intensity

	Vasari Option 1	Vasari Option 2	Vasari Option 3
Electricity EUI	14 kWh/sf/yr	14 kWh/sf/yr	14 kWh/sf/yr
Fuel EUI	30 kBtu/sf/yr	30 kBtu/sf/yr	30 kBtu/sf/yr
Total EUI	78 kBtu/sf/yr	79 kBtu/sf/yr	79 kBtu/sf/yr

	OSEP Option 1	EUI **	OSEP Option 2	EUI **	OSEP Option 3	EUI **
District Heating [kBtu]	353,867.52	15	364,160.82	16	376,937.39	17
District Cooling [kBtu]	171,251.60	7	155,972.79	7	170,256.39	8
Interior Lighting [kWh]	40,691.67	2	35,327.78	2	40,527.78	2
Interior Equipment [kWh]	54,772.22	2	43,386.11	2	49,380.56	2
Total End Uses Electricity [kWh]	95,463.89	4	78,713.89	3	89,908.33	4
Total End Uses District Cooling [kBtu]	171,251.60	7	155,972.79	7	170,256.39	8
Total End Uses District Heating [kBtu]	353,867.52	15	364,160.82	16	376,880.52	17
		27		26		28

Energy Model Comparison

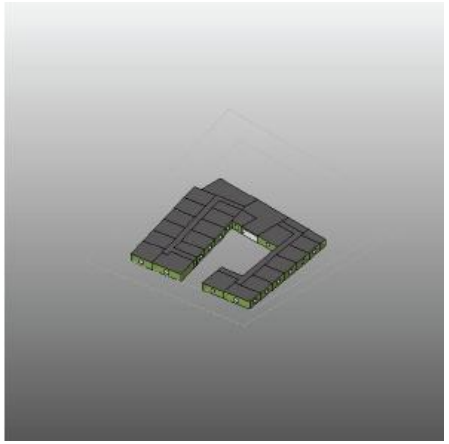
Opt 1



☺ Performance
☺ Cost
☹ Function

OSEP Option 1		EUI **
Total Electricity [kWh]	95,463.89	4
Total Cooling [kBtu]	171,251.60	7
Total Heating [kBtu]	353,867.52	15
		26

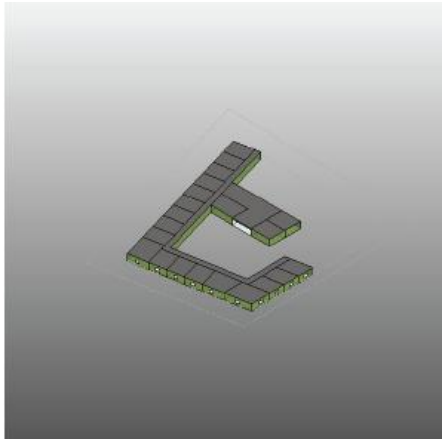
Opt 2



😐 Performance
😐 Cost
☺ Function

OSEP Option 2		EUI **
Total Electricity [kWh]	78,713.89	3
Total Cooling [kBtu]	155,972.79	7
Total Heating [kBtu]	364,160.82	16
		26

Opt 3



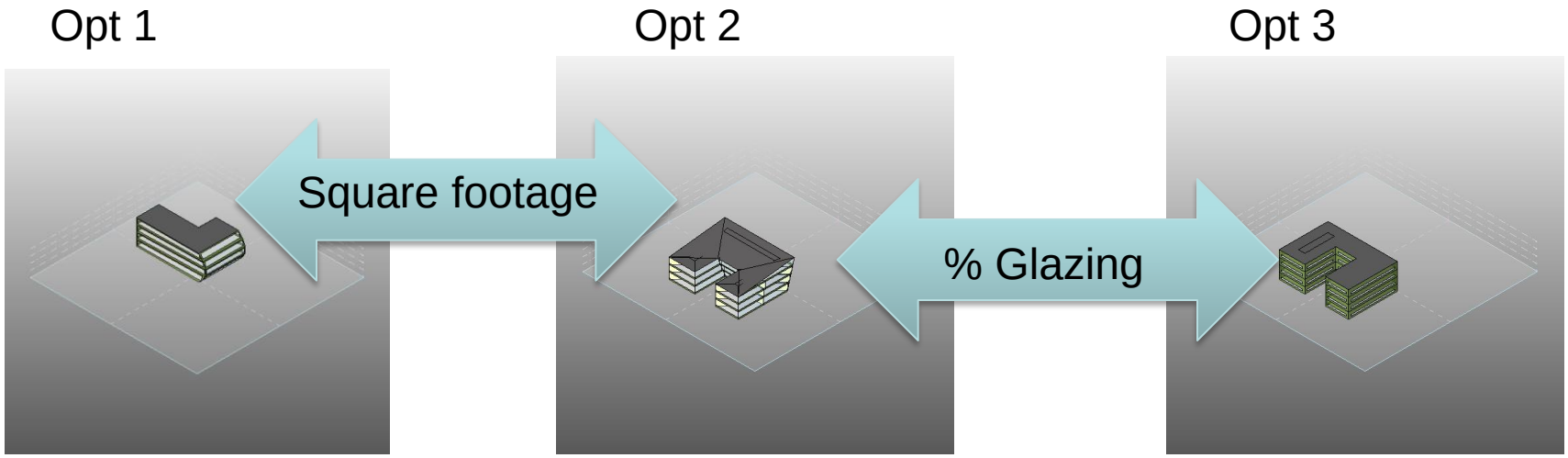
☹ Performance
☹ Cost
😐 Function

OSEP Option 3		EUI **
Total Electricity [kWh]	89,908.33	4
Total Cooling [kBtu]	170,256.39	8
Total Heating [kBtu]	376,880.52	17
		28

Student Experiments

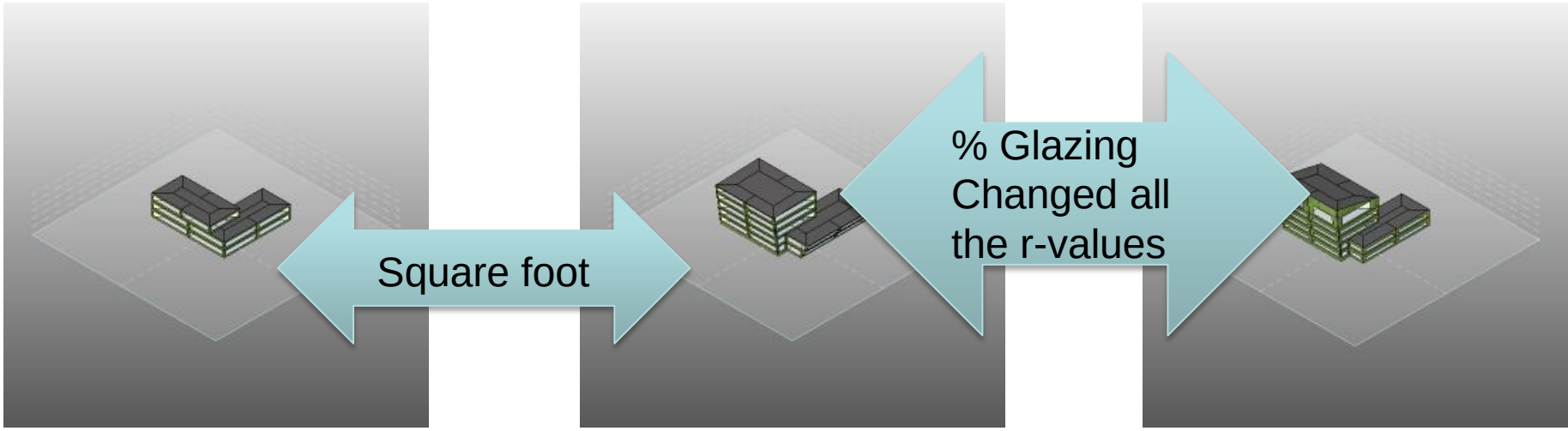
- *Maintain assumptions with incremental changes to only one item*

Energy Model Failures



	EUI	EUI	EUI
Total Electricity [kWh]	17	21	15
Total Fuel [kBtu]	35	44	17
Total EUI [kBtu]	94	114	67

Energy Model Failures



	EUI	EUI	EUI
Total Electricity [kWh]	17	17	16
Total Fuel [kBtu]	13	11	51
Total EUI [kBtu]	72	69	104

What did we learn?

Vasari

The interface is the same as Revit

- Knowledge of Revit makes Vasari easy to use

Vasari's energy analysis capabilities are limited

- This is advantageous for schematic design

Materials and assemblies are predefined and the selection is limited

- This is limiting if the design differs from the available choices

Vasari doesn't have error checking capabilities

- A user doesn't know if the model and analysis is correct

Energy results are graphed

- This provides a visual that is easily legible
- The graphs are not editable which is limiting

Energy results include cost information

What did we learn?

OpenStudio / EnergyPlus

Time consuming to learn even with prior knowledge of SketchUp

Many ways to customize and edit energy models

- More steps increase the chance for errors
- Leaving information out limits the outputs

Materials and assemblies (constructions) can be customized

- There are unlimited possibilities for how assemblies can be designed

Detailed error checking

- Allows the user to pinpoint specific problems with the energy model

Energy results are extensive and customizable

CONCLUSION

Conclusion
Vasari is best for early schematic design or massing models that do not require precise results.

OpenStudio and EnergyPlus are best for designs that are further along in the design process and are looking for accurate results. More accurate model, however more knowledge is required.

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Conceptual Energy Design Operations

- Tim Hemsath, AIA
- themsath3@unl.edu
- 402-472-4472
- Architecture, University of Nebraska-Lincoln

A BIM Journey: Destination Carbon Neutral

Keith Holloway, AIA, NCARB
Project and BIM Technology Manager

David Fishel, PE LEED AP
Senior Energy Analyst

Keith Holloway, AIA, NCARB
Project and BIM Technology Manager
RLF architecture | engineering | interiors
PH: 407-647-1039
bkh@rlfae.com

David Fishel, PE LEED AP
Senior Energy Analyst
RLF architecture | engineering | interiors
PH: 407-647-1039
dcf@rlfae.com

LEARNING OBJECTIVES

- ❑Better understand the process of incorporating sustainable and energy analysis tools within your project.

- ❑Set up models that respond to the collaboration needs of Architects, Engineers, Designers and other players in the design team.

- ❑Produce and coordinate deliverables across multiple disciplines, multiple models and multiple interfacing software.

- ❑Define strategies for BIM collaboration: model linking and data exchange.

RLF BIM PROCESS

www.rlfae.com

A Reflection of Office Characteristics and Deliverable Requirements





Founded in 1935

Based in Winter Park, Florida

Services include Master Planning, Architecture, Engineering and Interior Design

130+ Professionals

Type of Projects

Healthcare / Education / Cultural / Religious

Scope of Work

Design Build / Design Bid Build / Joint-Ventures / Prime / Consultant

Clients

US Department of Defense

Veterans Administration

Private Sector

Our Values

Design Excellence

Strong Management

Technology Driven

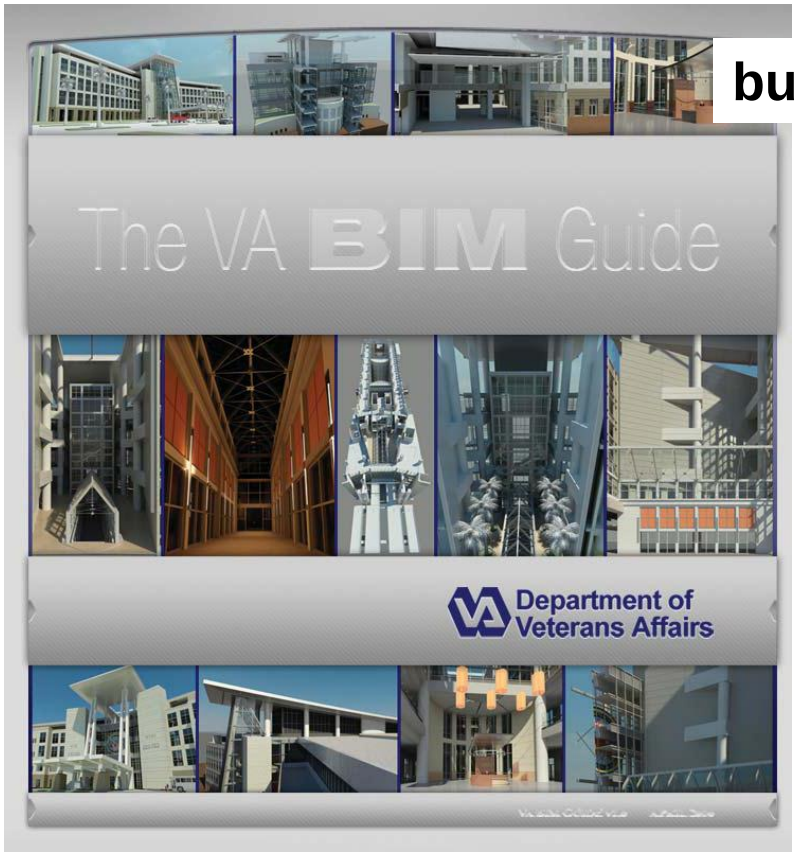
Design with Integrity

Model with Integrity

Positive BIM influences:

Standards Development / Resources

NIBS



buildingSMART Alliance

Penn State

GSA

VA

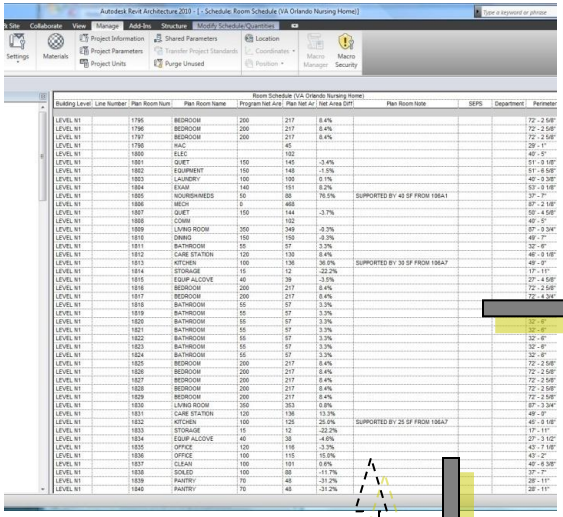
USACE BIM Guidelines- Attachment F

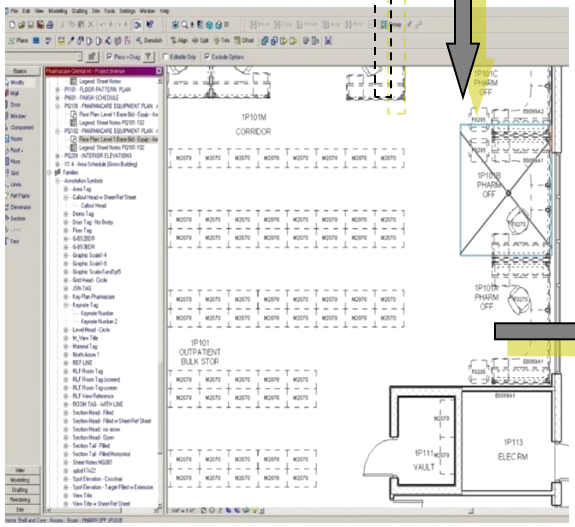
AIA NTAP

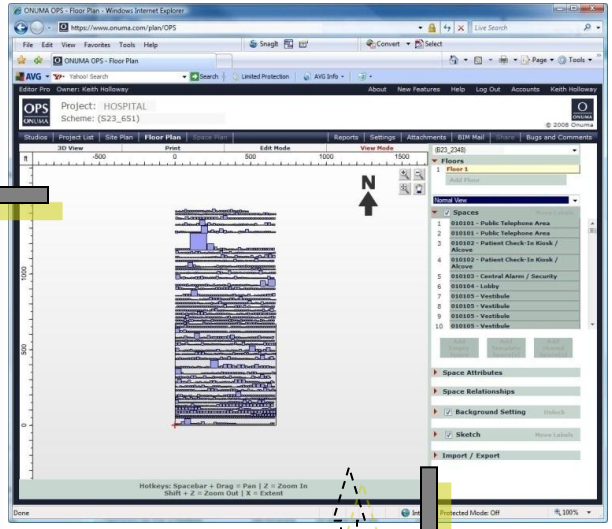
New Technologies, Alliances, Practices

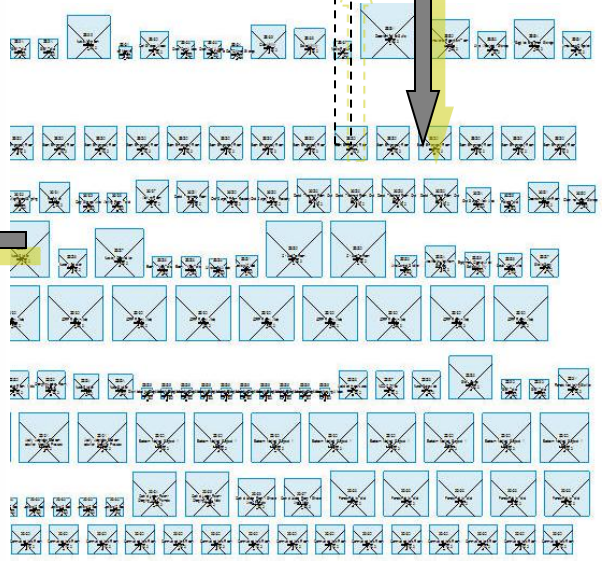
Modeling Data Influences

From RAW information to STREAMING DATA





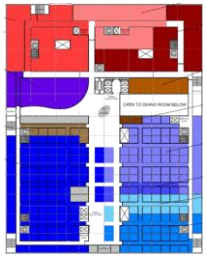


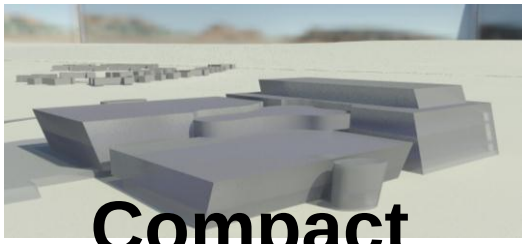


“Program for Design Spreadsheet Data Reuse…”

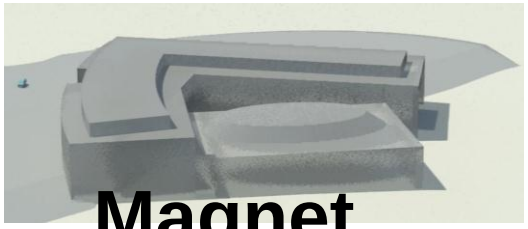
Early Site Impressions

Charrette Design Options

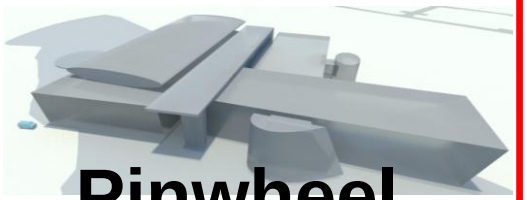




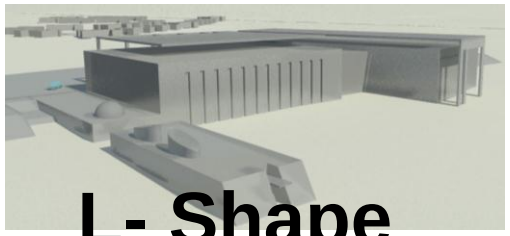
Compact



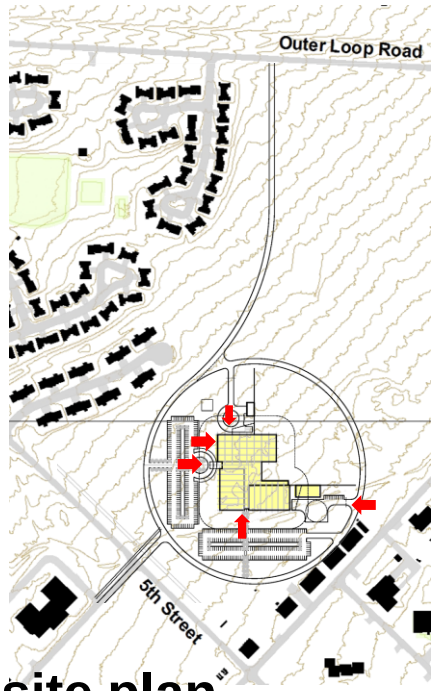
Magnet



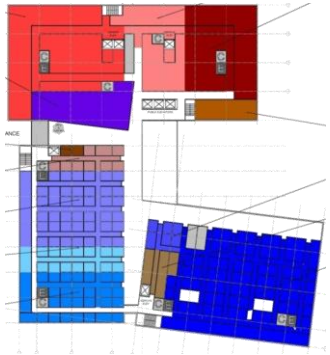
Pinwheel



L- Shape



site plan



floor plan

massing

Selected Option

AIA

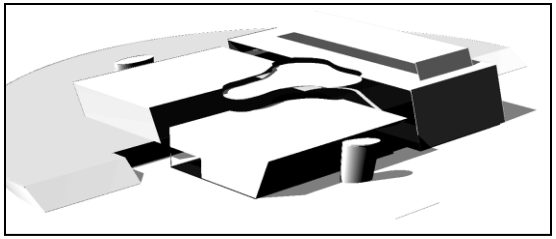
Energy Modeling Methodology: AECOM

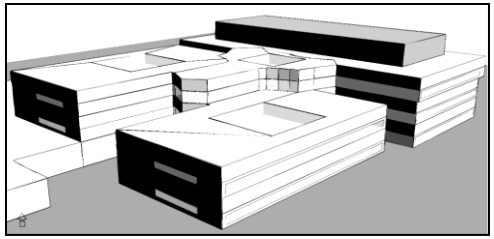
INPUTS

Inputs from Revit
- Building geometry
- Building orientation

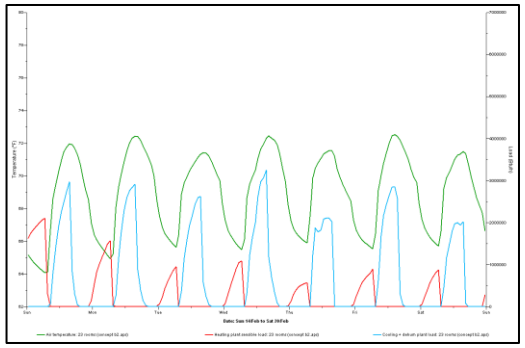
Energy Modeling Inputs
- Site location
- Building construction assemblies
  - ✓Architect input
  - ✓ASHRAE 90.1-2007
- Internal gains and schedules
  - ✓ASHRAE Fundamentals

Simulation Software





RESULTS



Heating Loads/Cooling Loads

Advantages
- Compact design reduces wall area.
- High window to wall area ratio provides access to views.
- Building entrance is located within wind shadow from dominant NE wind.

Disadvantages
- Deep floorplates limit depth of daylighting.
- Significant SE glazing could result in early morning solar control issues.

Potential Mitigation Strategies
- Solar Shading
- Daylighting strategies

Site Opportunities: Wind Energy : Solar Energy : Diurnal Temperature Range : Passive Design Strategies

Site Opportunities: Solar

High average solar radiation levels provides opportunities for:

- **Solar PV power generation**
- **Solar thermal water heating**

Site Challenges: Solar

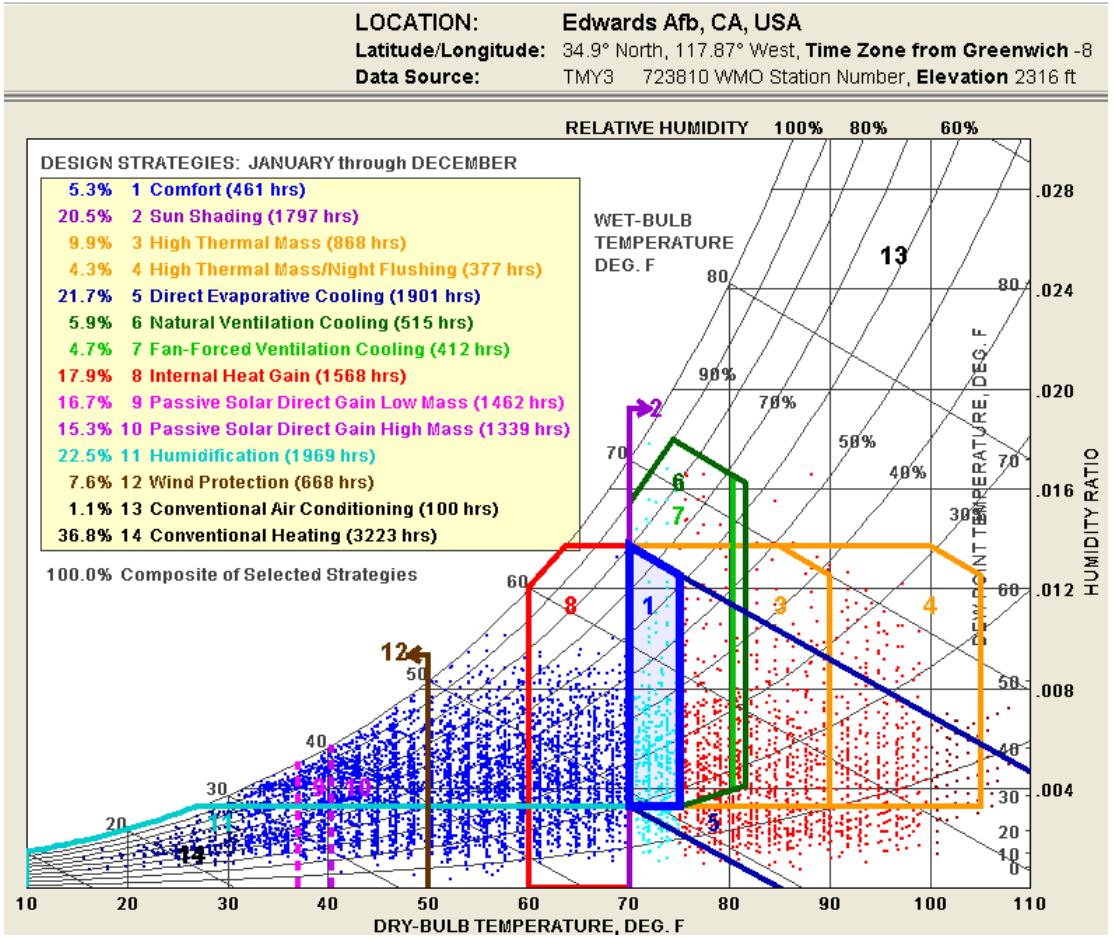
- **Impact of dust on modules.**

Site Opportunities: Passive Design

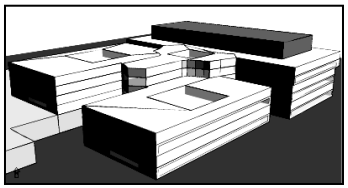
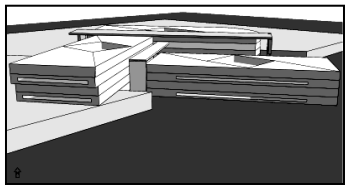
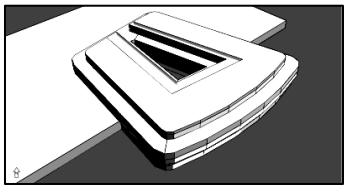
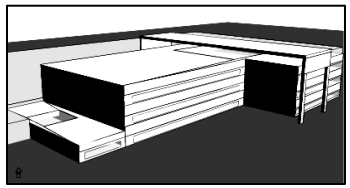
- **Evaporative cooling**
- **Solar shading**
- **Natural ventilation**
- **Use of thermal mass storage**

Site Challenges : Passive Design

- **Water limitations**
- **Dust / Sand**



Energy Modeling Results – Summary

	"Compact"	"Pinwheel"	"Magnet"	"L-shaped"
Conditioned Floor Area [ft^2]	186,715	215,787	278,229	196,868
Window-to-Wall Ratio	0.36	0.25	0.34	0.29

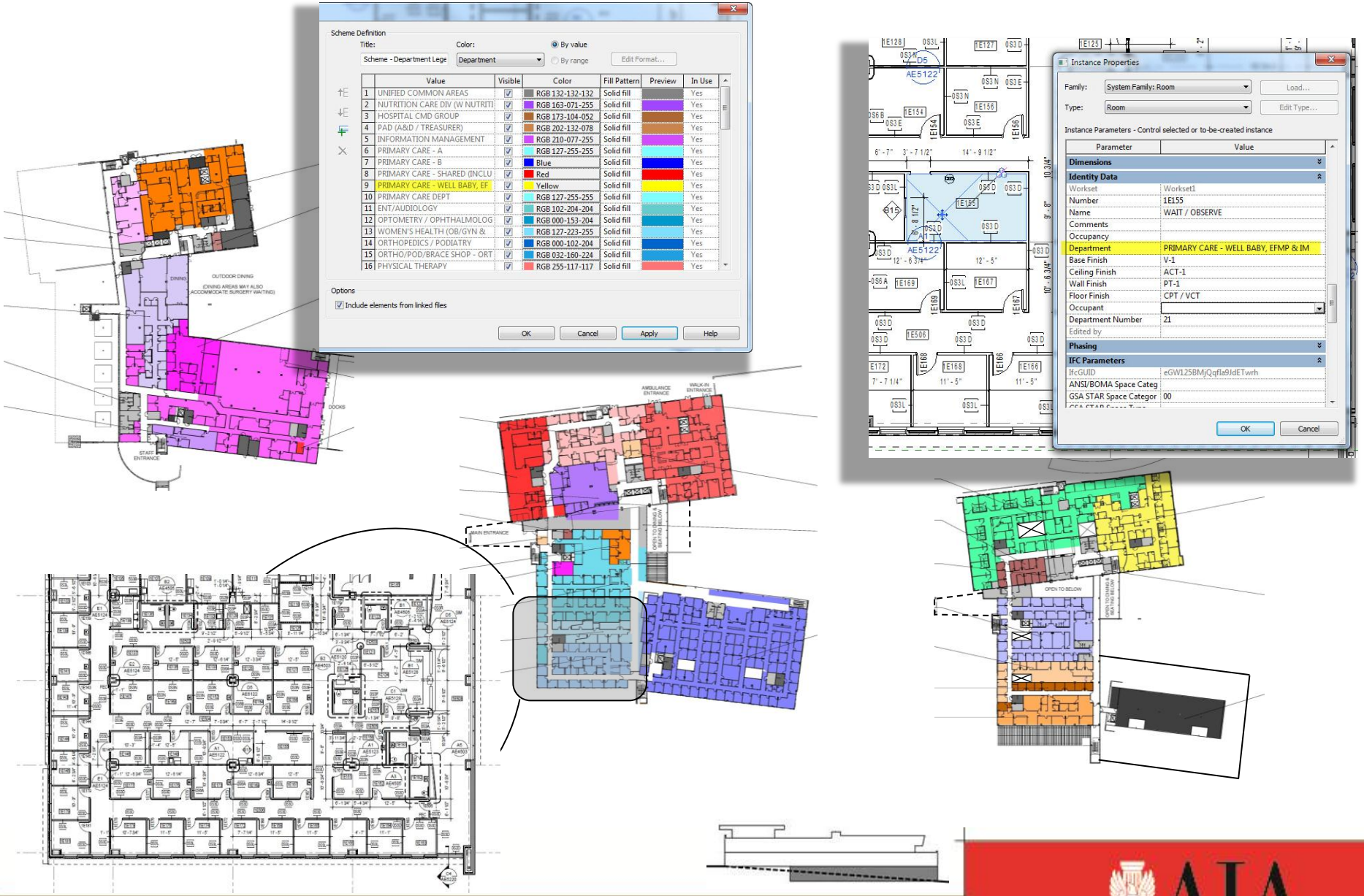
- Ranking by combined annual heating / cooling energy demand

	Combined Peak [BTU/h-ft^2]	Ranking
"Compact"	66.7	3
"Pinwheel"	67.3	4
"Magnet"	64.5	2
"L-shaped"	64.1	1

- Ranking by combined peak heating and cooling

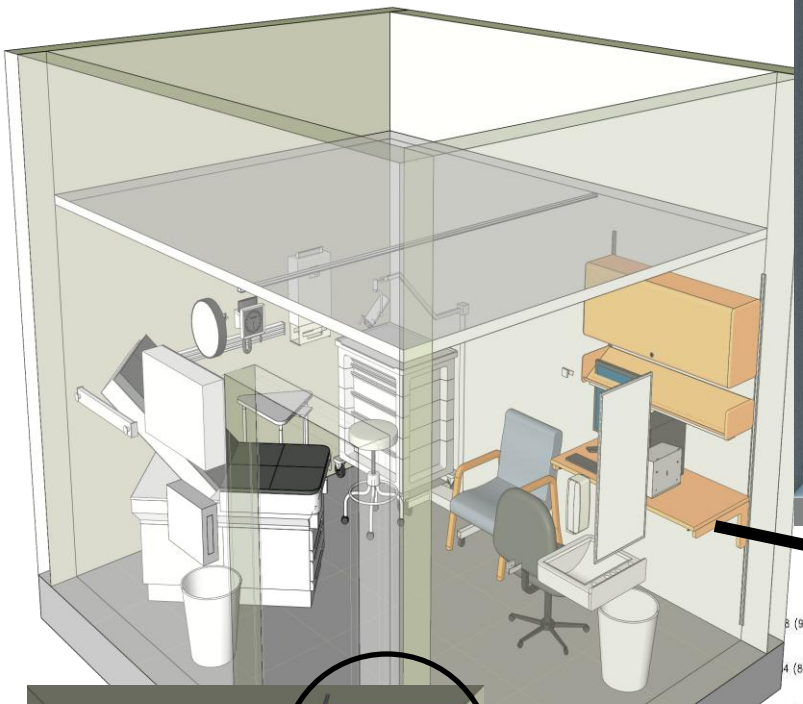
	Combined Peak [BTU/h-ft^2]	Ranking
"Compact"	42.9	4
"Pinwheel"	43.9	3
"Magnet"	38.9	1
"L-shaped"	39.1	2

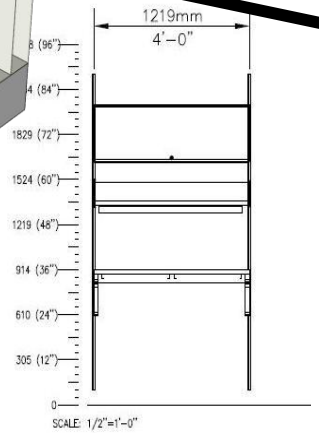
From Concept to Facility level of Detail

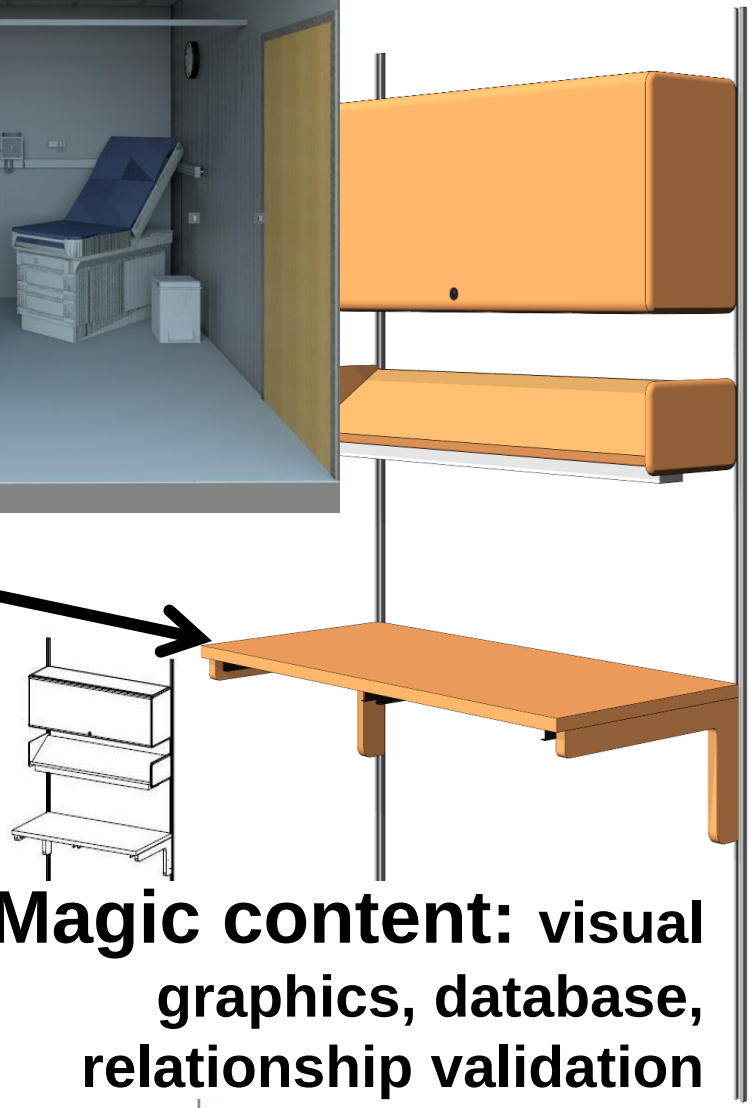


AIA

BIM CONTENT DEVELOPMENT



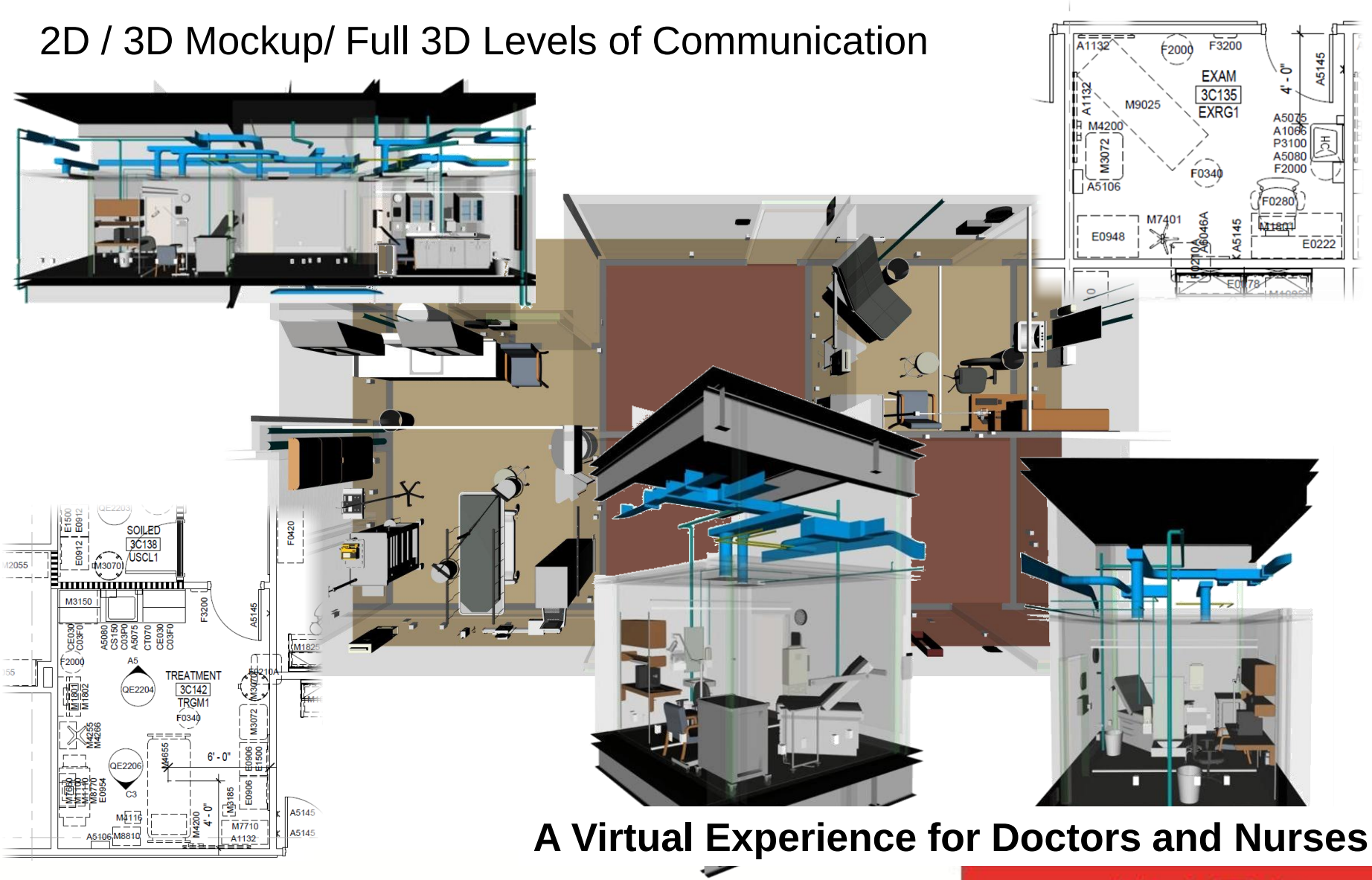




Magic content: visual graphics, database, relationship validation

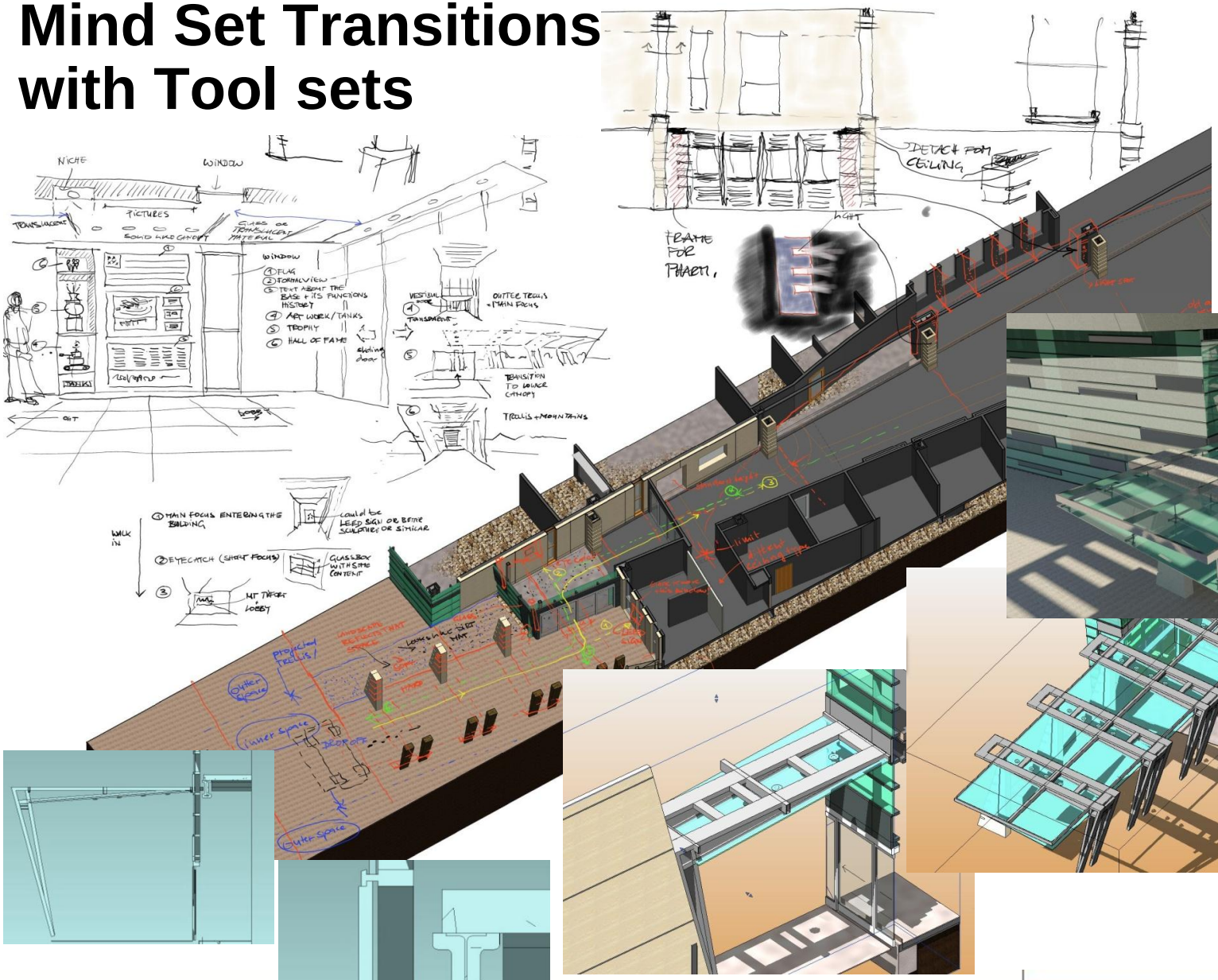
CONTRACT DOCUMENT DEVELOPMENT

2D / 3D Mockup/ Full 3D Levels of Communication

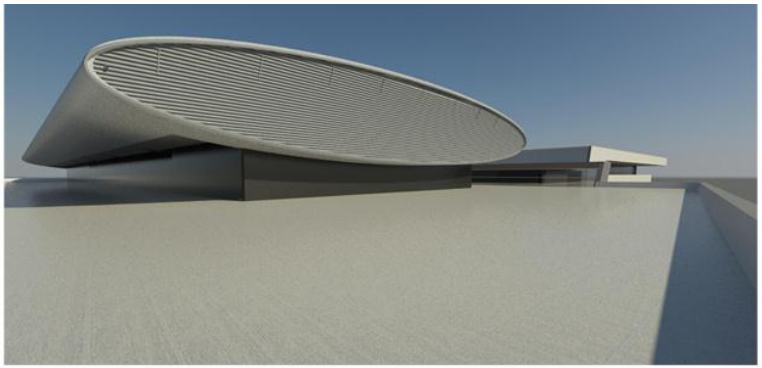


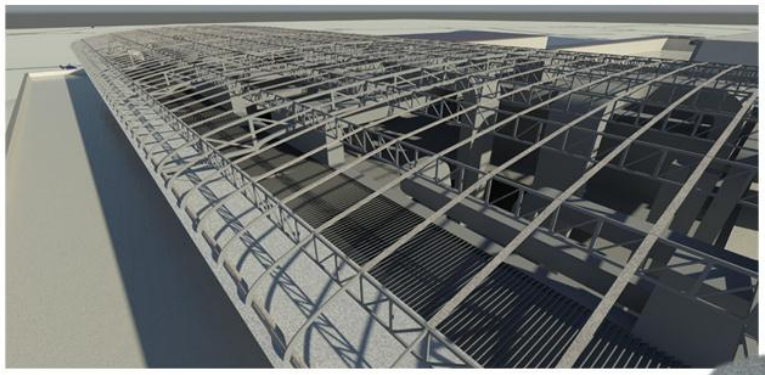
A Virtual Experience for Doctors and Nurses

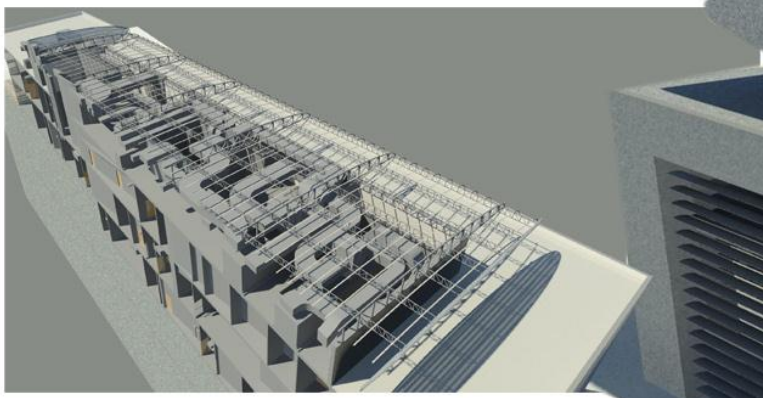
Mind Set Transitions with Tool sets

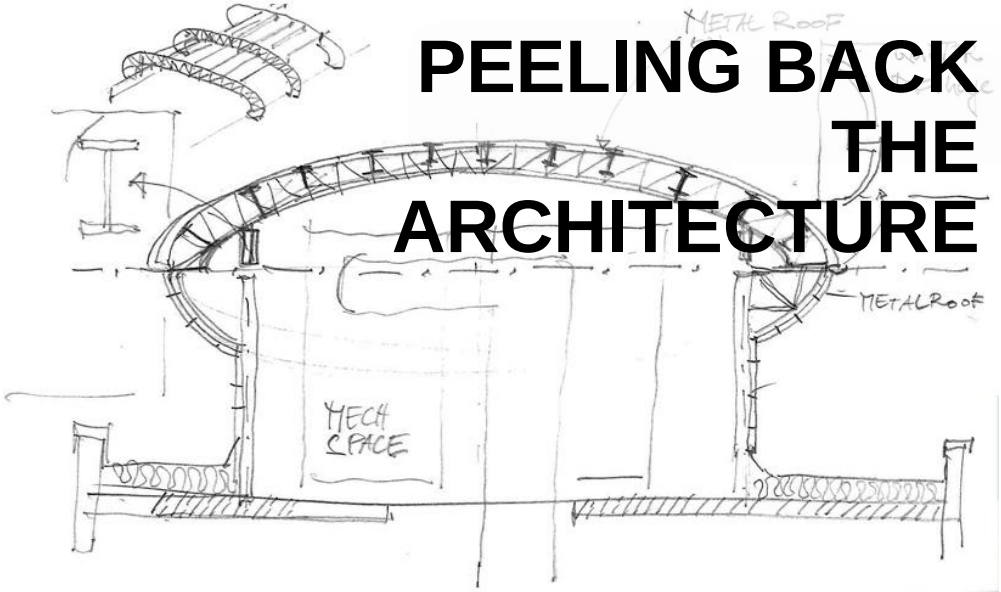


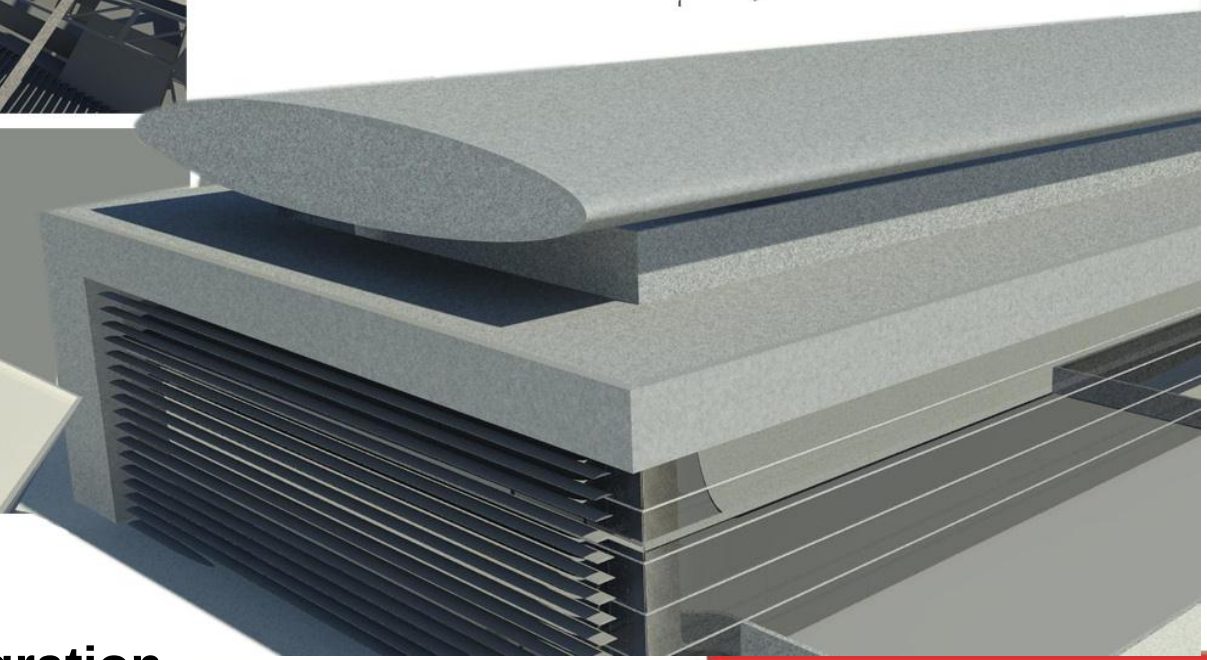
PEELING BACK THE ARCHITECTURE







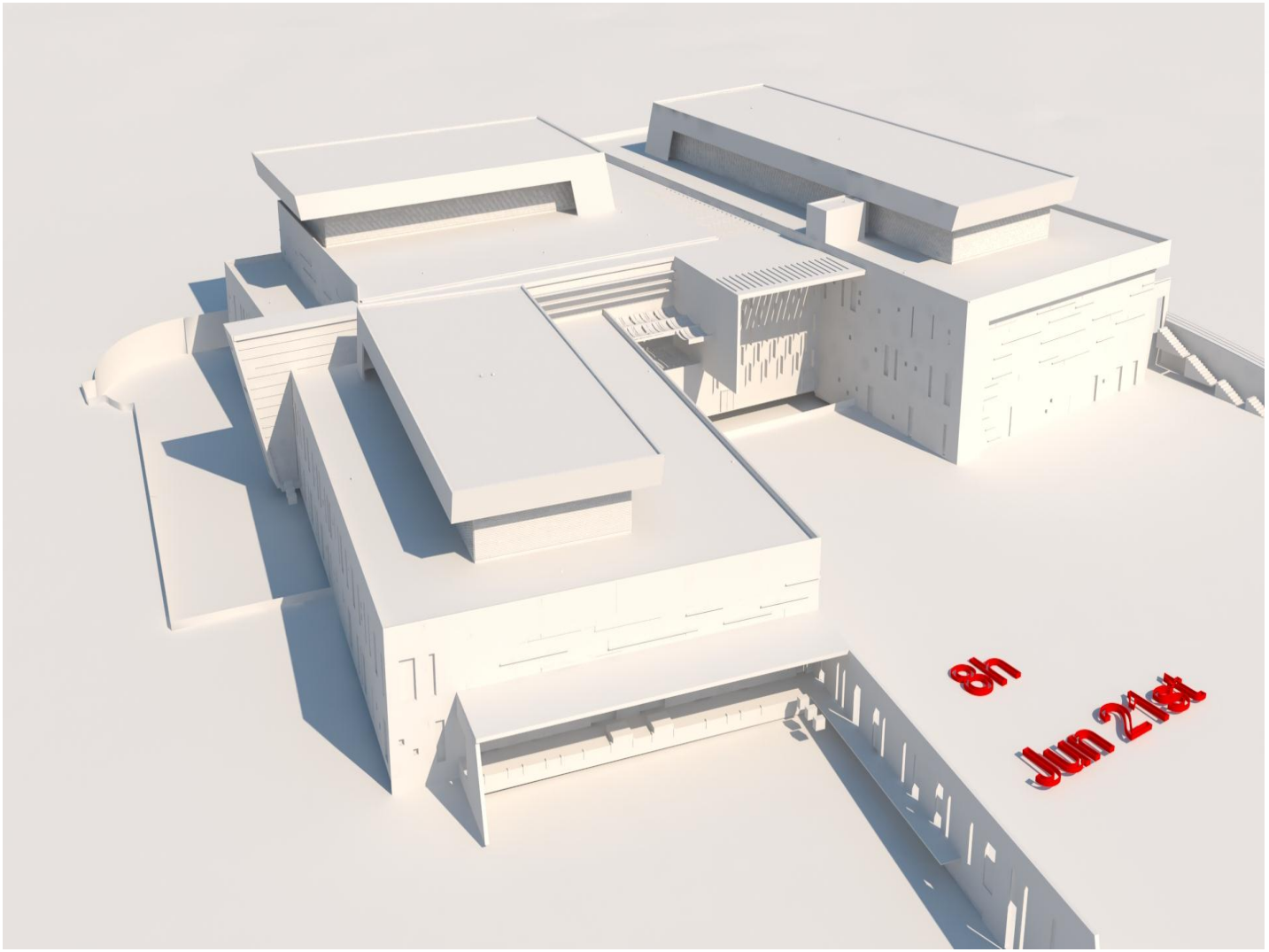




New Avenues of Integration

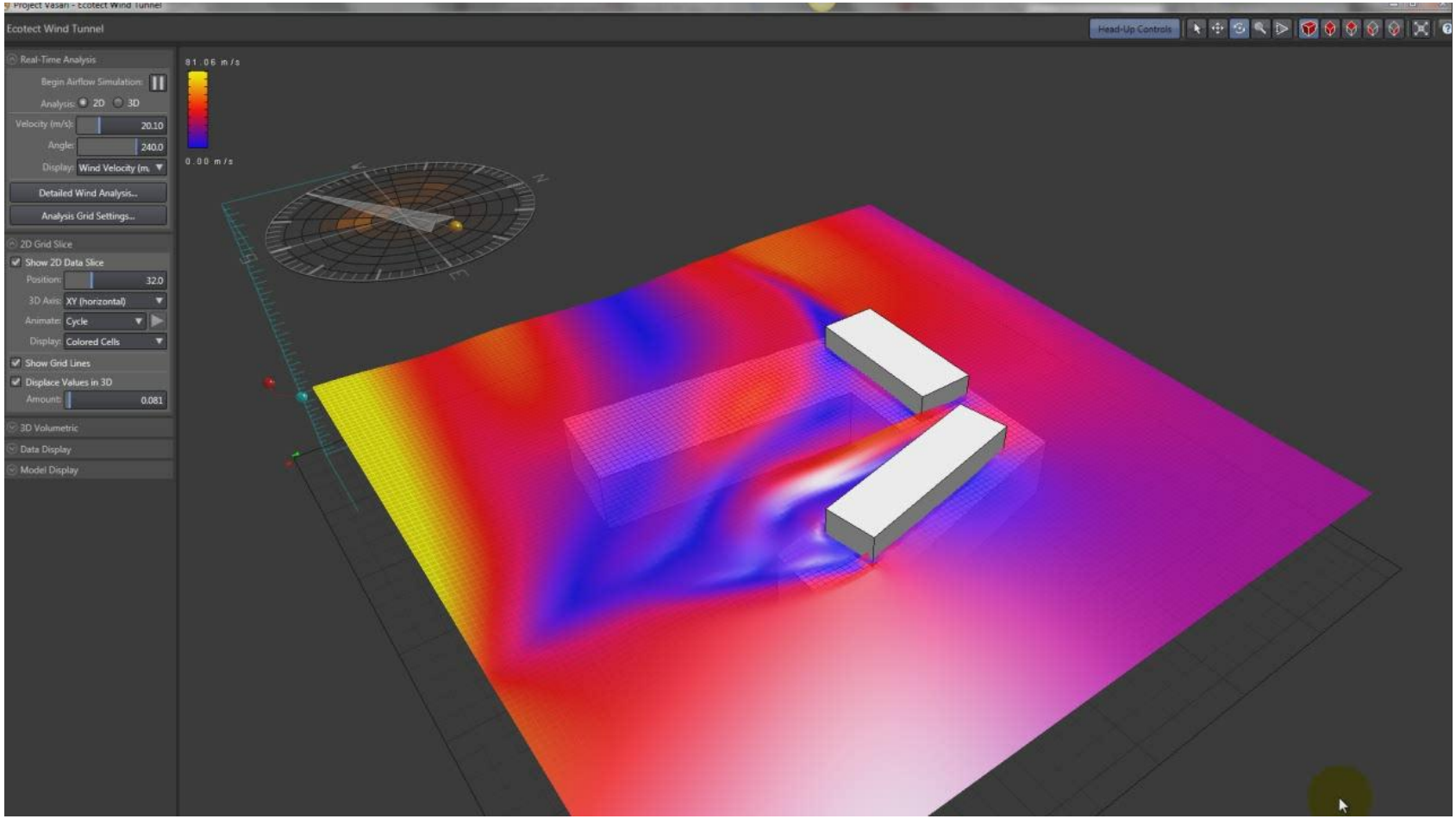
Coordination Walk through the Building

SUN STUDIES



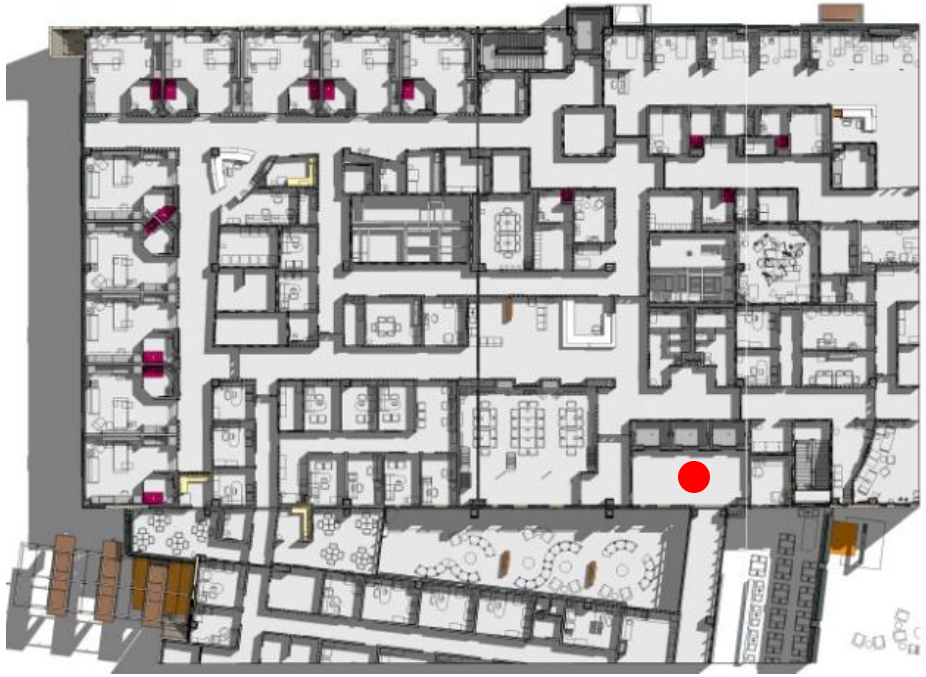
Technology Based Design Studies

WIND SIMULATION



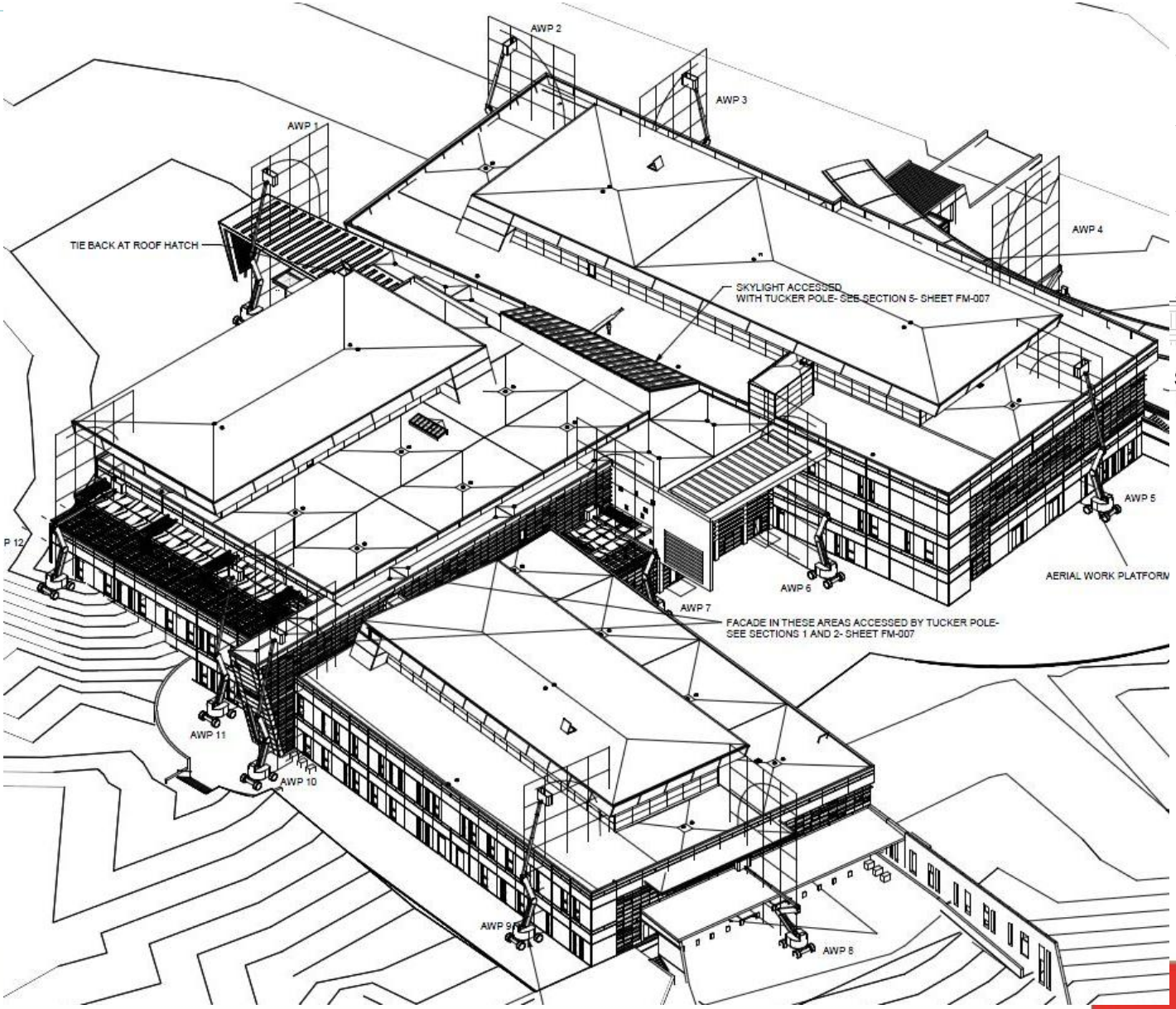


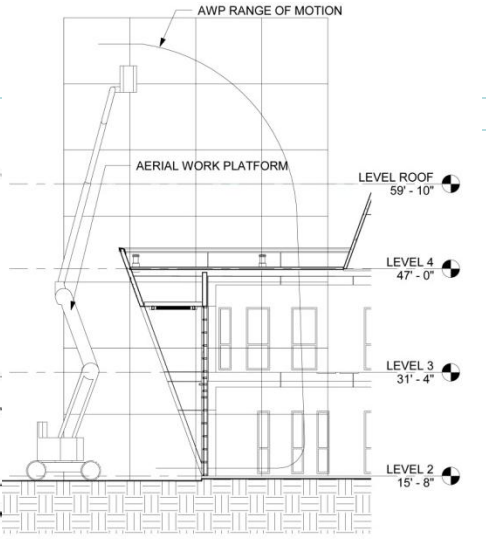




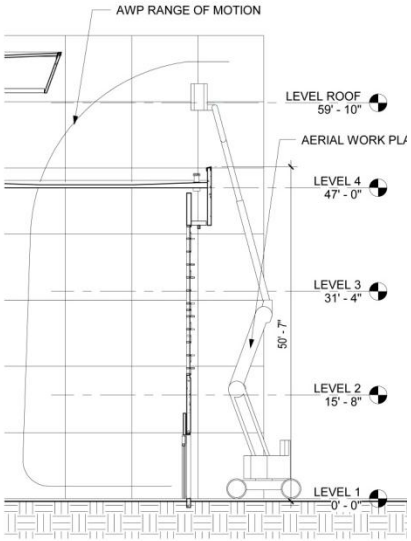
Visualization / Simulation

FACILITY MAINTANANCE STUDIES





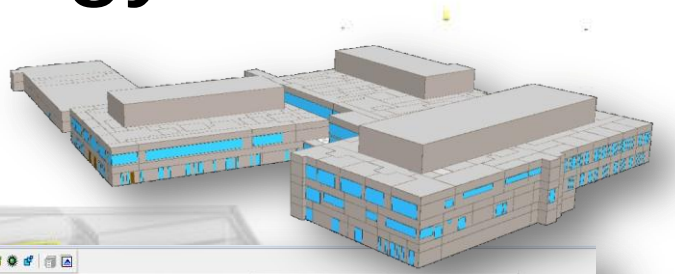
SECTION AT HOSPITAL WEST FACADE
3/32" = 1'-0"



5 SECTION AT EAST FACADE-
3/32" = 1'-0"

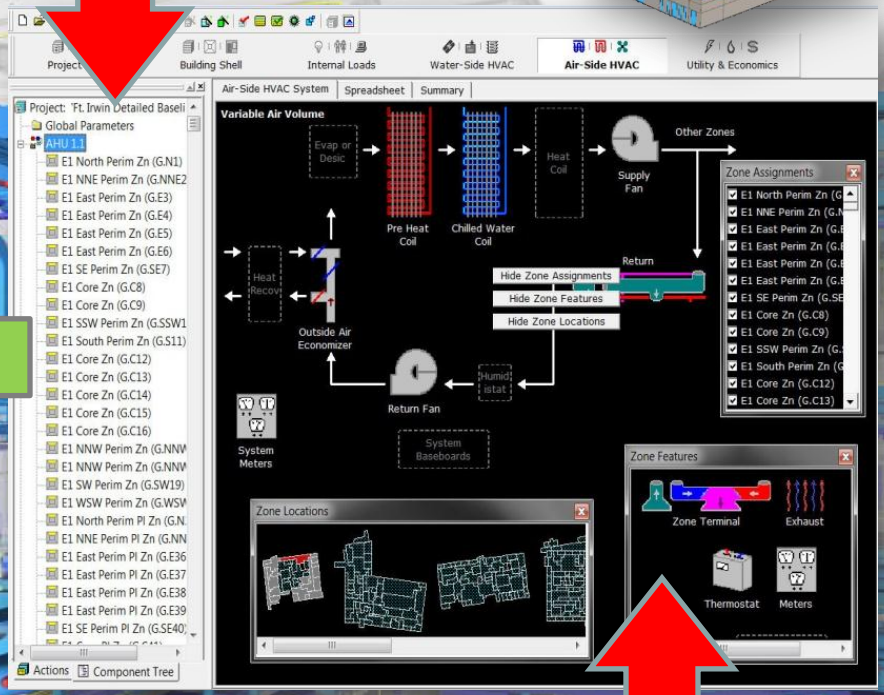
Comprehensive Energy Model

Inputs from Architecture



- Building Envelope
- Mechanical Systems
- Electrical Systems
- Controls

Optimize Design



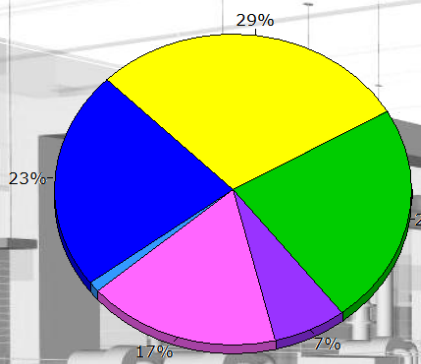
Inputs from Program (site, engineering, schedules, codes, …)

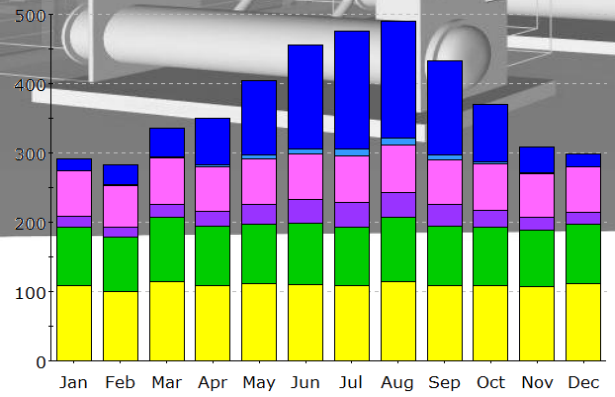
AIA

Conservation Measures

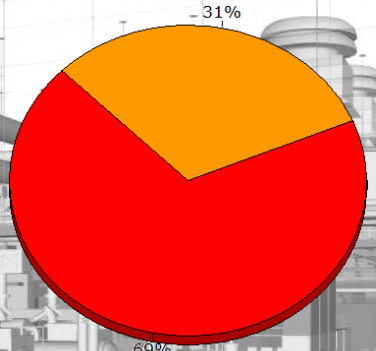
Life Cycle Cost Analysis to justify choices

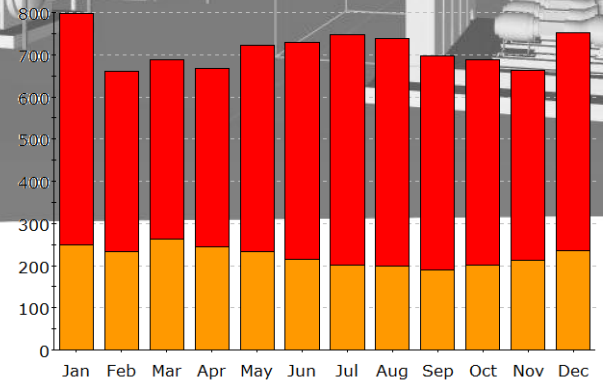
Electric Consumption
(KWh x 1,000)



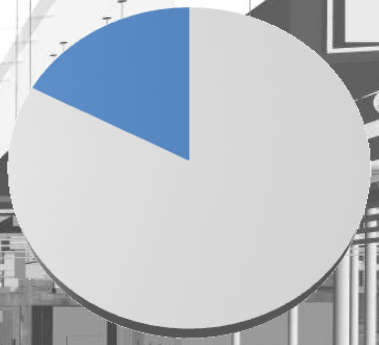


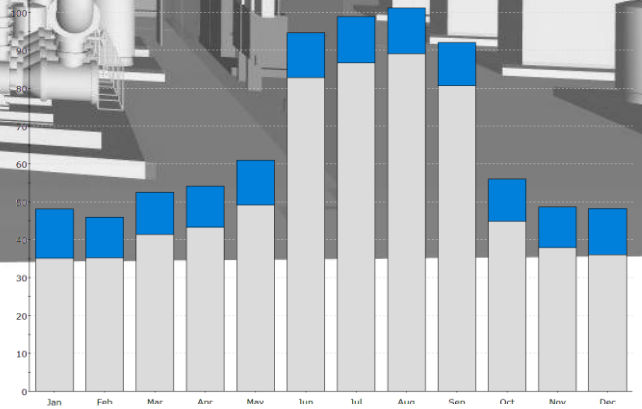
Gas Consumption
(Btu x 1,000,000)





Monthly Utility Bills
($)





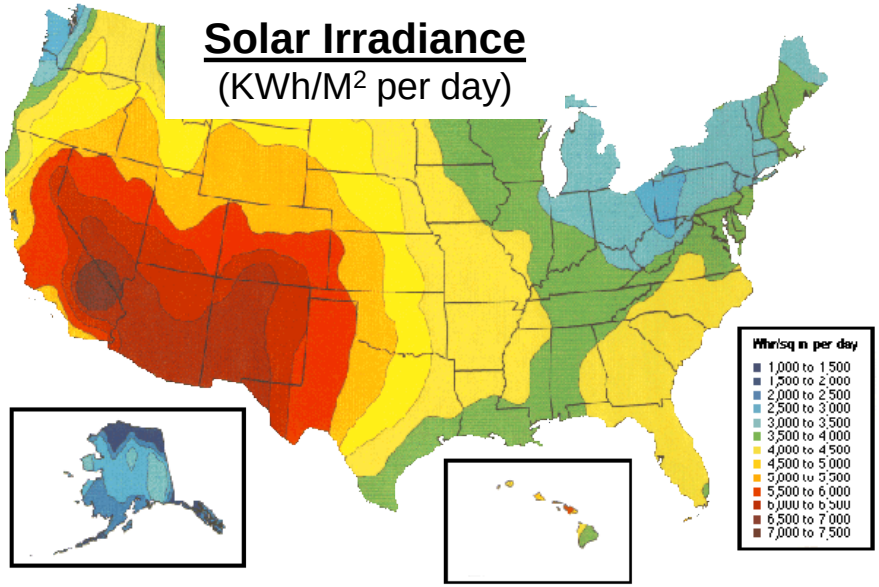
Electricity $662,300/yr
Propane $138,800/yr

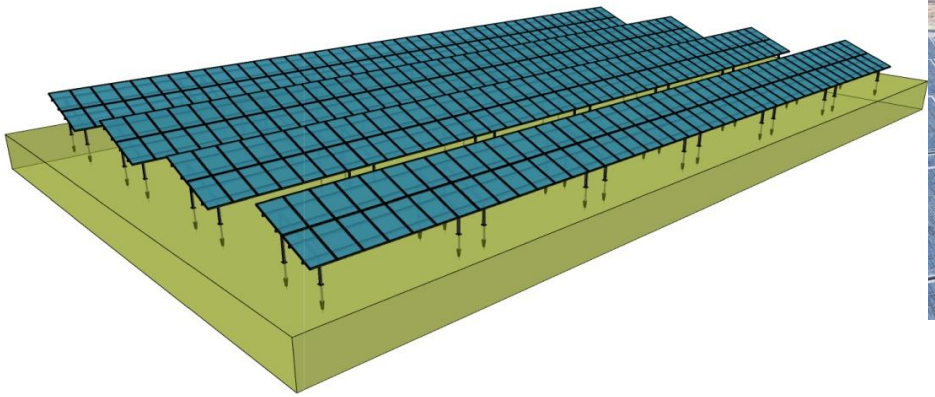
Area Lighting
Task Lighting
Misc. Equipment
Exterior Usage
Pumps & Aux.
Ventilation Fans
Water Heating
Ht Pump Supp.
Space Heating
Refrigeration
Heat Rejection
Space Cooling

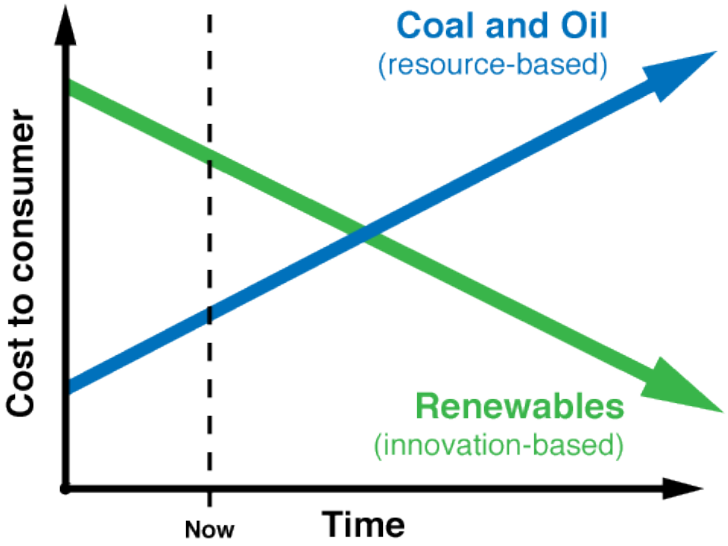
AIA

Generation Measures (2nd effort)

- 2 MW Solar Array
- (15 year simple payback)

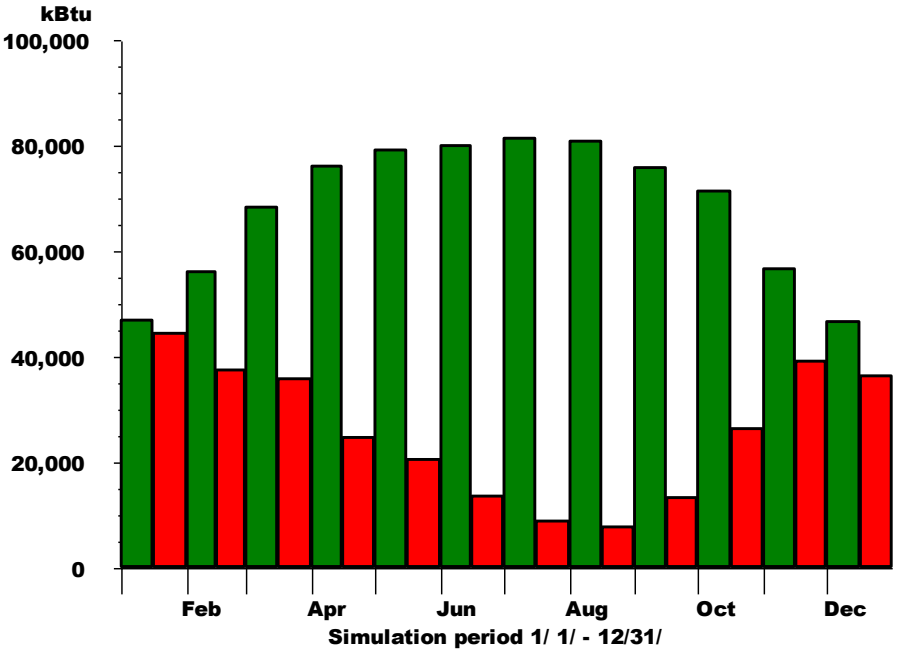


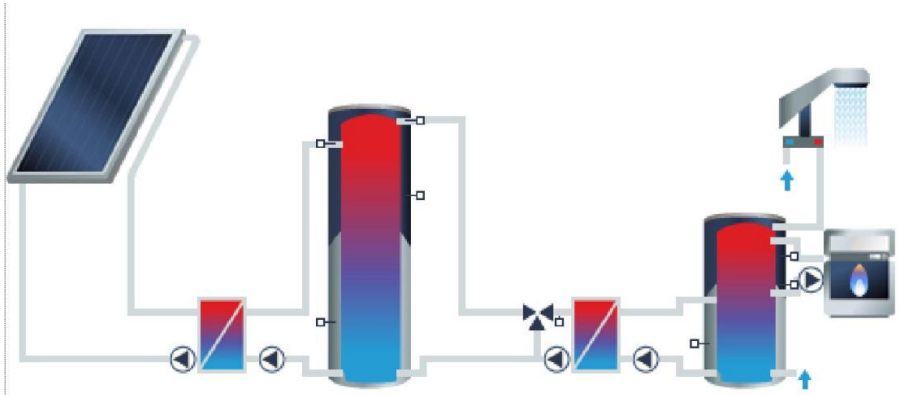




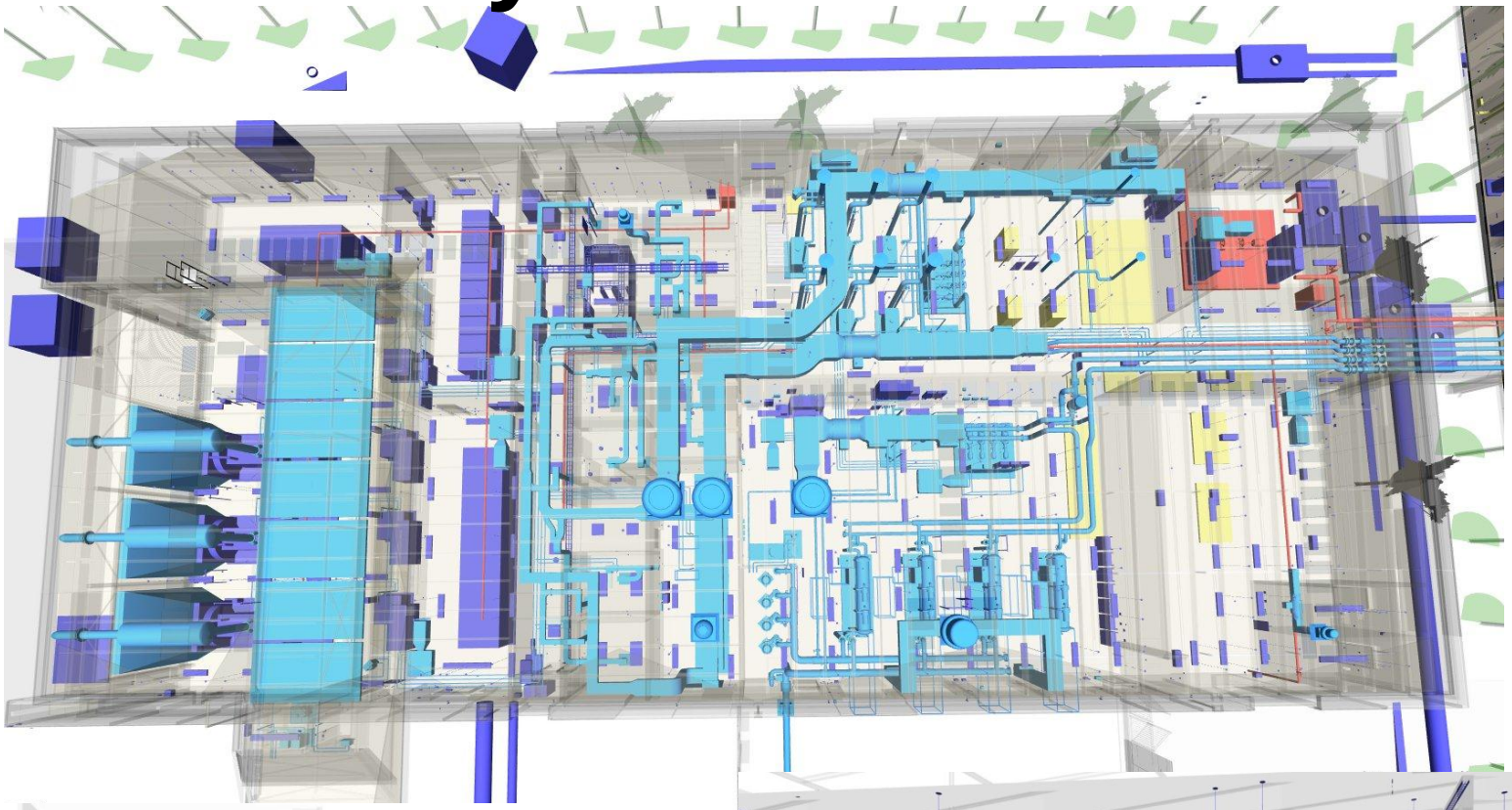
Generation Measures (2nd effort)

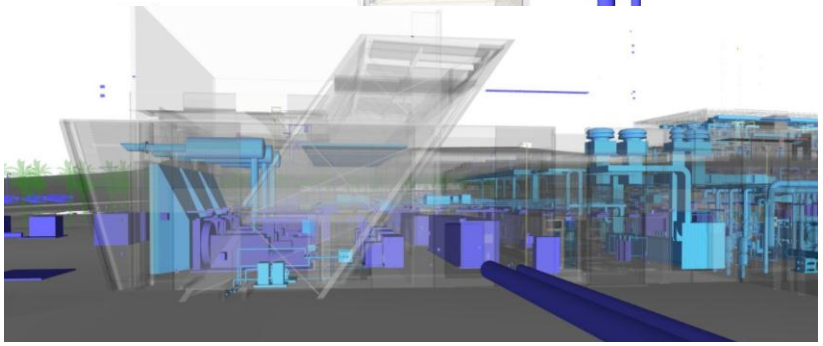
- 475,000 Btu/hr Solar Thermal Array
- Energy Model used to optimize components
- (12 year simple payback)

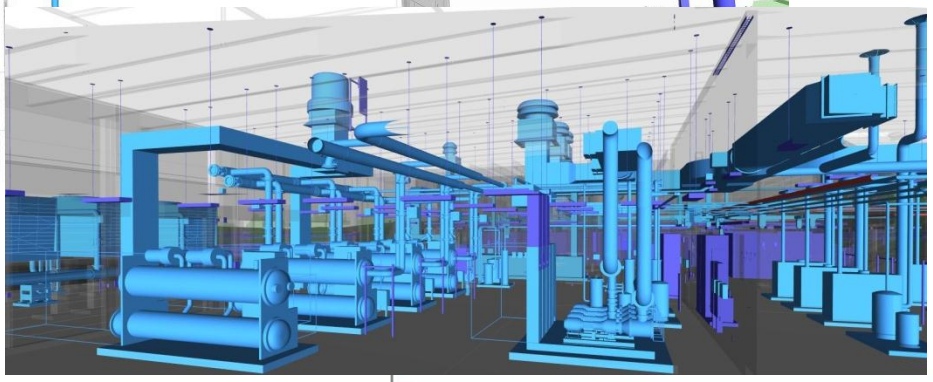




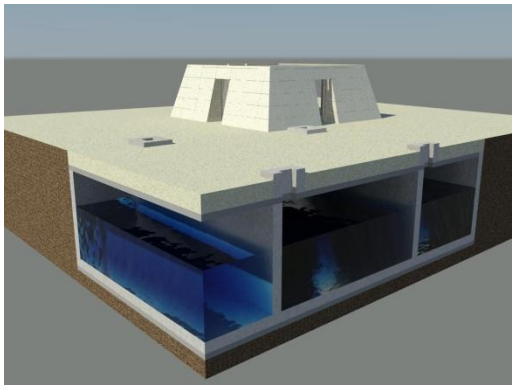
Central Utility Plant







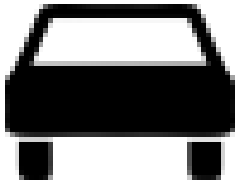
Central Utility Plant



Environmental Benefits

- **3,925** Metric Tons per year reduction of green house gas emissions below ASHRAE Baseline

= Reduction of emissions of 750 Cars per year



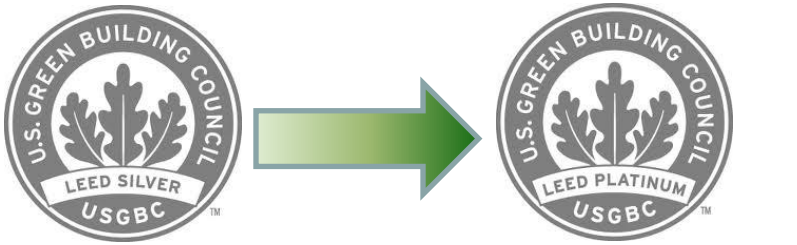
= Reduction of 441,500 gallons of gas or 9,145 barrels of oil consumption per year

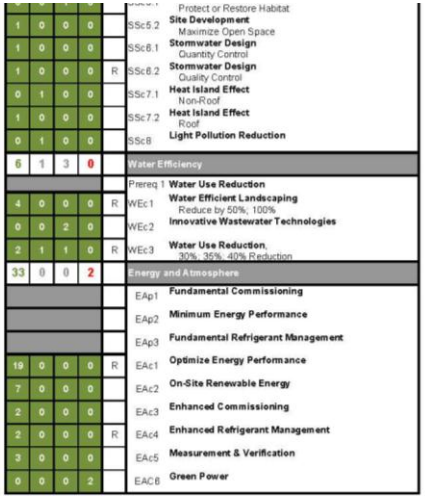
= Carbon sequestered annually by 840 acres of forest per year

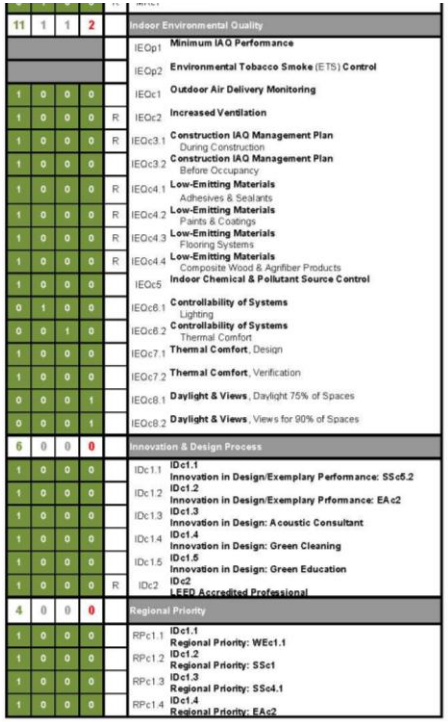
LEED Goals

Must Achieve:
LEED Silver

Goal:
LEED Platinum







Next Steps:

- **LEED Documentation**
  - **Some credits are underway**
  - **Begin during S6**
  - **Energy Model – ongoing evolution**
- **LEED-Online Design Review Schedule**
  - **Typically allow 3-4 weeks after complete design information**
  - **Realizing tight schedule – Submit by 12/7**

Certification Target	SILVER
Anticipated	PLATINUM

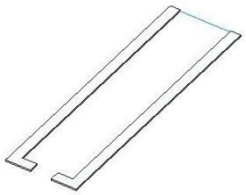
Certified: 40-49
Silver: 50-59
Gold: 60-79
Platinum: 80-110

AIA

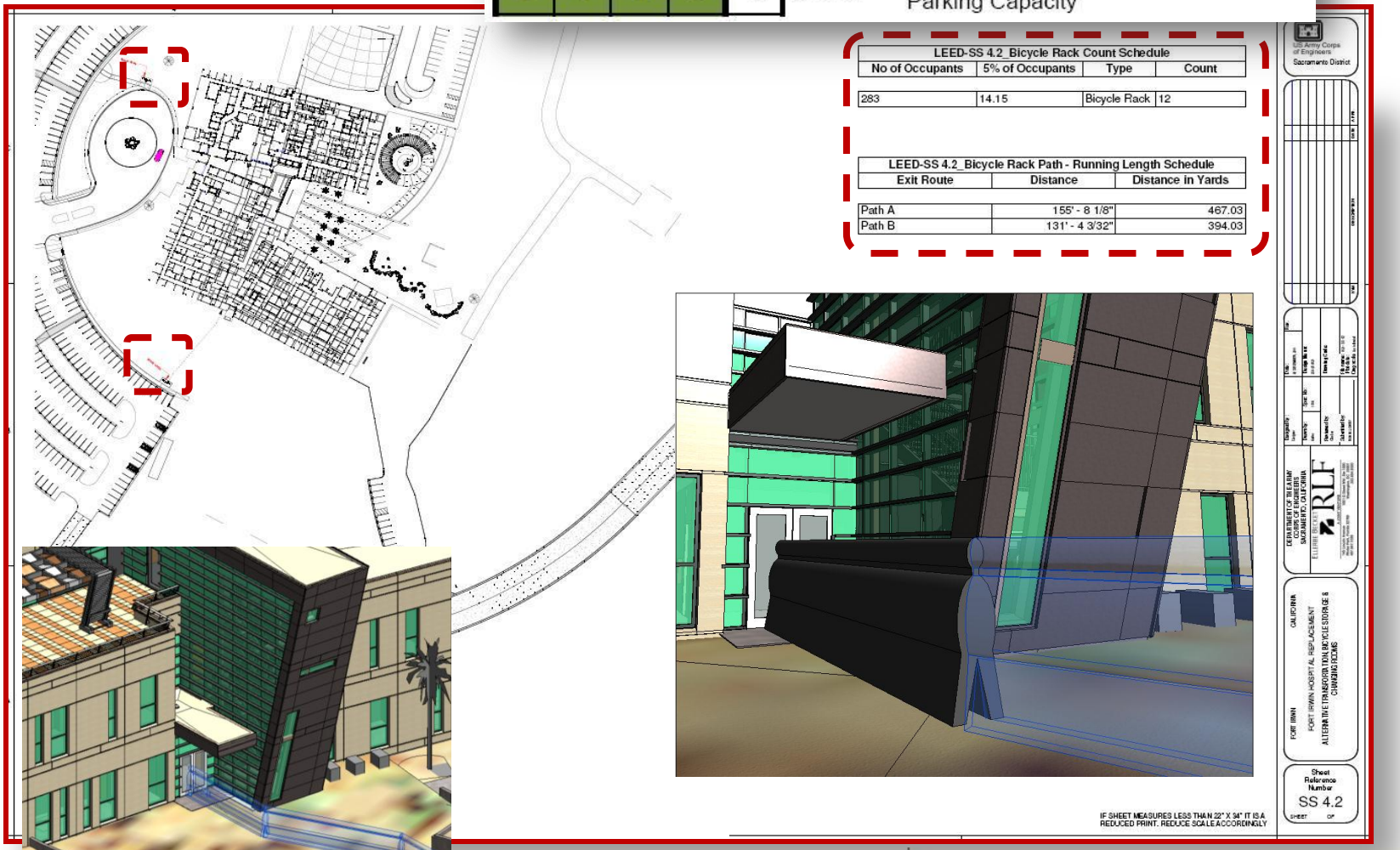
LEED Validation Documents

6	0	0	0		SSc4.1	**Alternative Transportation** Public Transportation Access
1	0	0	0		SSc4.2	**Alternative Transportation** Bicycle Storage & Changing Rooms
3	0	0	0	R	SSc4.3	**Alternative Transportation** Low-Emitting & Fuel-Efficient Vehicles
2	0	0	0	R	SSc4.4	**Alternative Transportation** Parking Capacity

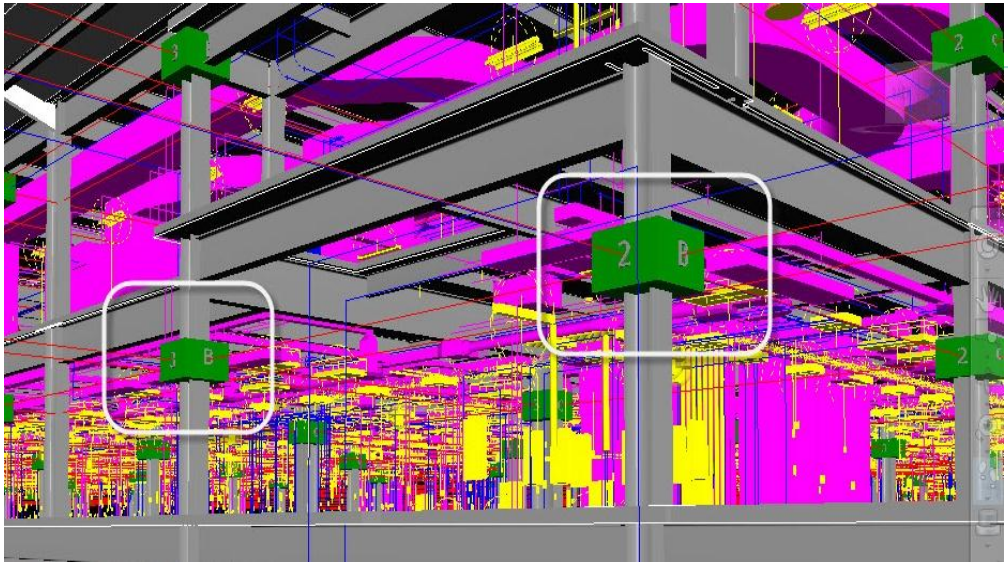
Bicycle rack

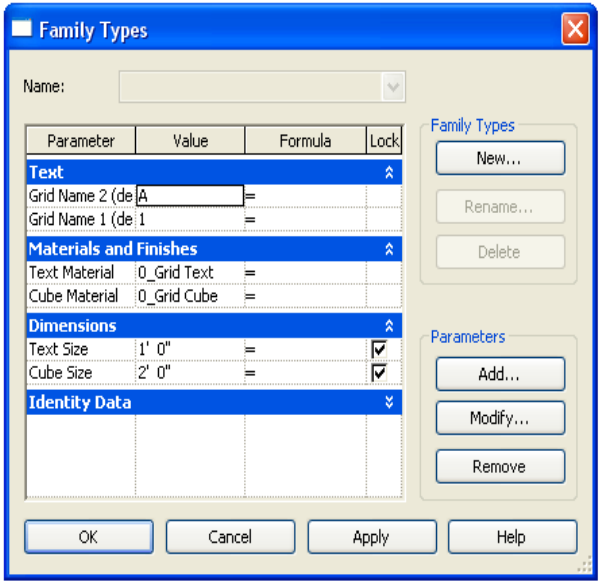


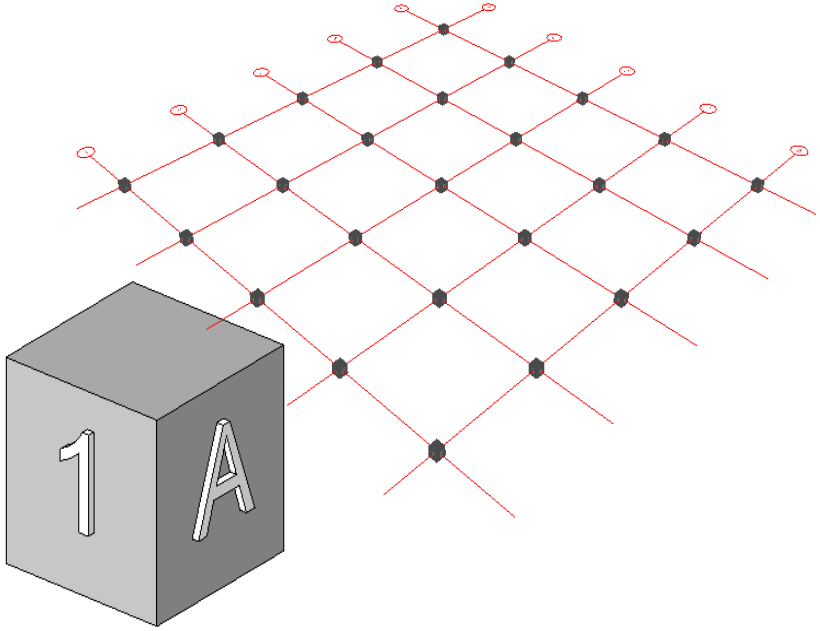
Standard Bicycle Rack Space

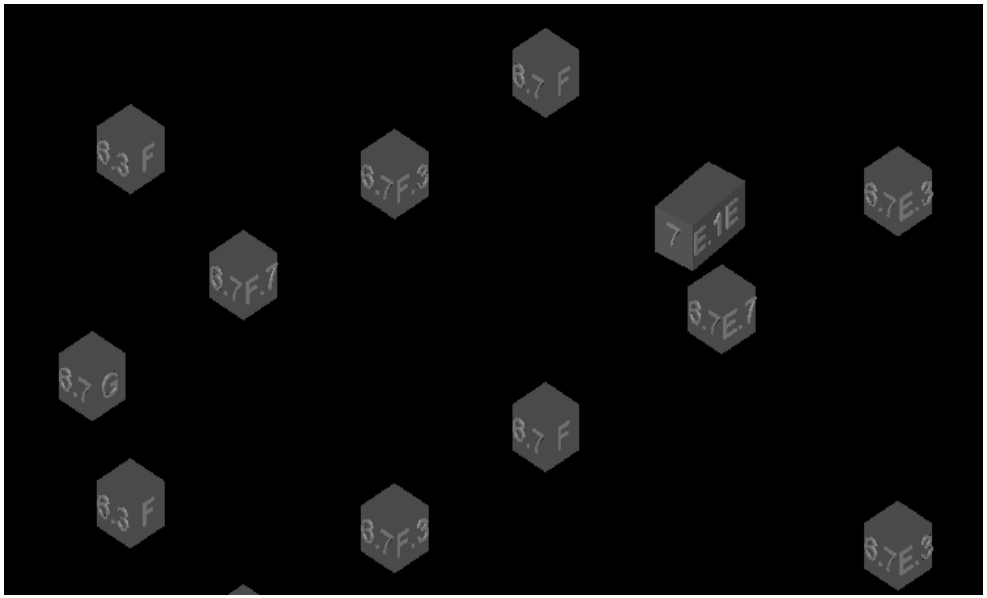


Building Systems: Full Exposure



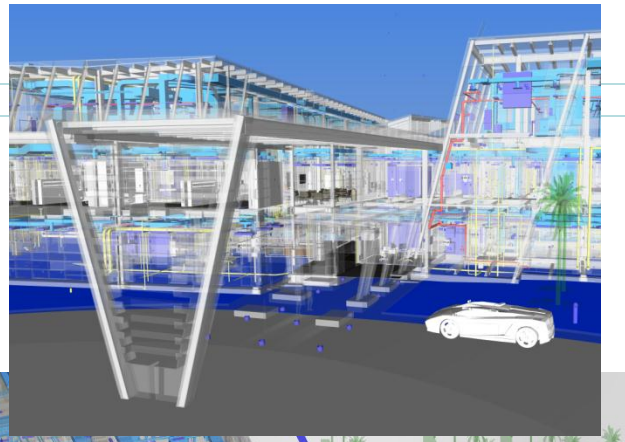


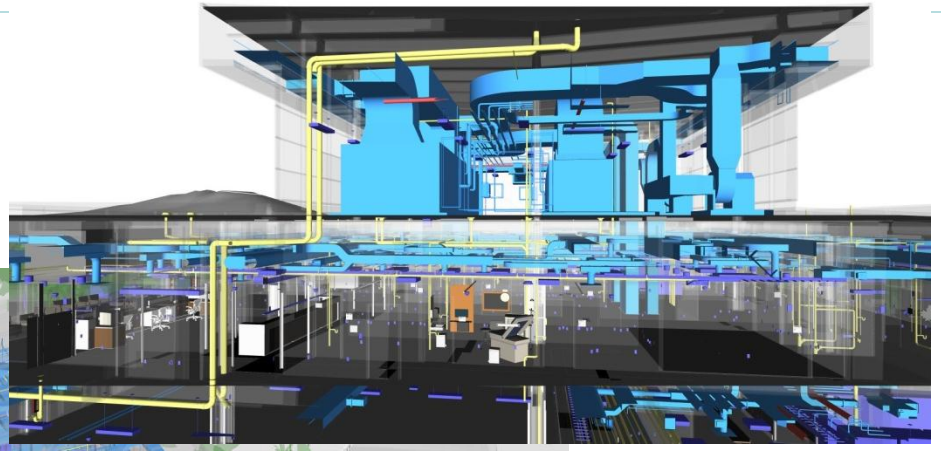


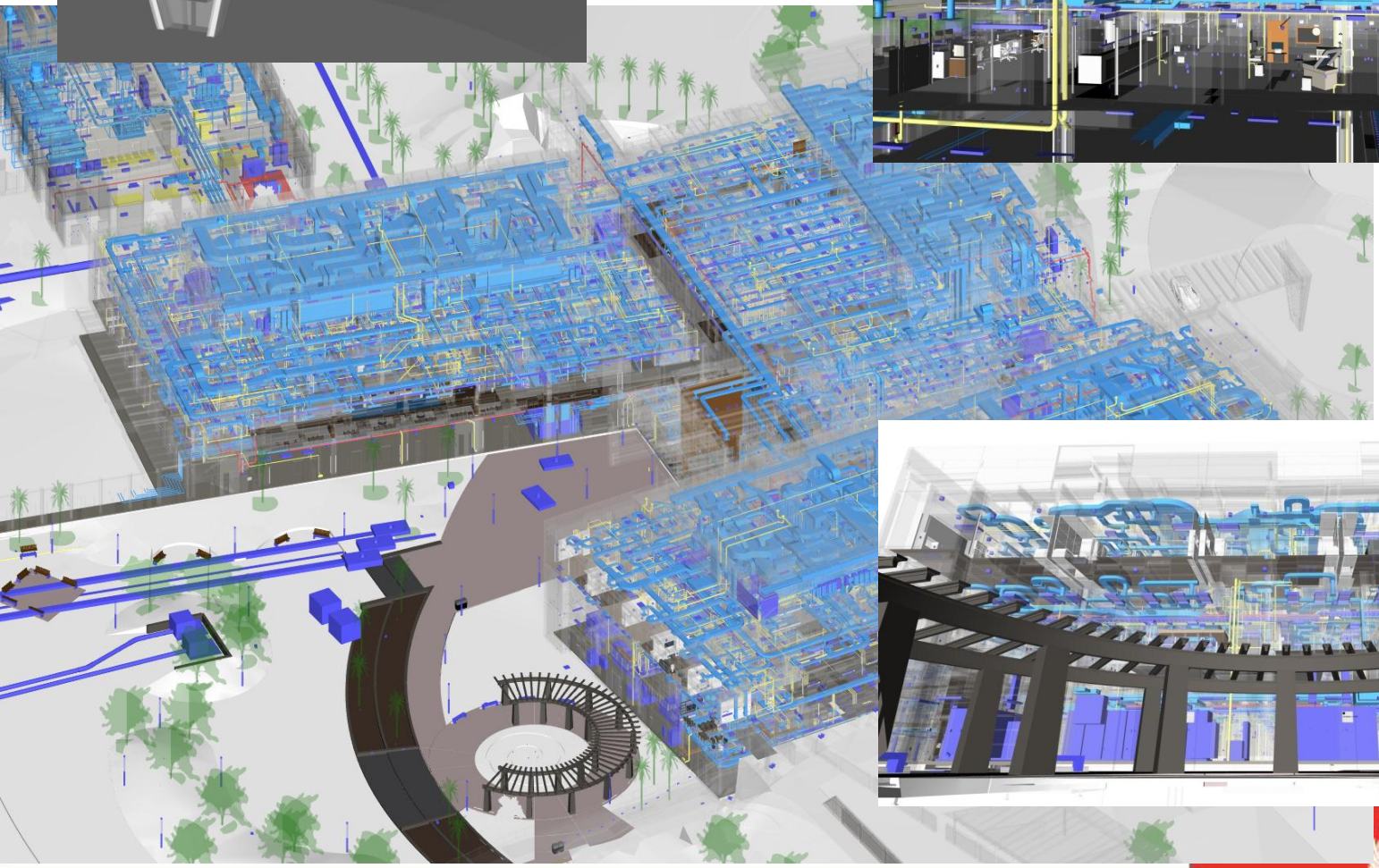


Finding Your Way in Navisworks

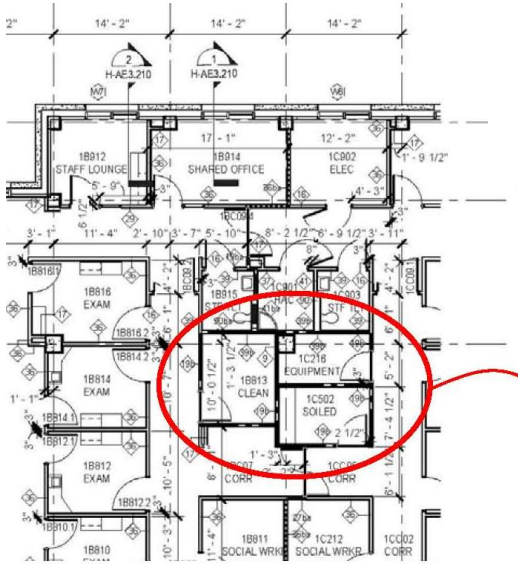
Revealing the Systems







NEW CONTRACT DOCUMENT STANDARDS



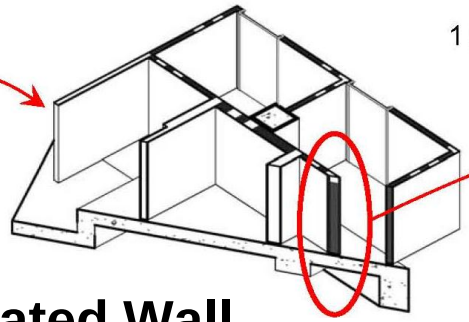
SERIES FOR ADDITIONAL DIMENSIONS AND INFORMATION.

G. DIMENSIONS ARE TO COLUMN GRID, FACE OF MASONRY OR CONCRETE, INSIDE FACE OF SHAFT WALL OR TO FACE OF METAL STUD.

H. SEE H-A5.7 SERIES FOR WINDOW AND LOUVER TYPES.

I. REFER TO PLUMBING PLANS, H-MP1 SERIES, FOR FLOOR DRAIN LOCATIONS.

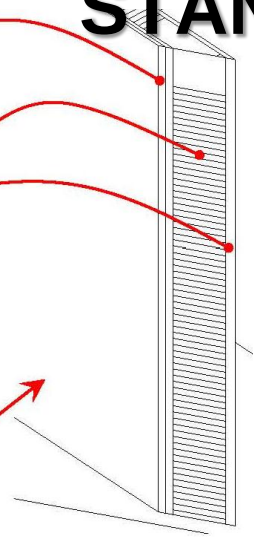
J. REFER TO SHEET H-AE5.210 FOR TYPICAL EXPANSION JOINT DETAILS.

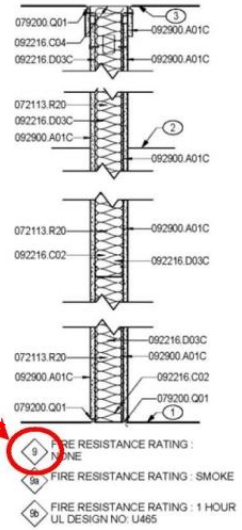


2 Layers Gyp. Bd.

Metal Stud Layer with Fire Rating Fill Pattern applied

1 Layer Gyp. Bd.





Section

Plan

Section

B. Partition Type Detail

Parametric Rated Wall Patterns

AL / CLINIC
, AREA A, ZONE 2
UCTION PLAN
t Director

A NEW HOSPITAL FOR
VAMC ORLANDO, FLORIDA

Location: Orlando, Florida

Date: 9 DECEMBER, 2009 | Checked: BKH | Drawn: EB / RLF

Project Number: 673-950

Building Number: 01 AND 02

Drawing Number: H-AE1.1FA2

Dwg. of

OFFICE OF FACILITIES MANAGEMENT

Department of Veterans Affairs

WALL SCHEDULE

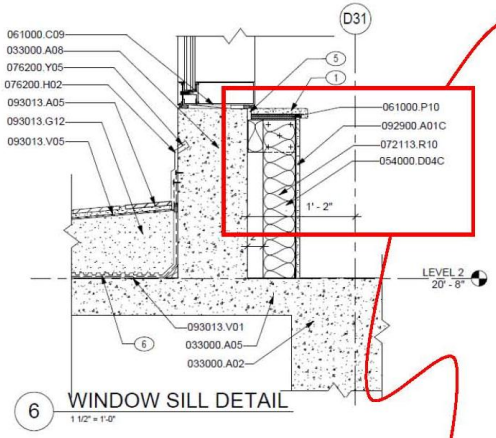
Type Mark	Partition Type Code	Description	Area	Length
9	09P2103	2 1/2" Metal Stud, 5/8" Gypsum Board on 1 Side 6" above Ceiling	4252.1 SF	444' - 8 65/128"
13c	09P2702c	4" "C-H" Metal Stud, Batt Insulation, 5/8" Gypsum Board on 2 Sides at Full Heig	2897.0 SF	134' - 0 181/256"
16	09P4101	3 5/8" Metal Stud, 5/8" Gypsum Board on 2 Sides 6" above Ceiling	17006.8 SF	4967' - 7 9/32"
17	09P4103	3 5/8" Metal Stud, 5/8" Gypsum Board on 1 Side 6" above Ceiling	28713.6 SF	2233' - 9 85/128"
20c	09P4109c	3 5/8" Metal Stud, 2 layer of 5/8" Gypsum Board on 2 Sides at Full Height	9598.4 SF	568' - 9 39/256"
26	09P4201	3 5/8" Metal Stud, Batt Insulation, 5/8" Gypsum Board on 1 Side at Full Height	1372.3 SF	247' - 9 21/128"
			63840.3 SF	8596' - 8 123/256"

Is the Object Identifiable and Can You Count it ?

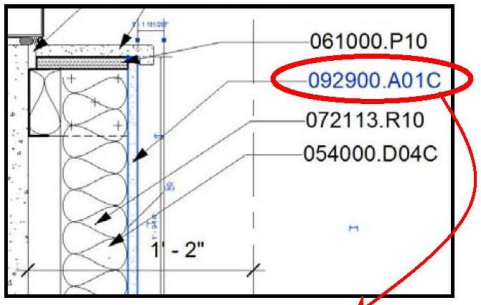
WALL SECTION AND DETAIL INTELLIGENCE

BIM Material Notation:

Rather than using loose text, BIM software allows linking model objects to an editable text file that holds specification data for Construction Document notation purpose via the object's parameters. This notation shall have the ability to be shown by either numeric specification section or description:



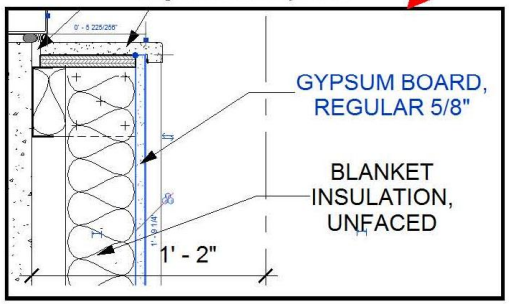
Specification Section:

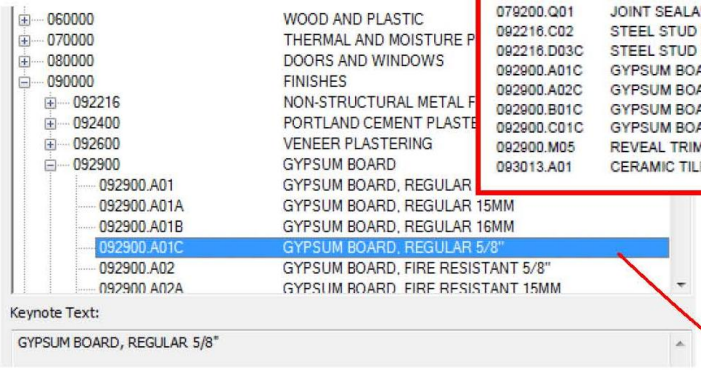


092900.A01C

Specification Section | Catalog Sorting Digits

Object Description:





NOTES:

SHEET NOTES:

A. REFER TO SHEET G-011 FOR GENERAL ABBREVIATIONS AND ARCHITECTURAL SYMBOLS.

B. EXTEND GYPSUM BOARD TO BOTTOM OF CEILING PLATFORM IN AREAS WHERE NO CEILING IS SCHEDULED.

C. REFER TO FIN FOR FINISH IN

D. SEE SHEETS SAFETY PLAN

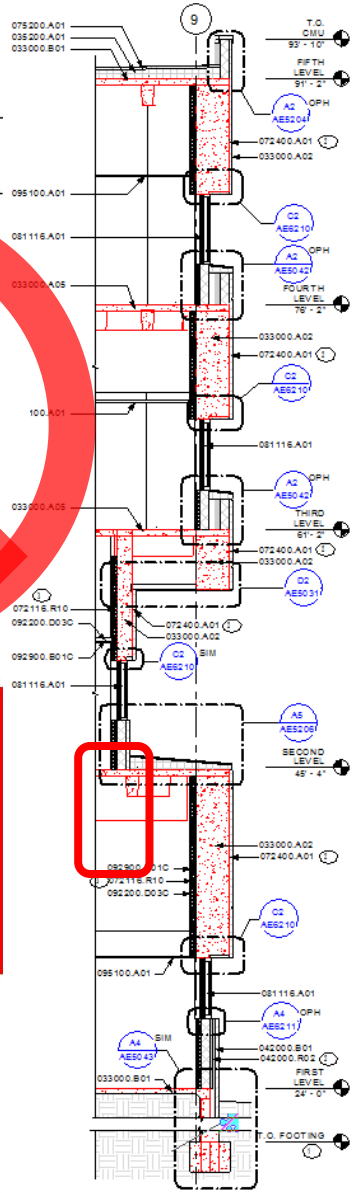
00 KEYNOTES

1 SOLID SURFACE STOOL OVER PLYWOOD SUBSTRATE
2 REFER TO REFLECTED CEILING PLANS FOR CEILING HEIGHTS
3 DRAPERY POCKET
4 PARTITION TYPE 77c
5 HOLD BACK OF STOOL & PLYWOOD 1/2" FROM CONCRETE CURB AND LOOSE PACK w/INSULATION
6 DRAINAGE MAT

Loose Text / lines

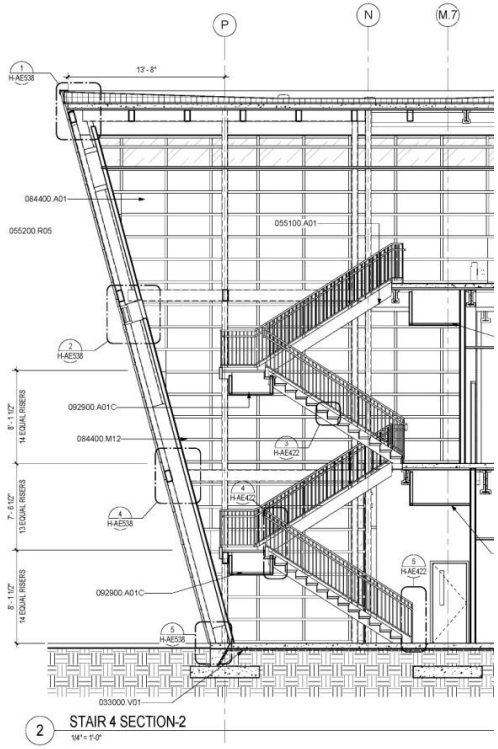
MATERIAL NOTES

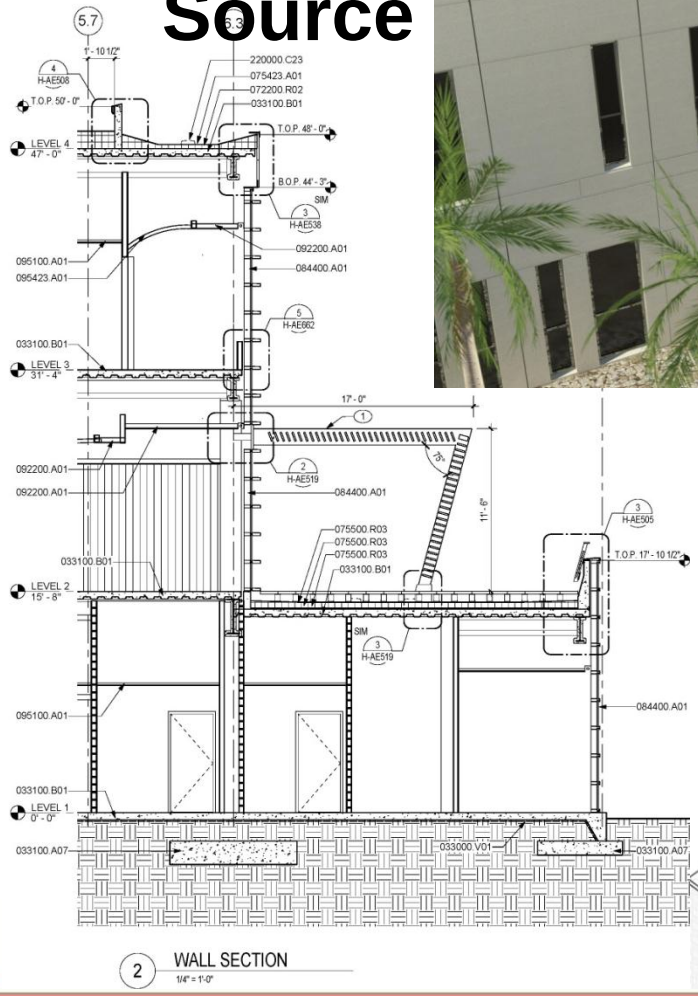
072113.R20	SOUND ATTENUATION BATTS
078400.Q01	FIRESTOPPING SEALANT
079200.Q01	JOINT SEALANT
092216.C02	STEEL STUD RUNNER TRACK
092216.D03C	STEEL STUD 3 5/8"
092900.A01C	GYPSUM BOARD, REGULAR 5/8"
092900.A02C	GYPSUM BOARD, FIRE RESISTANT 5/8"
092900.B01C	GYPSUM BOARD, GLASS MAT FACED 5/8]
092900.C01C	GYPSUM BOARD, IMPACT RESISTANT 5/8"
092900.M05	REVEAL TRIM
093013.A01	CERAMIC TILE

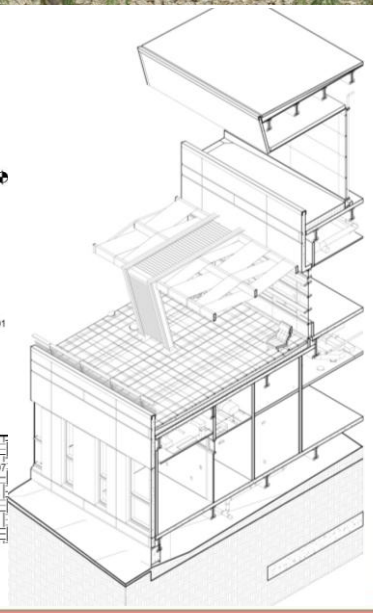


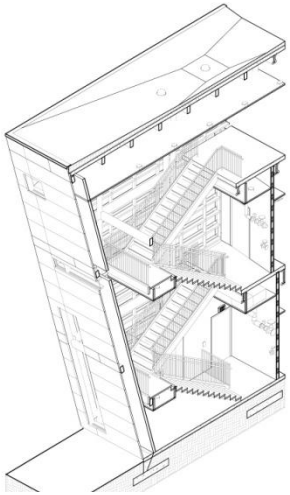
Element Based Integration of Schedules, Drawings and Specifications

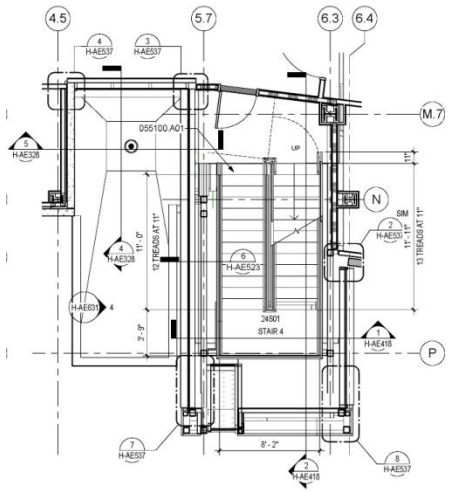
Renderings Contract Documents Same Source

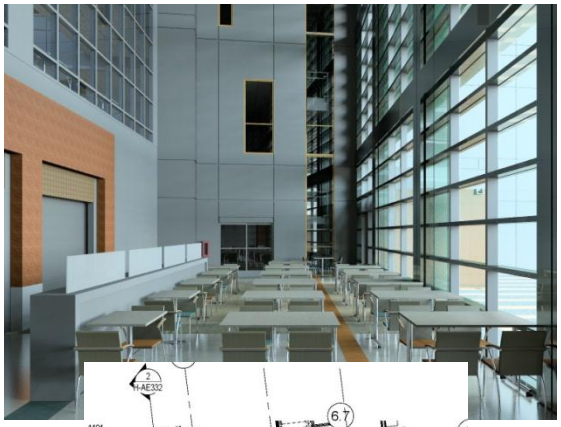


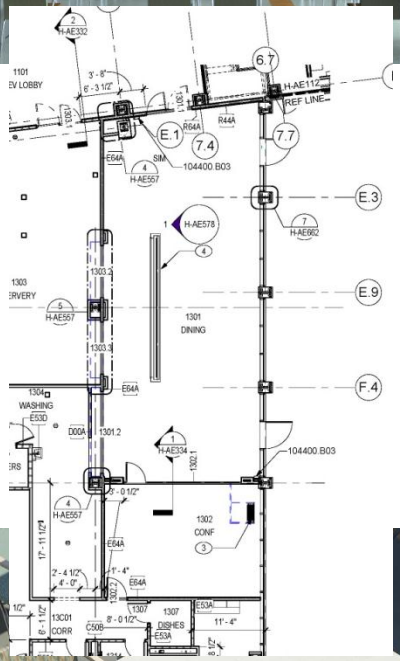


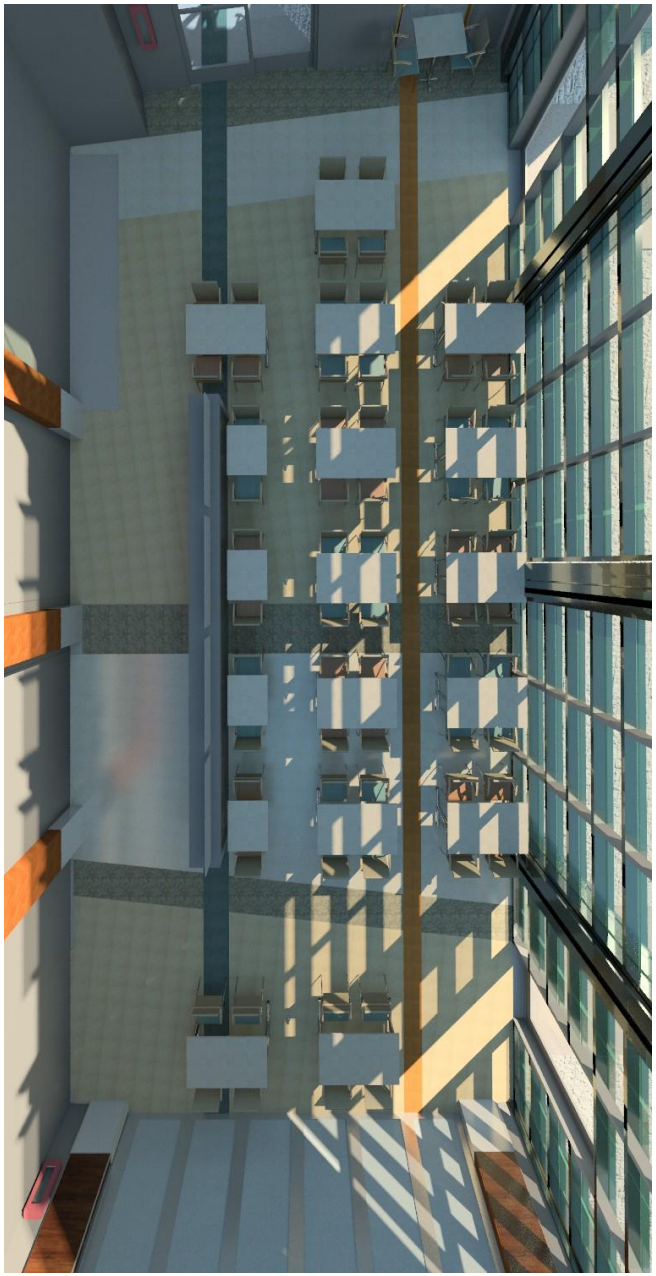


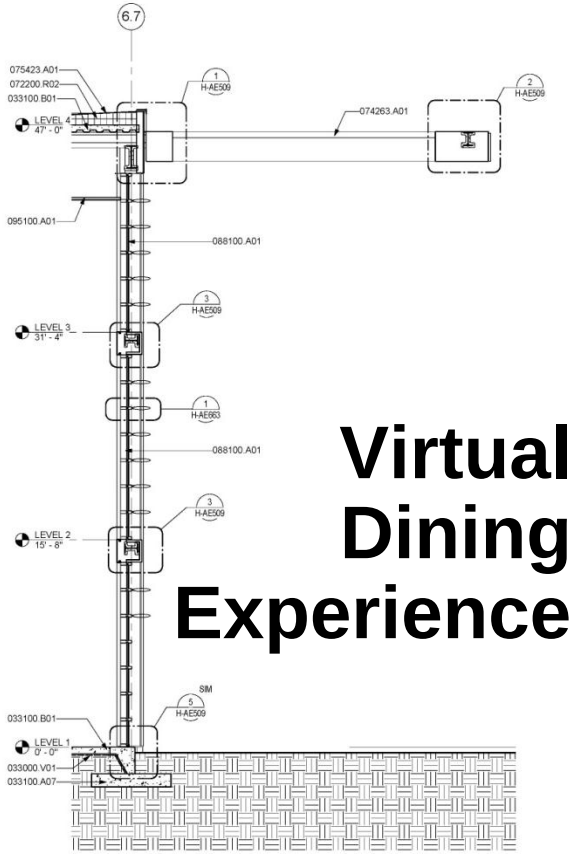






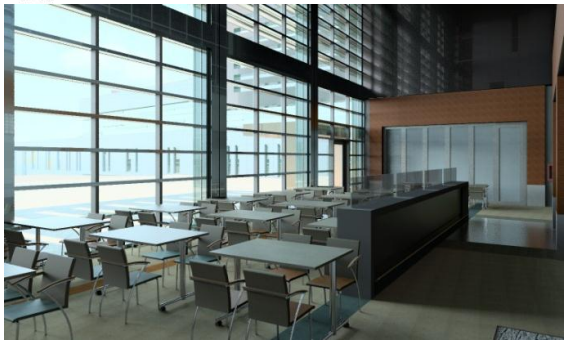




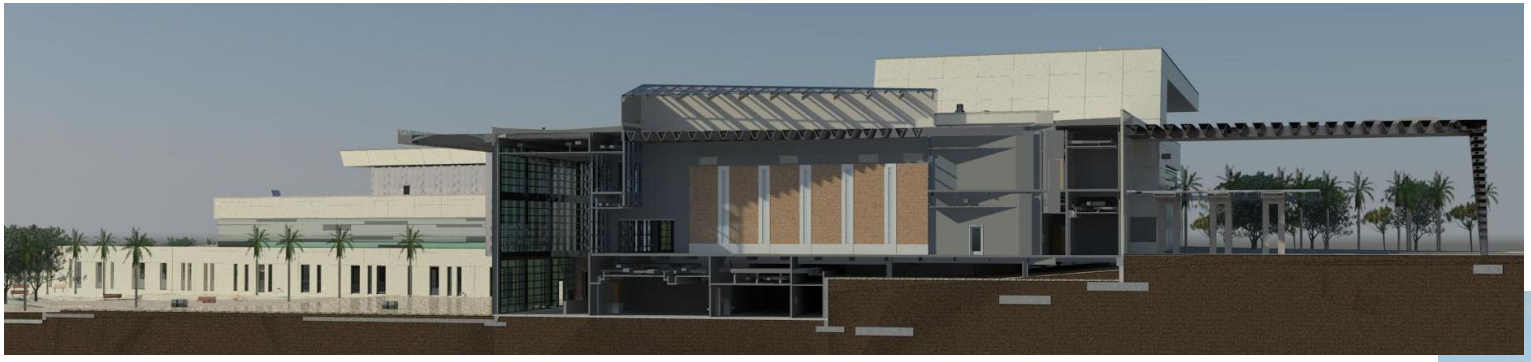


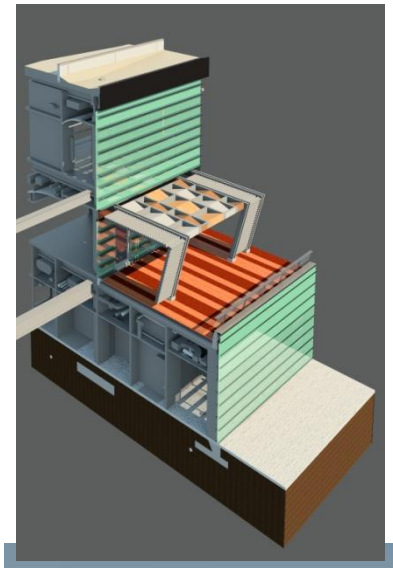
Virtual Dining Experience

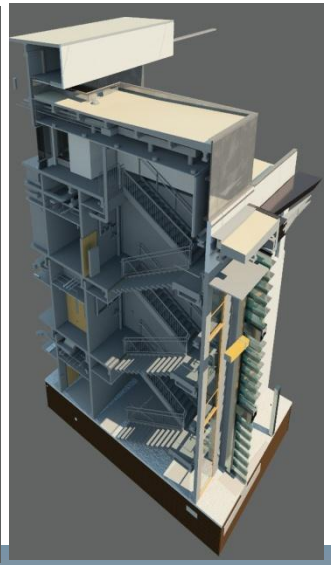
1 WALL SECTION
1/4" = 1'-0"

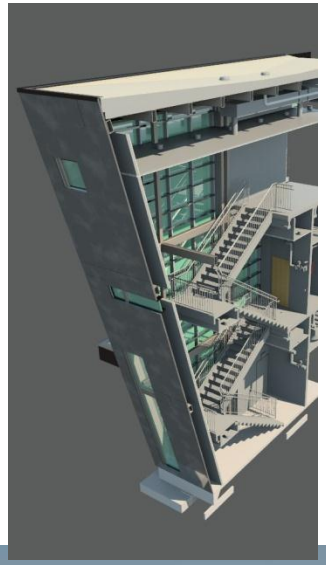


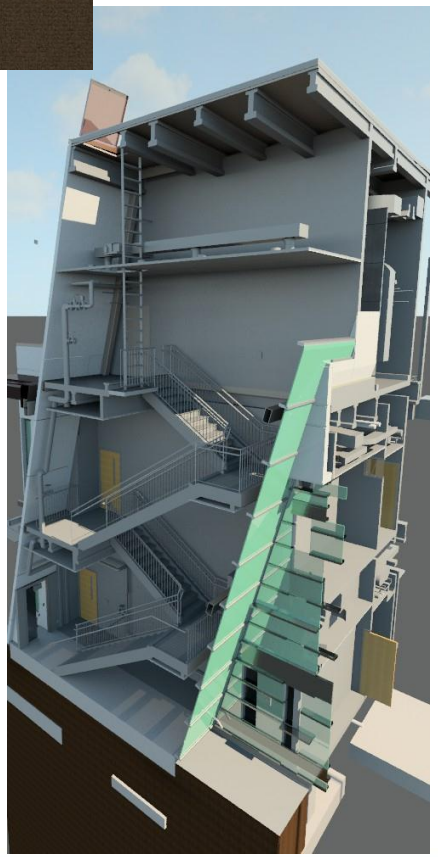
Building Information Model Slices



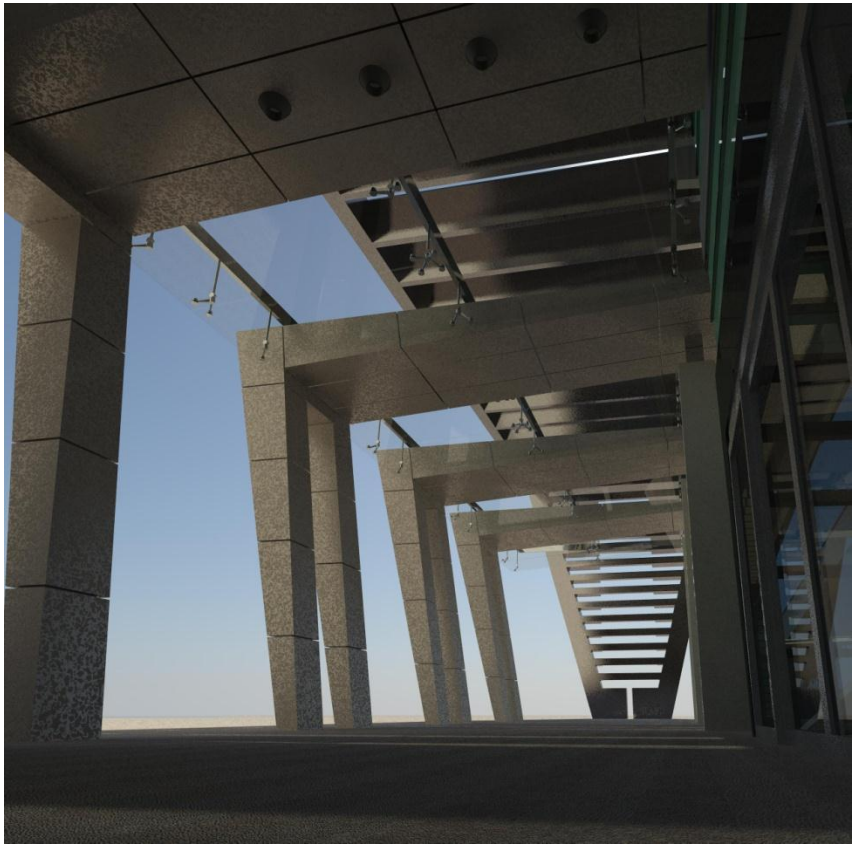








Virtual Interior Experience

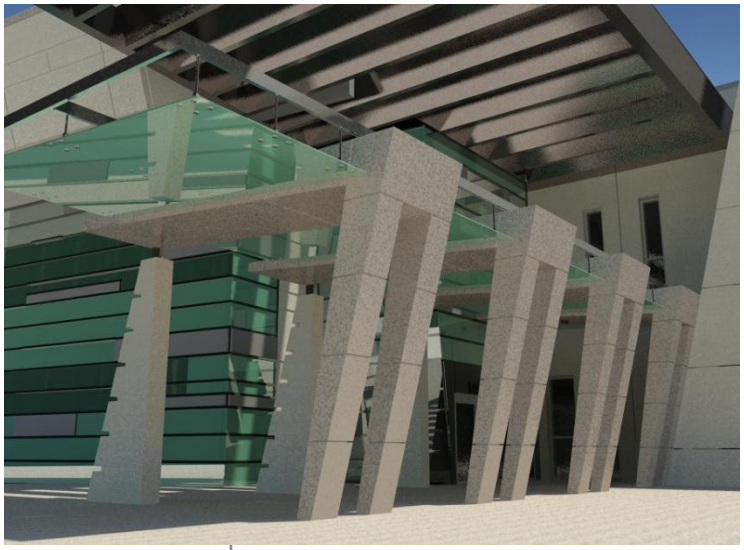


WRAP-UP

Keith Holloway, AIA, NCARB
Project and BIM Technology Manager
bkh@rlfae.com

David Fishel, PE LEED AP
Senior Energy Analyst
dcf@rlfae.com

RLF architecture | engineering | interiors
PH: 407-647-1039
ww.rlfae.com



- Identify appropriate influences and standards to follow
- Analysis begins at project Award
- Identify your end goal at the beginning
- Last thought…

Challenge Current Processes and Expose the True Critical path of Information Flow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