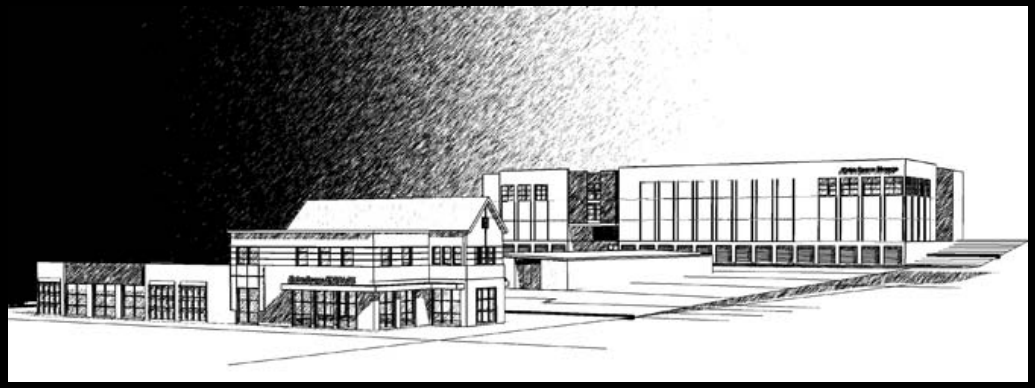

Monthly Webinar Series

Friday, 09 March 2012

BIM for Small Projects II

Case Studies in Innovative BIM Use

Technology in Architectural Practice
http://aia.org/TAP

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BIM for Small Projects II

Schedule - Eastern Standard Time (EST)

1:00 - 1:10pm Introduction and TAP upcoming events
Jeffrey W. Ouellette, Assoc. AIA
TAP Communications Committee Chair

1:10 - 2:15 pm BIM for Small Projects II
H. Edward Goldberg, AIA, NCARB
Jared Banks, AIA
Brian Skripac, Assoc. AIA, LEED AP BD+C

2:15 - 2:30 pm Q&A and final comments

BIM for Small Projects II

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BIM for Small Projects II

Acknowledgements

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BIM for Small Projects II

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BIM for Small Projects II

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All attendees will be eligible to receive:
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1.25 Experience Hour for interns enrolled in IDP.

All attendees at your site will submit for credit by completing the webinar survey/report form. The URL to the survey/form will be emailed to attendees/registrants at the end of the presentation. Certificates of Completion can be download at the end of the survey.

Continuing education questions can be directed to knowledgecommunities@aia.org.

BIM for Small Projects II

AIA/CES Course Description

There is a widely shared perception that small firms and sole practitioners cannot take advantage of Building Information Modeling due to such factors as its cost, complexity, training time, and productivity for small projects. These case studies, presented by architects who work in small firms or as sole practitioners, will demonstrate how BIM has enhanced their practices and enabled them to create excellent projects.

BIM for Small Projects II

AIA/CES Learning Objectives

1. Learn how small practices are making innovative and productive use of BIM.

2. Learn how such practices are using BIM to offer integrated design and construction services to their clients.

3. Compare how various BIM platforms (Revit, ArchiCAD, Vectorworks, Bentley Architecture, for example) perform in a small practice environment.

4. Learn how your practice can implement BIM in a way that meets your specific needs and helps you achieve your goals.

BIM for Small Projects II

AIA TAP Leadership 2012

David Scheer
Chair - 2012

Kimon Onuma
Chair - 2013

Calvin Kam

Stephen Hagan

Kristine Fallon

Tony Rinella

Active Past Chairs

Brian Skripac

Jeffrey Ouellette

Karen Kensek

Luciana Burdi

Marty Doscher

Mike Kenig

Pete Evans

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BIM for Small Projects II

TAP Upcoming Events

- **14 March 2012, TAP Local Discussion Groups Webinar**
  - Discussion group leaders from around nation
  - Those wanting to start new groups
- **16 May 2012, Connect with Technology Workshop @ AIA 2012**
  - Full-day pre-convention CE Workshop
  - Help architects with integrating technologies into their practices
- **13 April 2012, Monthly TAP Webinar - Interoperability**
  - Survey of current technology interoperability projects and opportunities
  - Kimon Onuma, FAIA

BIM for Small Projects II

Speaker Introduction

H. Edward Goldberg, AIA, NCARB

- HEGRA Architects, LLC – Baltimore, MD
- Architectural Technology Author

Jared Banks, AIA

- Shoegnome, LLC – St. Paul, MN
- Formerly with SALA Architects - Minneapolis, MN

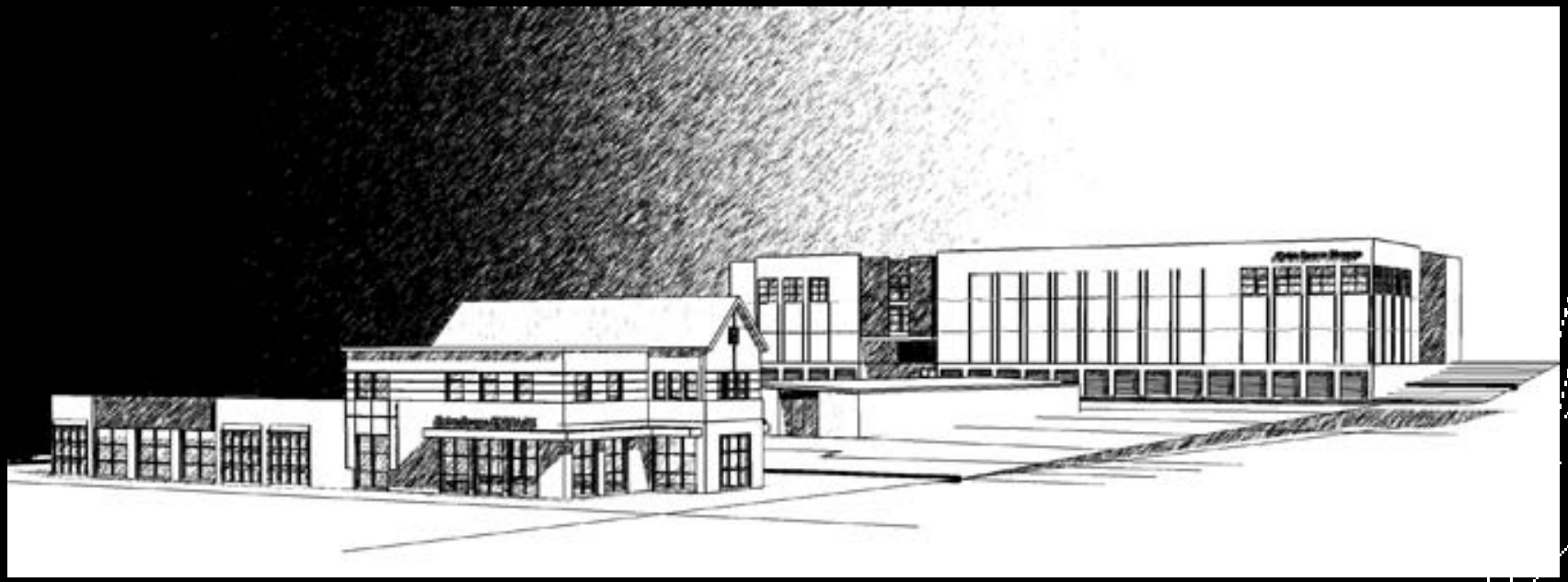
Brian Skripac, Assoc. AIA, LEED AP BD+C

- Director of BIM
- DesignGroup – Columbus, OH

H. Edward Goldberg, AIA, NCARB

HEGRA Architects, LLC – Baltimore, MD

Extra Space Storage



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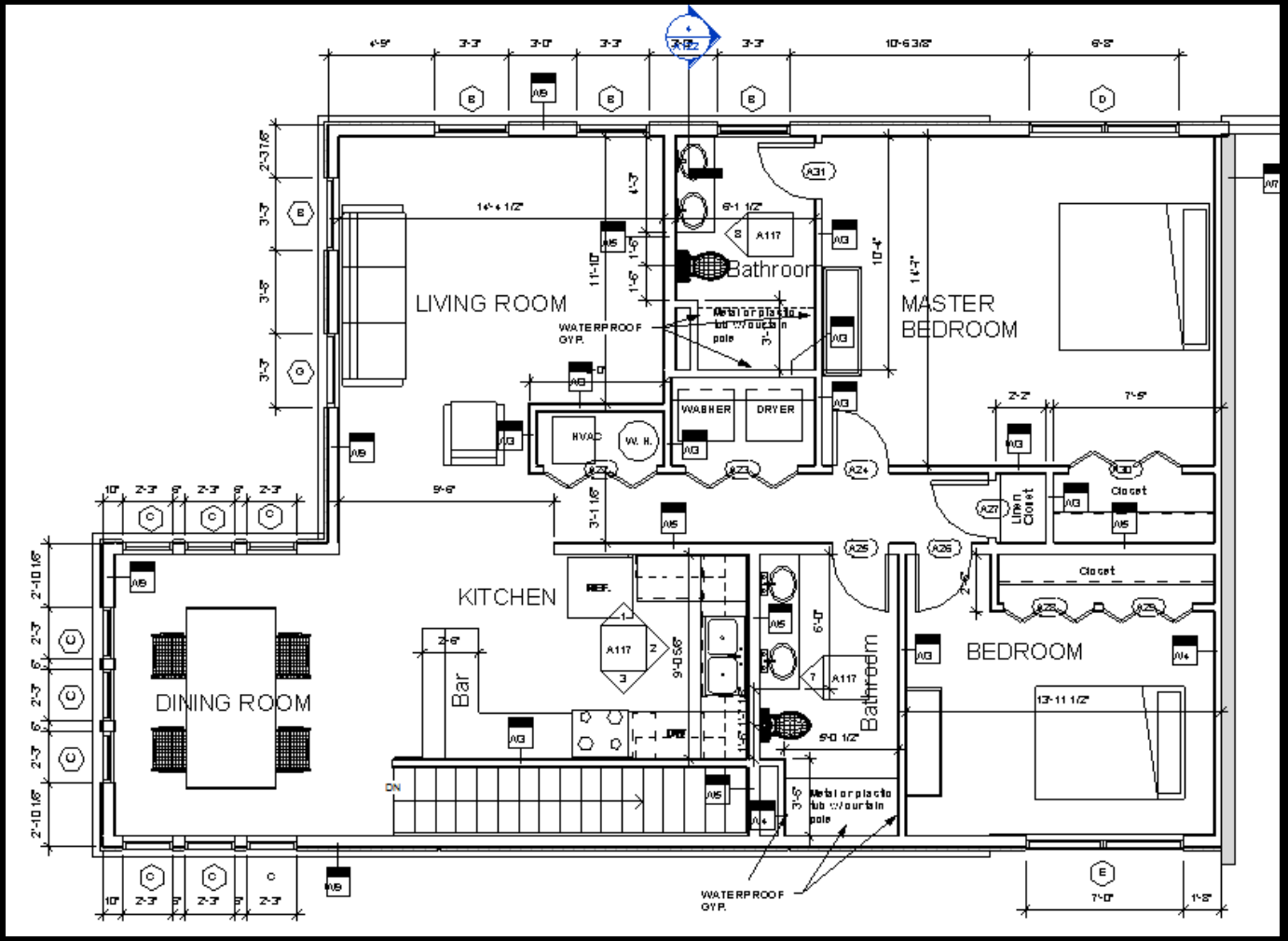

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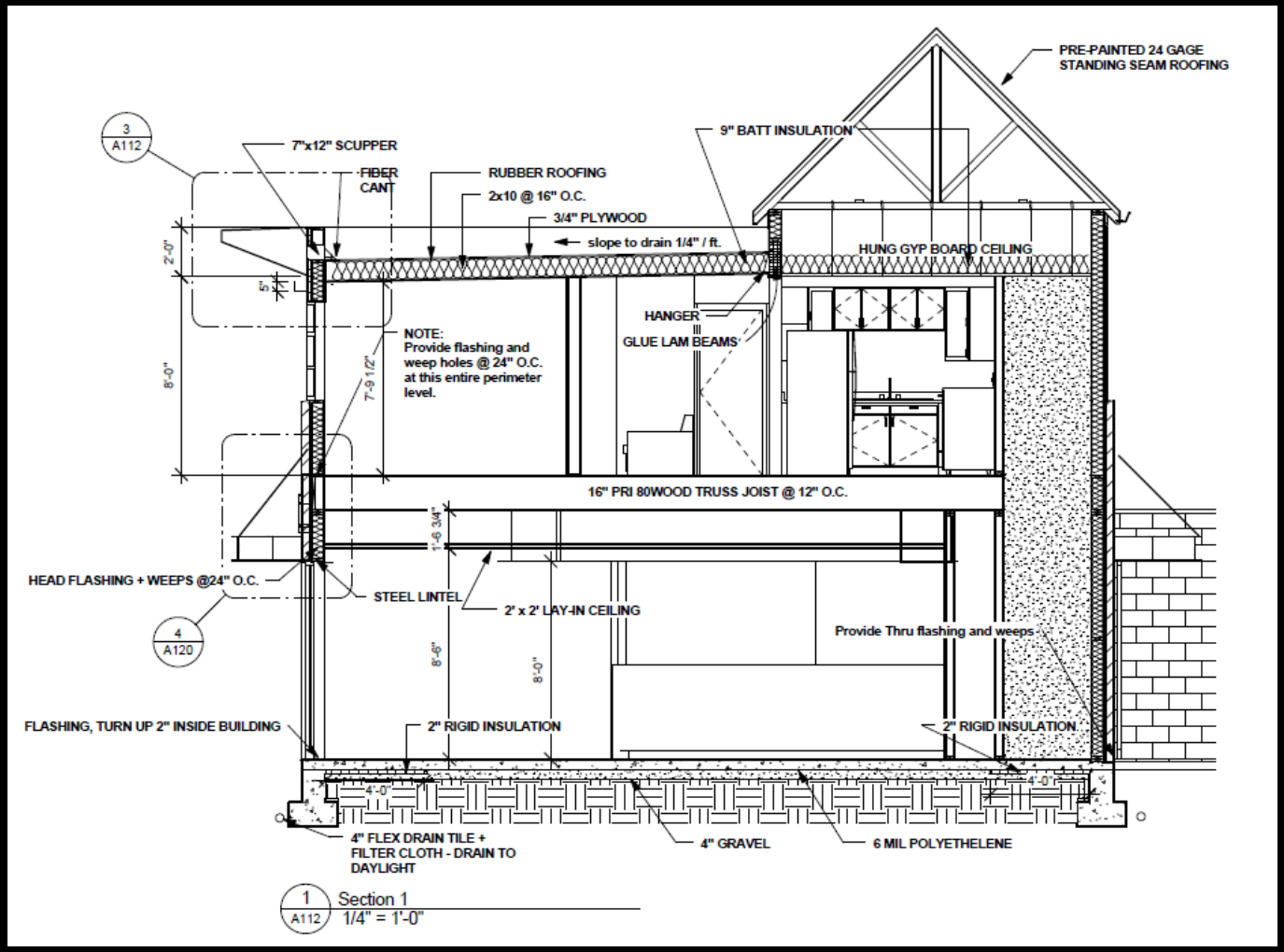

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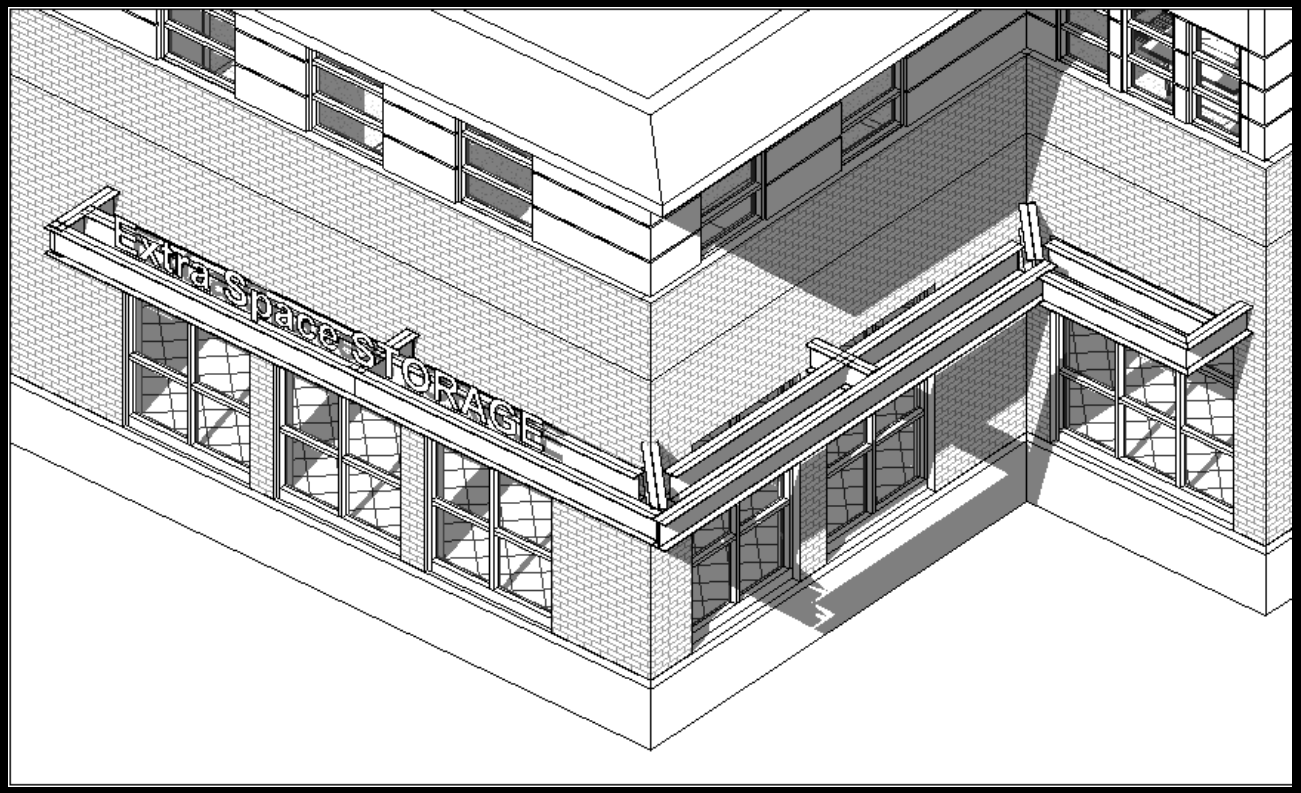
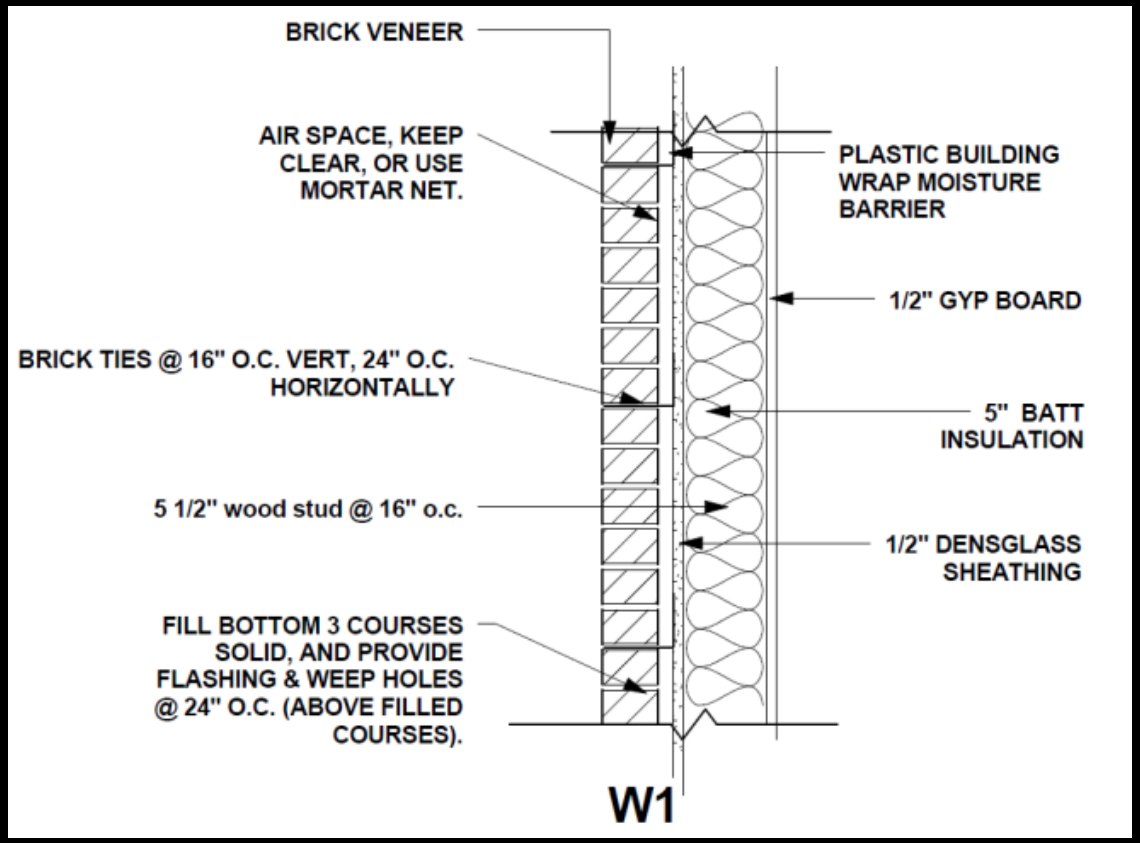
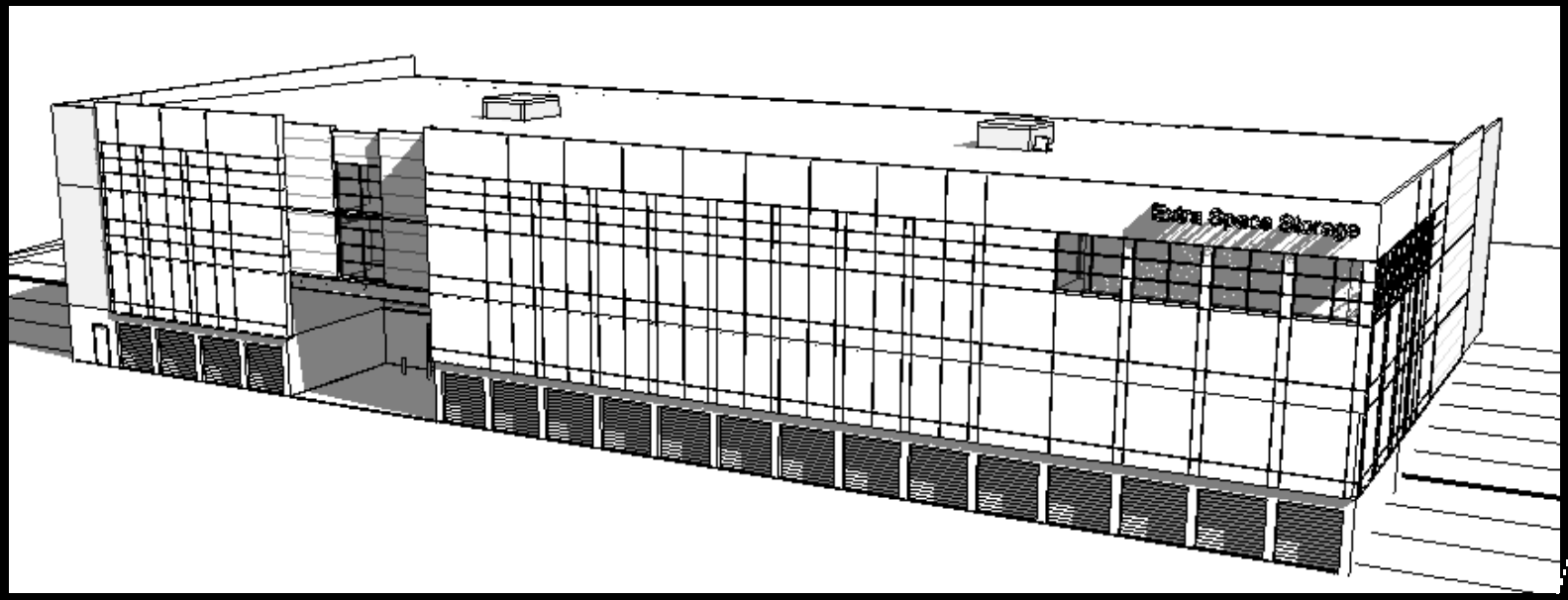

extra space STORAGE


BRICK VENEER
AIR SPACE, KEEP CLEAR, OR USE MORTAR NET.
PLASTIC BUILDING WRAP MOISTURE BARRIER
1/2" GYP BOARD
BRICK TIES @ 16" O.C. VERT, 24" O.C. HORIZONTALLY
5" BATT INSULATION
5 1/2" wood stud @ 16" o.c.
1/2" DENSGLASS SHEATHING
FILL BOTTOM 3 COURSES SOLID, AND PROVIDE FLASHING & WEEP HOLES @ 24" O.C. (ABOVE FILLED COURSES).
W1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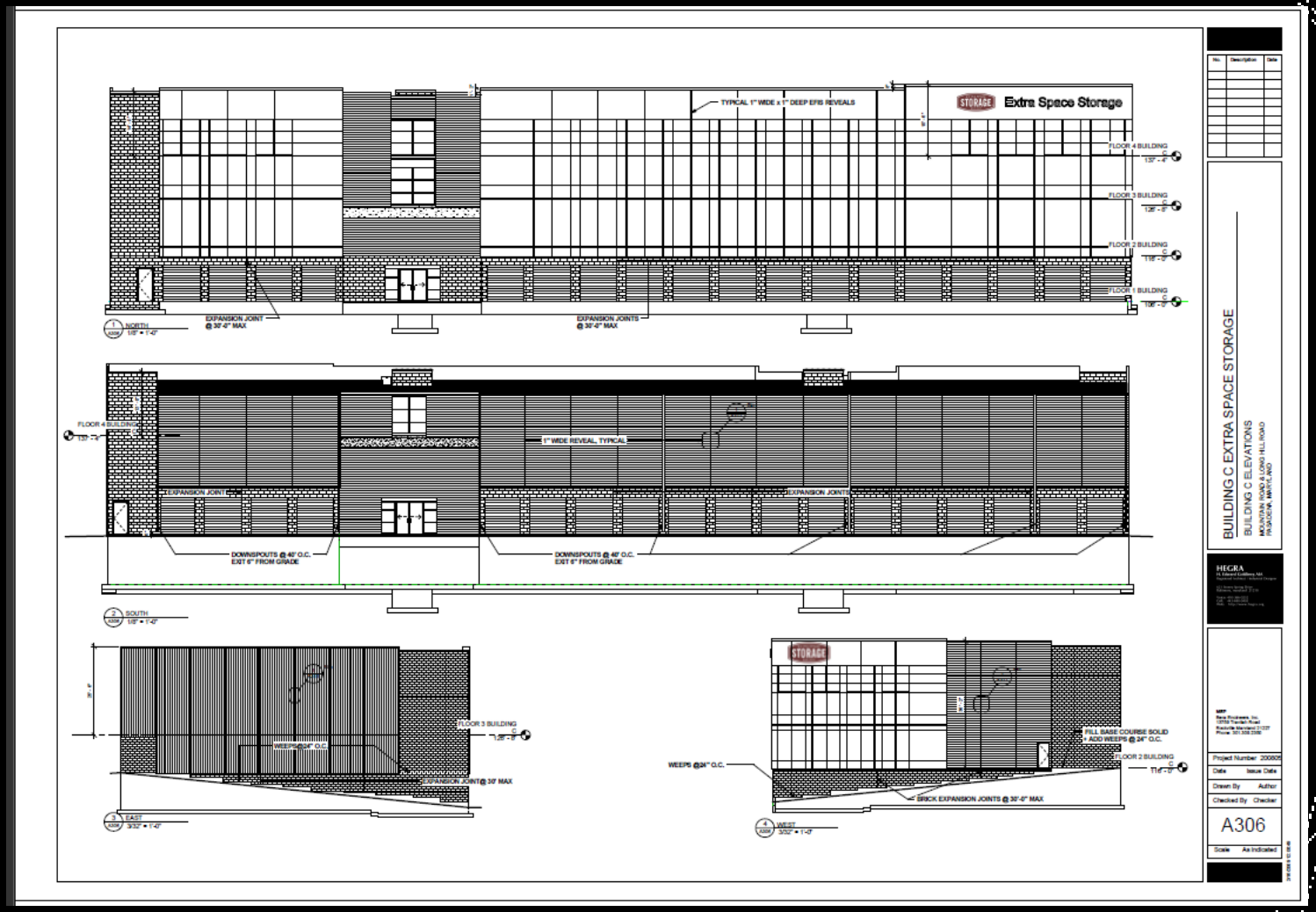

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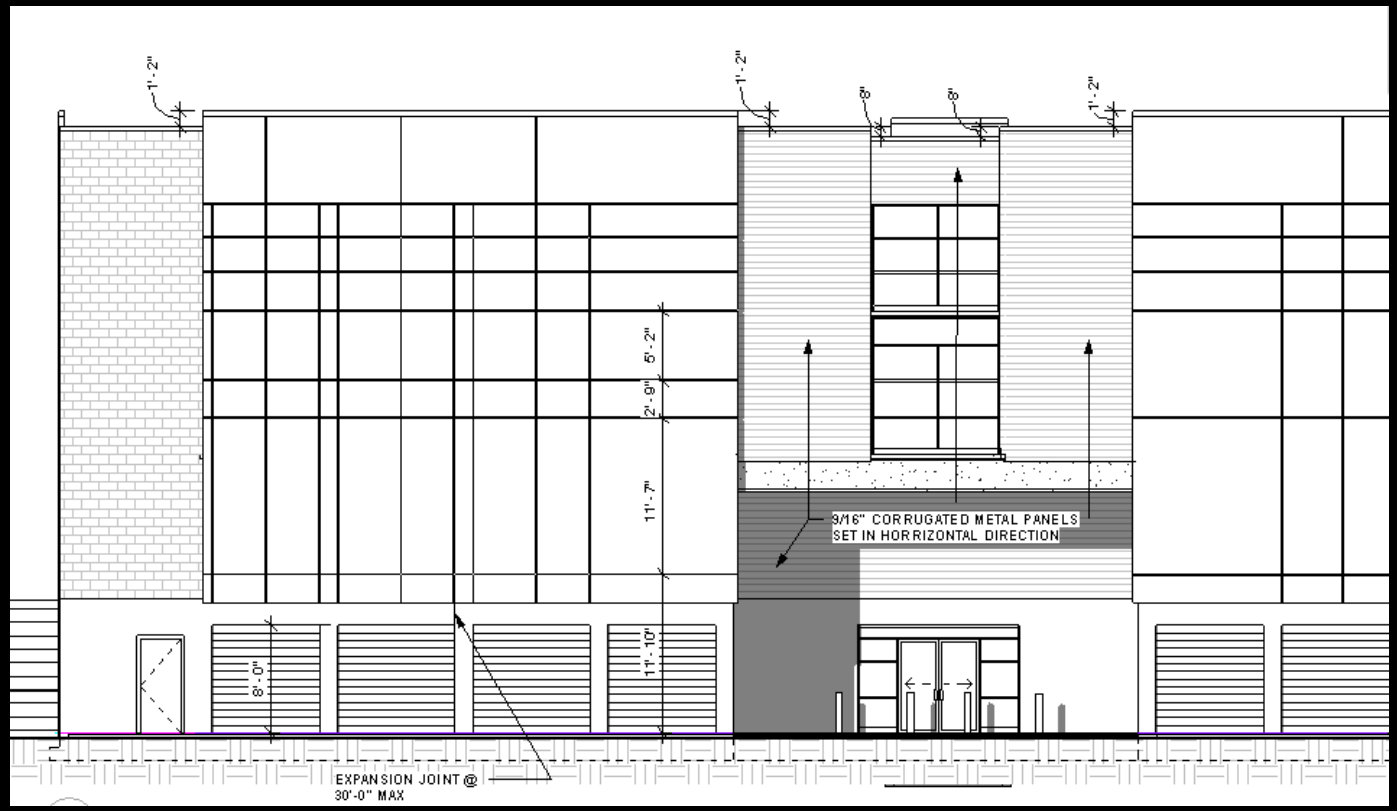

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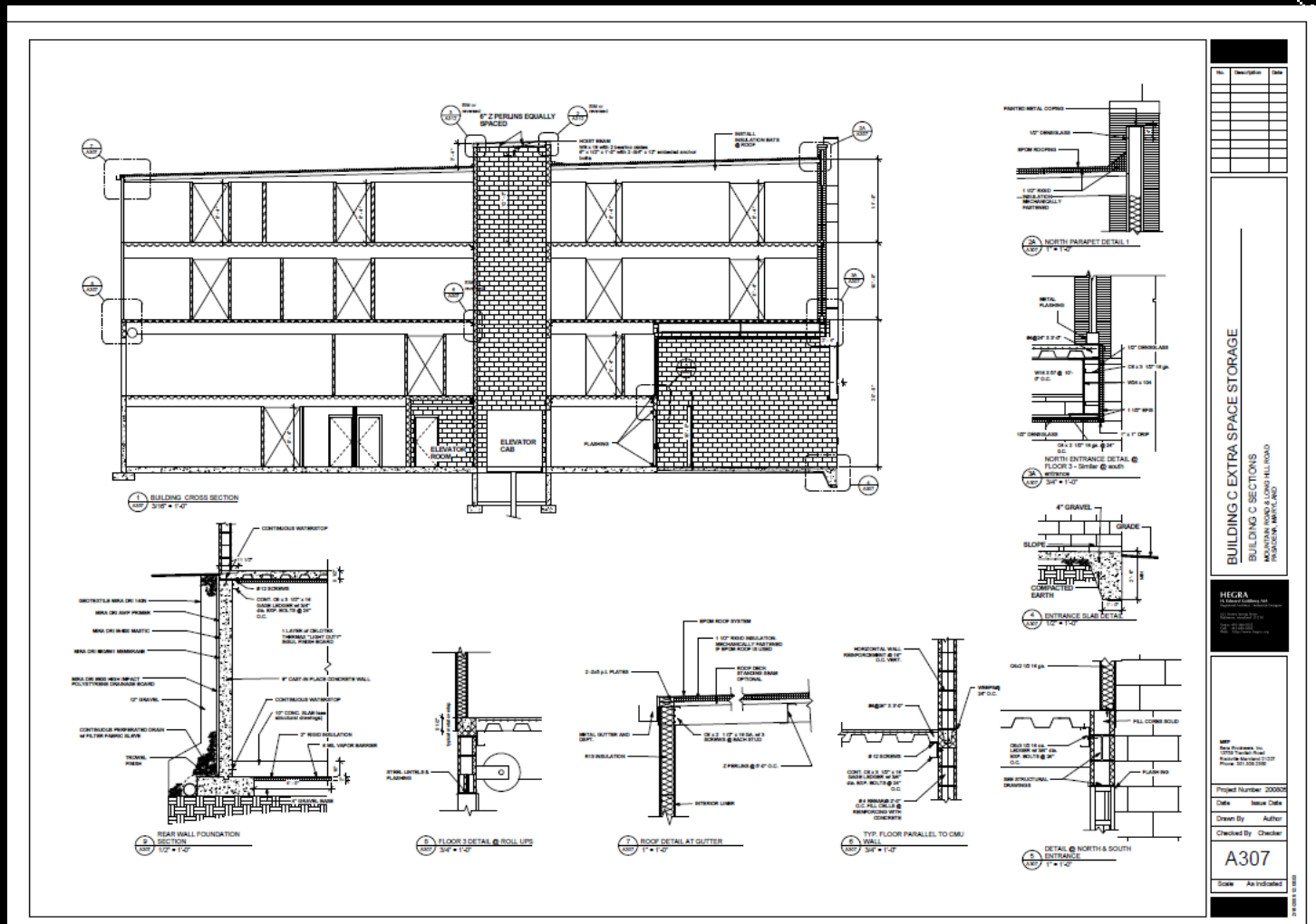

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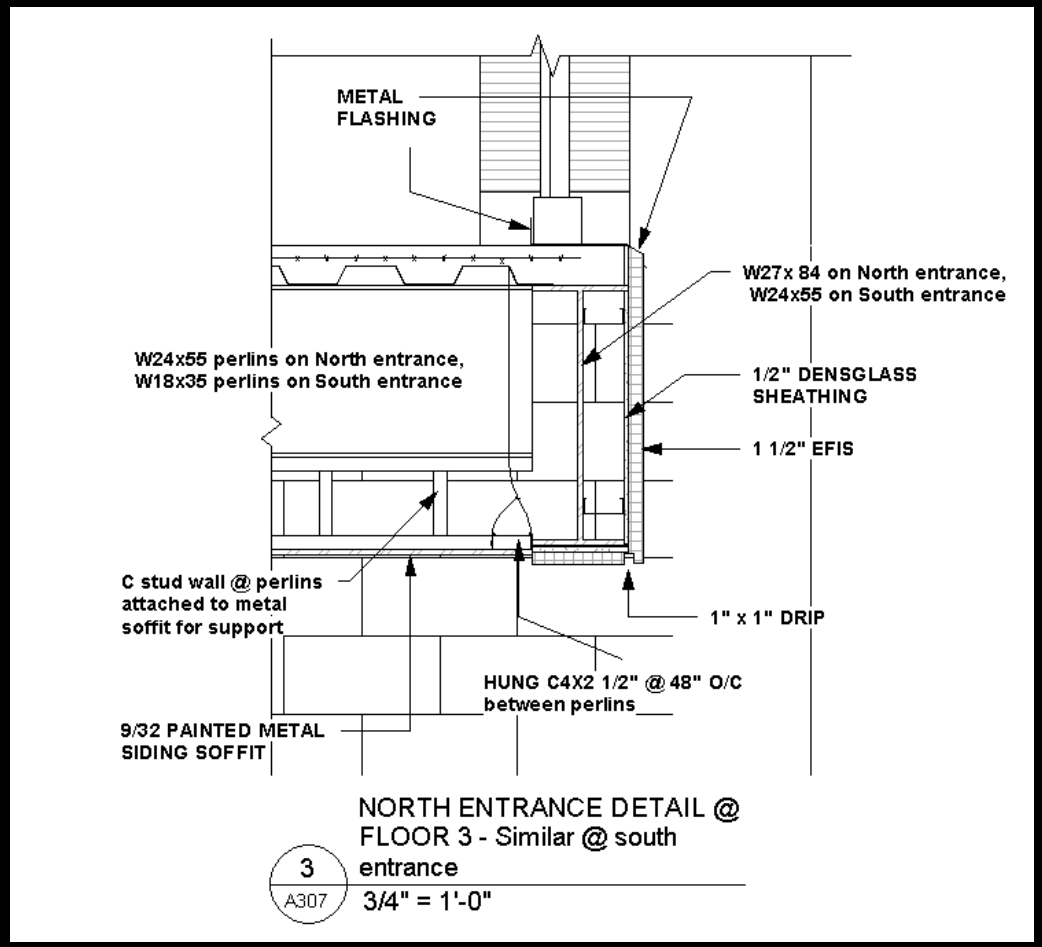
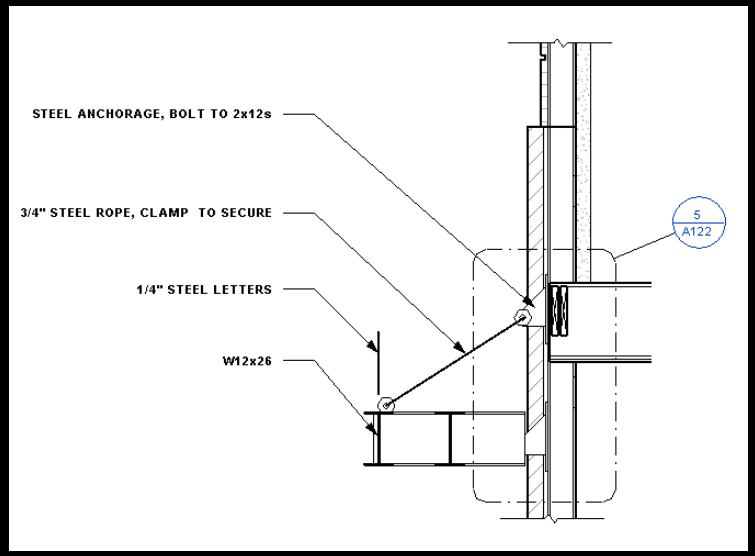
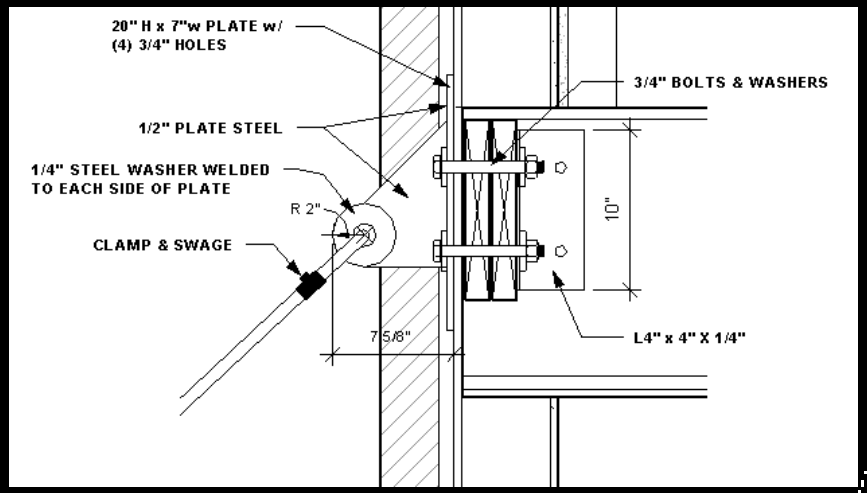
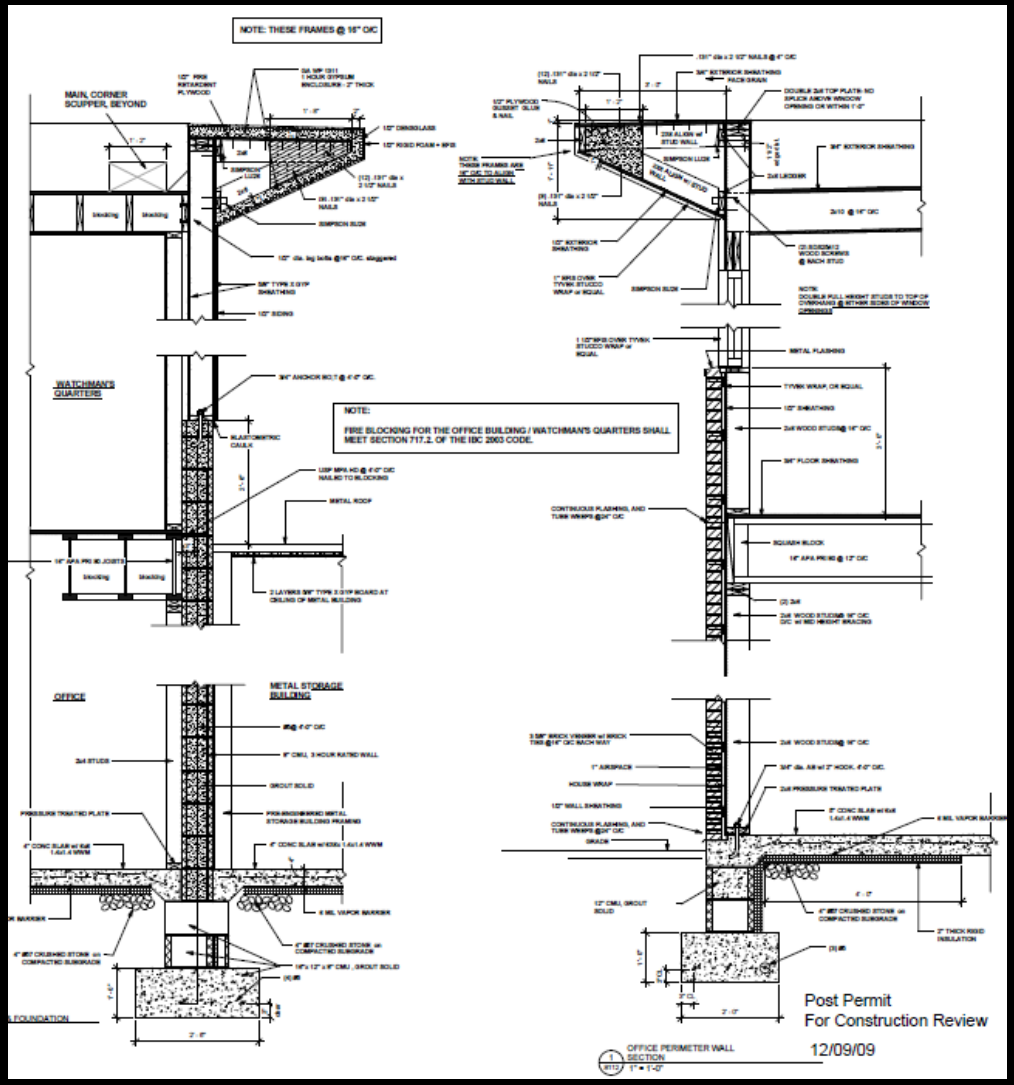
Hybrid Detail




STEEL ANCHORAGE, BOLT TO 2x12s
3/4" STEEL ROPE, CLAMP TO SECURE
1/4" STEEL LETTERS
W12x26
5
A122


20" H x 7"w PLATE w/
(4) 3/4" HOLES
3/4" BOLTS & WASHERS
1/2" PLATE STEEL
1/4" STEEL WASHER WELDED
TO EACH SIDE OF PLATE
R 2"
CLAMP & SWAGE
10"
7 5/8"
L4" x 4" X 1/4"



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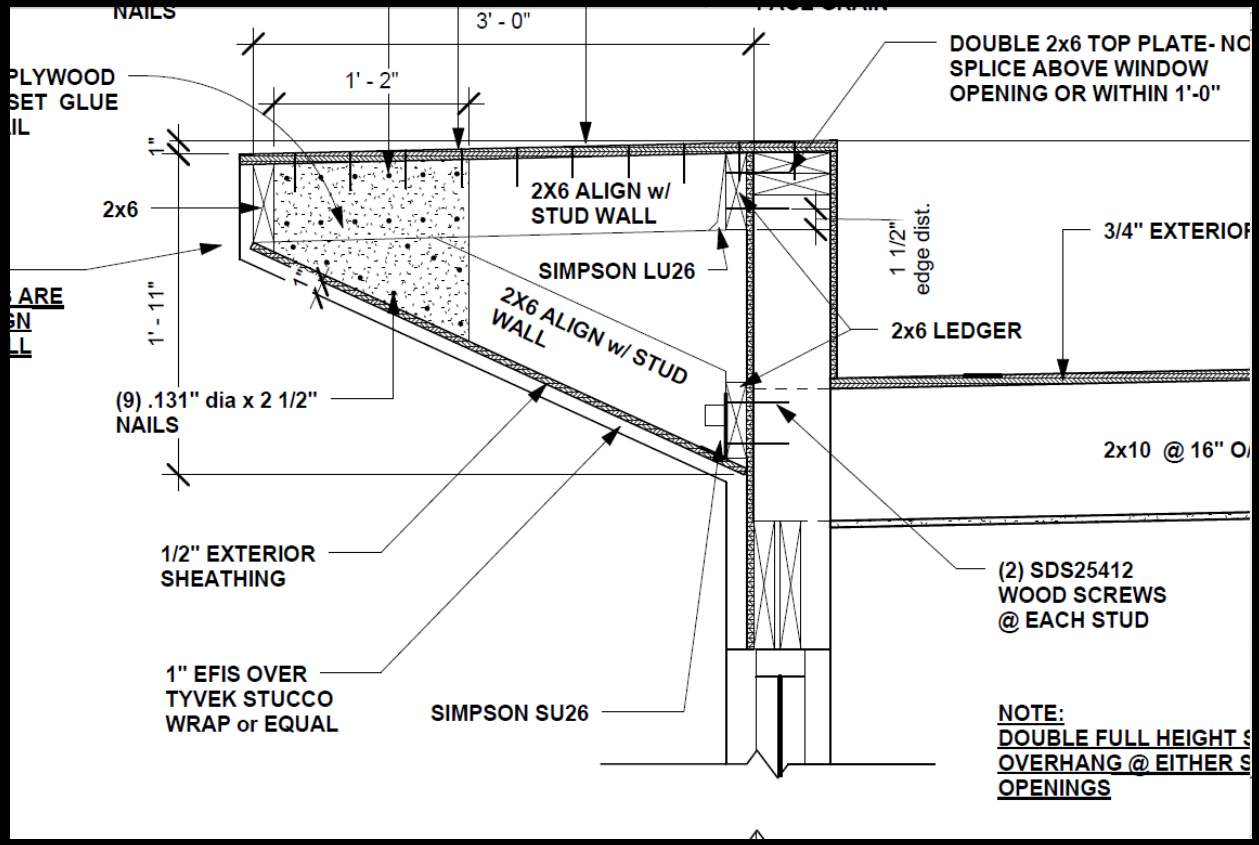

NAILS
3' - 0"
1' - 2"
PLYWOOD
SET GLUE
IL
1"
2x6
ARE
GN
LL
1' - 11"
1"
(9) .131" dia x 2 1/2"
NAILS
1/2" EXTERIOR
SHEATHING
1" EFIS OVER
TYVEK STUCCO
WRAP or EQUAL
SIMPSON SU26
2X6 ALIGN w/
STUD WALL
SIMPSON LU26
2X6 ALIGN w/ STUD
WALL
DOUBLE 2x6 TOP PLATE- NO
SPLICE ABOVE WINDOW
OPENING OR WITHIN 1'-0"
1 1/2"
edge dist.
2x6 LEDGER
3/4" EXTERIOR
2x10 @ 16" O
(2) SDS25412
WOOD SCREWS
@ EACH STUD
NOTE:
DOUBLE FULL HEIGHT S
OVERHANG @ EITHER S
OPENINGS

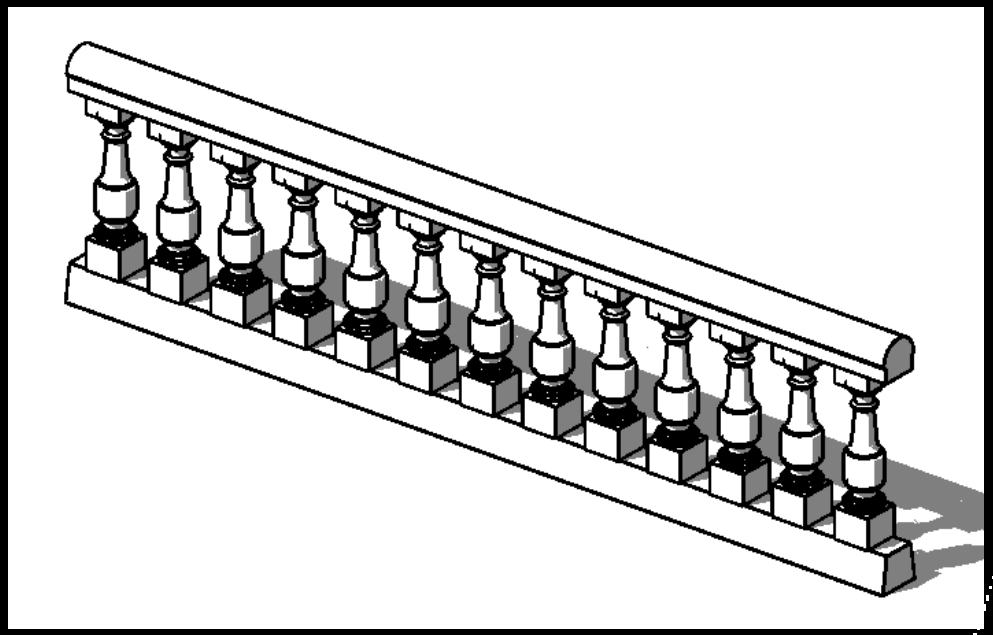
- BIM benefits:

1. Wall Lengths – for stud counts
2. Floor areas – concrete, Tile, roofing, etc
3. Wall areas -- for paint, wall coverings, etc.
4. Profiles for all extrusions.
5. Energy model available if desired.
6. Capable of coordinating integrated dwgs, and jpgs.
7. Better coordination of CDs.
8. 3D visualizations for owner, Permit department and field construction.
9. Quicker delivery, more profit, fewer employees.

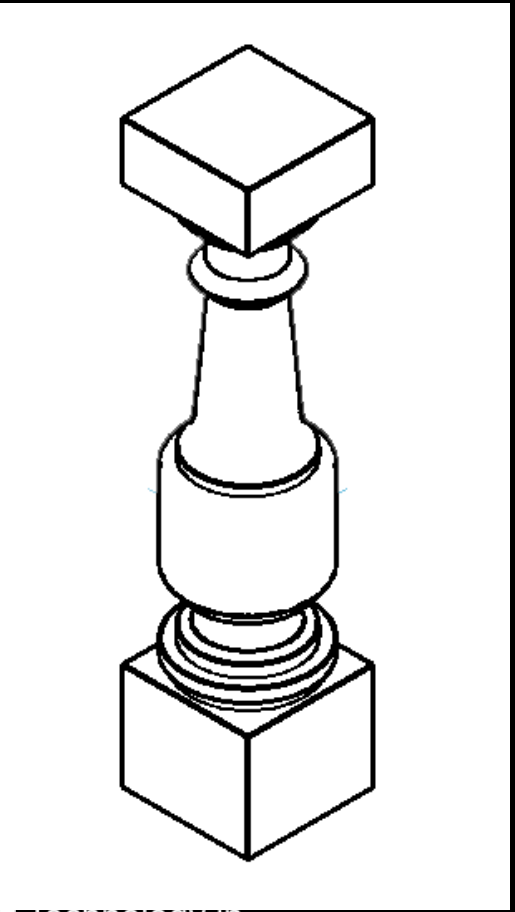
Window Surround in 3D

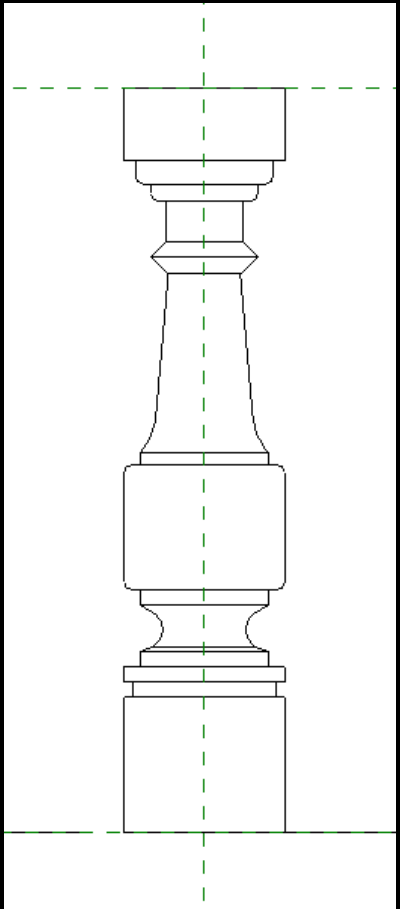
Baluster is wire cut from foam, profile from Revit.

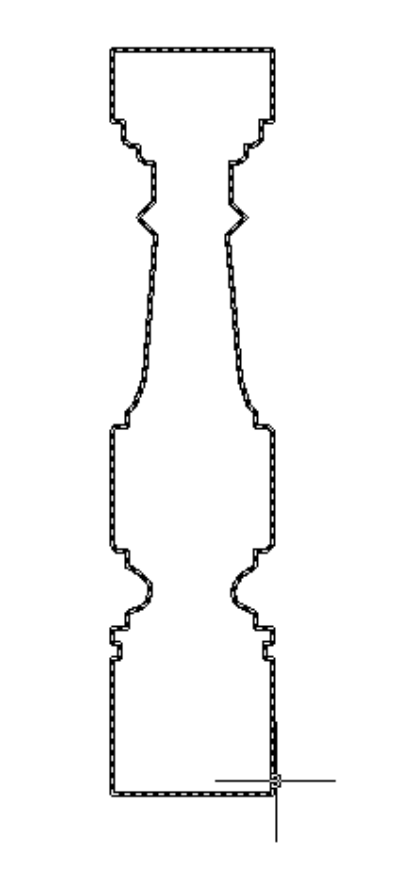
All cornice foam extrusions also created from Revit profiles



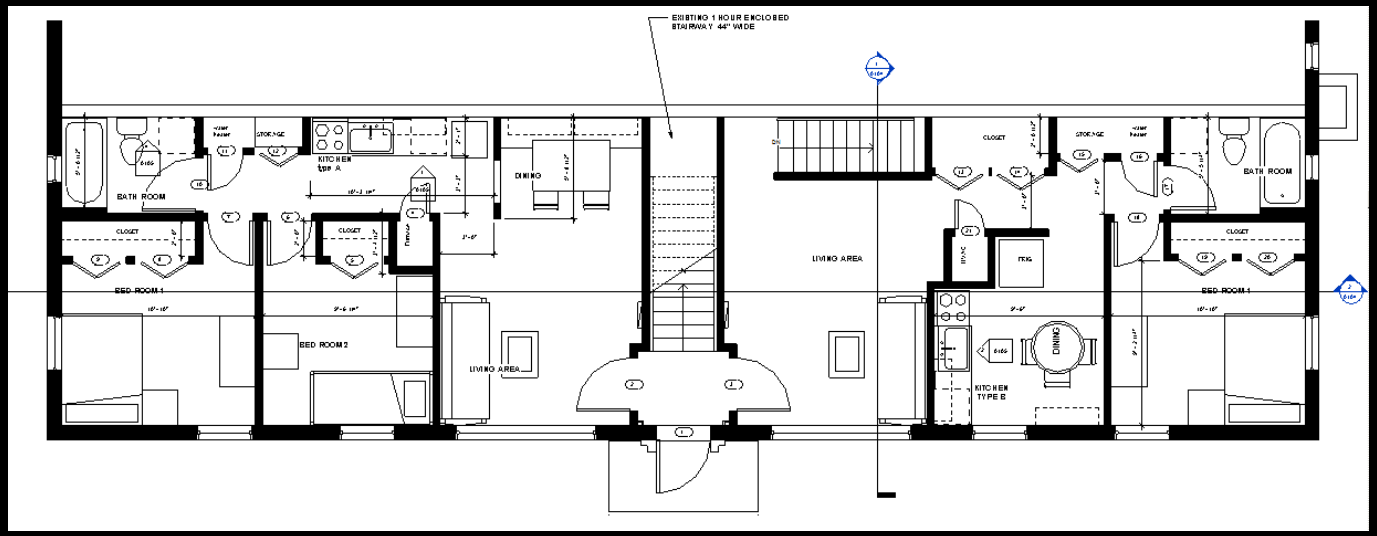
Baluster model, profile is exported as a Vector file







4643 Hillside Ave, Washington DC HEGRA Properties LLC



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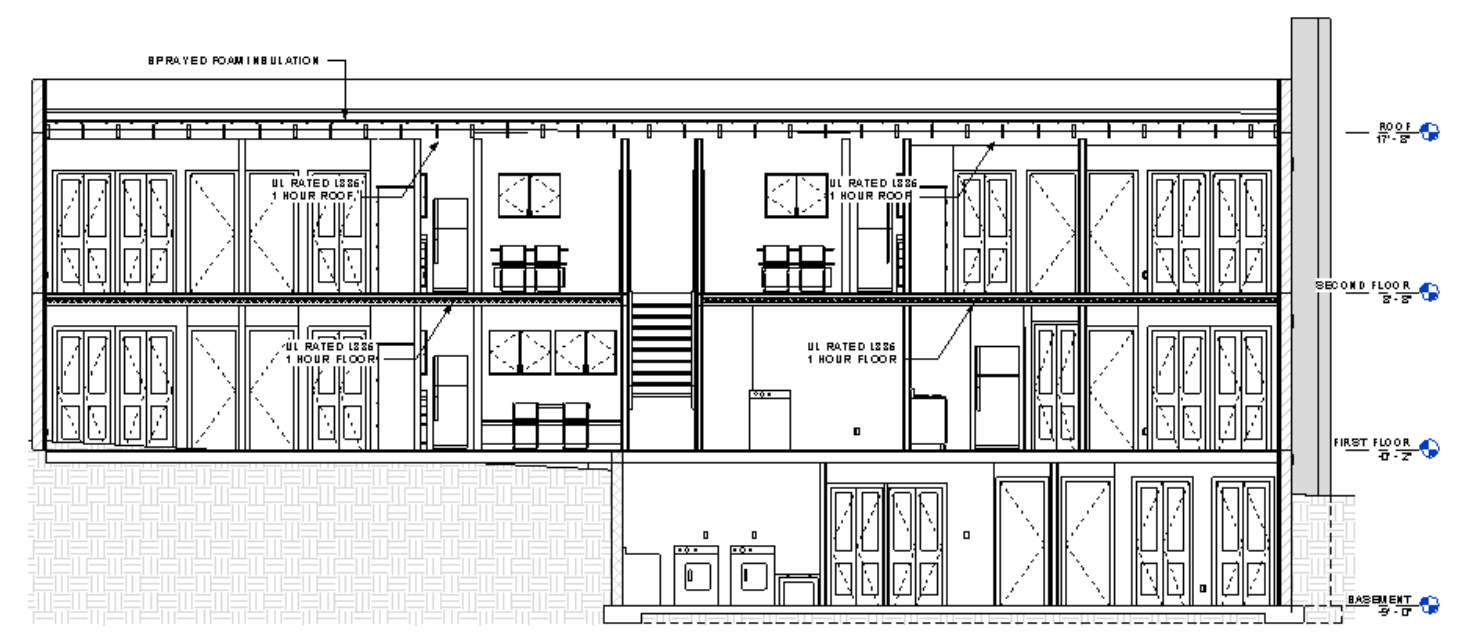
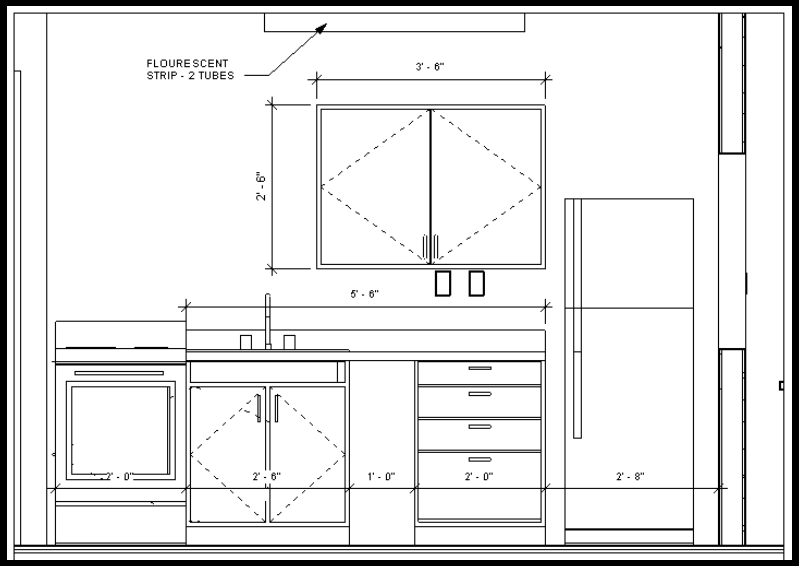
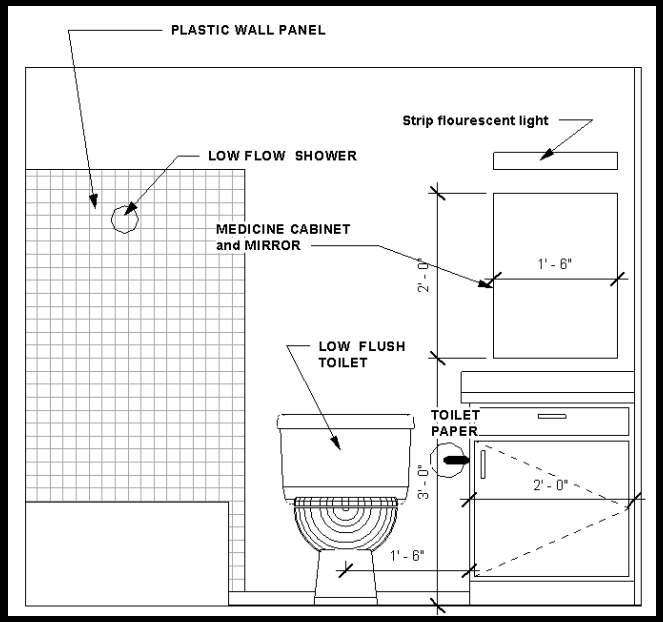

SPRAYED FOAM INSULATION
UL RATED L336
1 HOUR ROOF
UL RATED L336
1 HOUR ROOF
UL RATED L336
1 HOUR FLOOR
UL RATED L336
1 HOUR FLOOR
ROOF
17'-8"
SECOND FLOOR
8'-8"
FIRST FLOOR
0'-2"
BASEMENT
-9'-0"

4643 Hillside Ave, Washington DC





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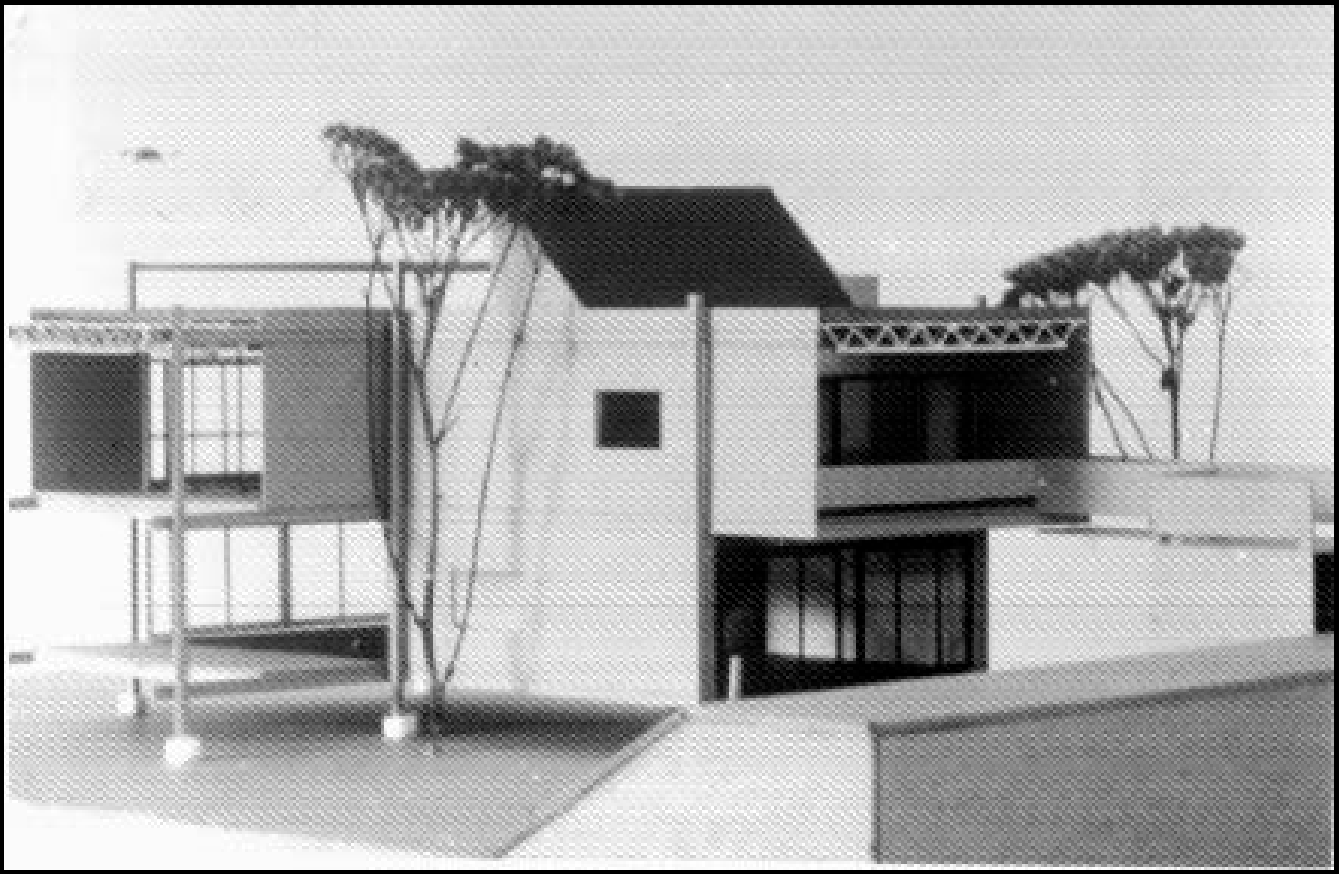
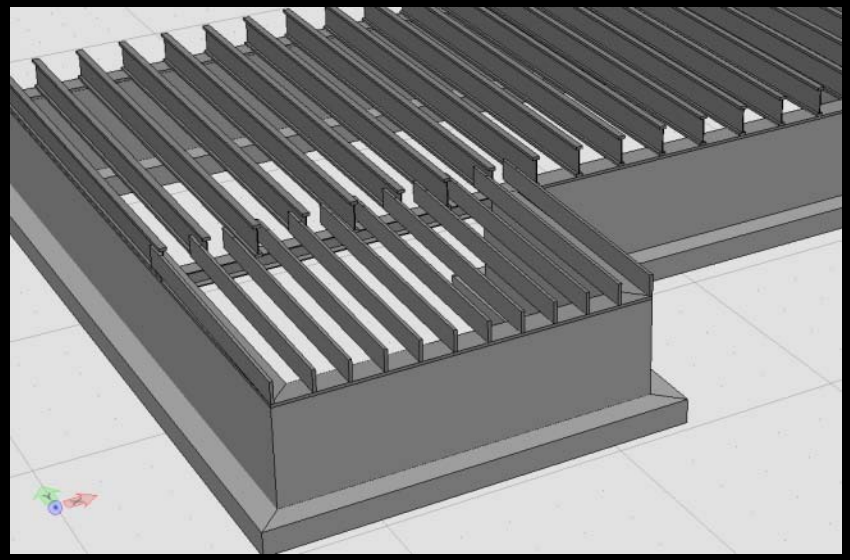
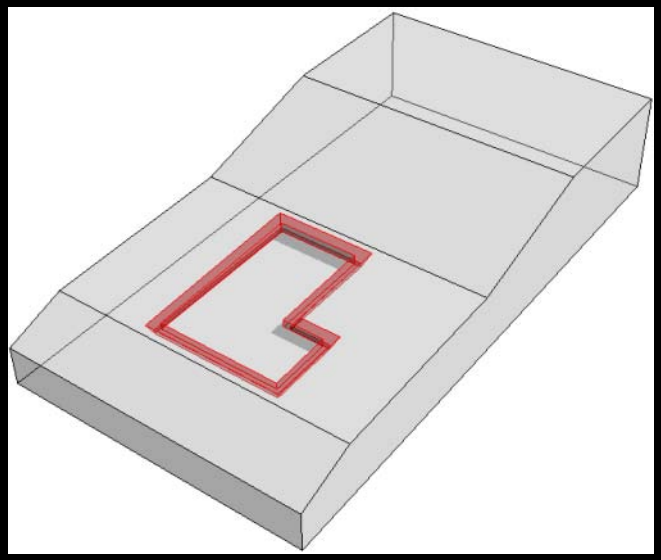
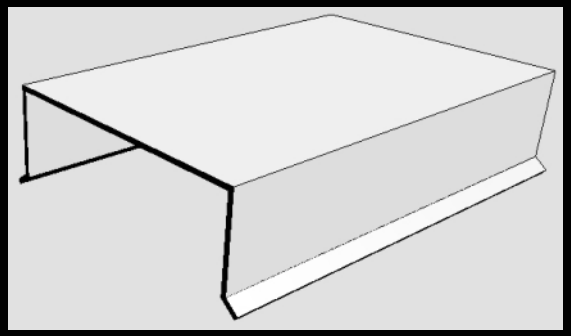
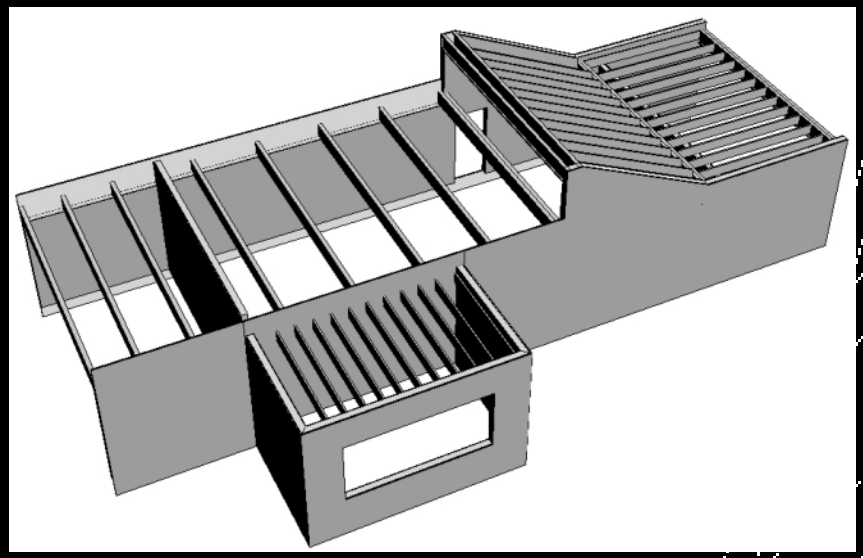
CHODAK Residence Westminster MD



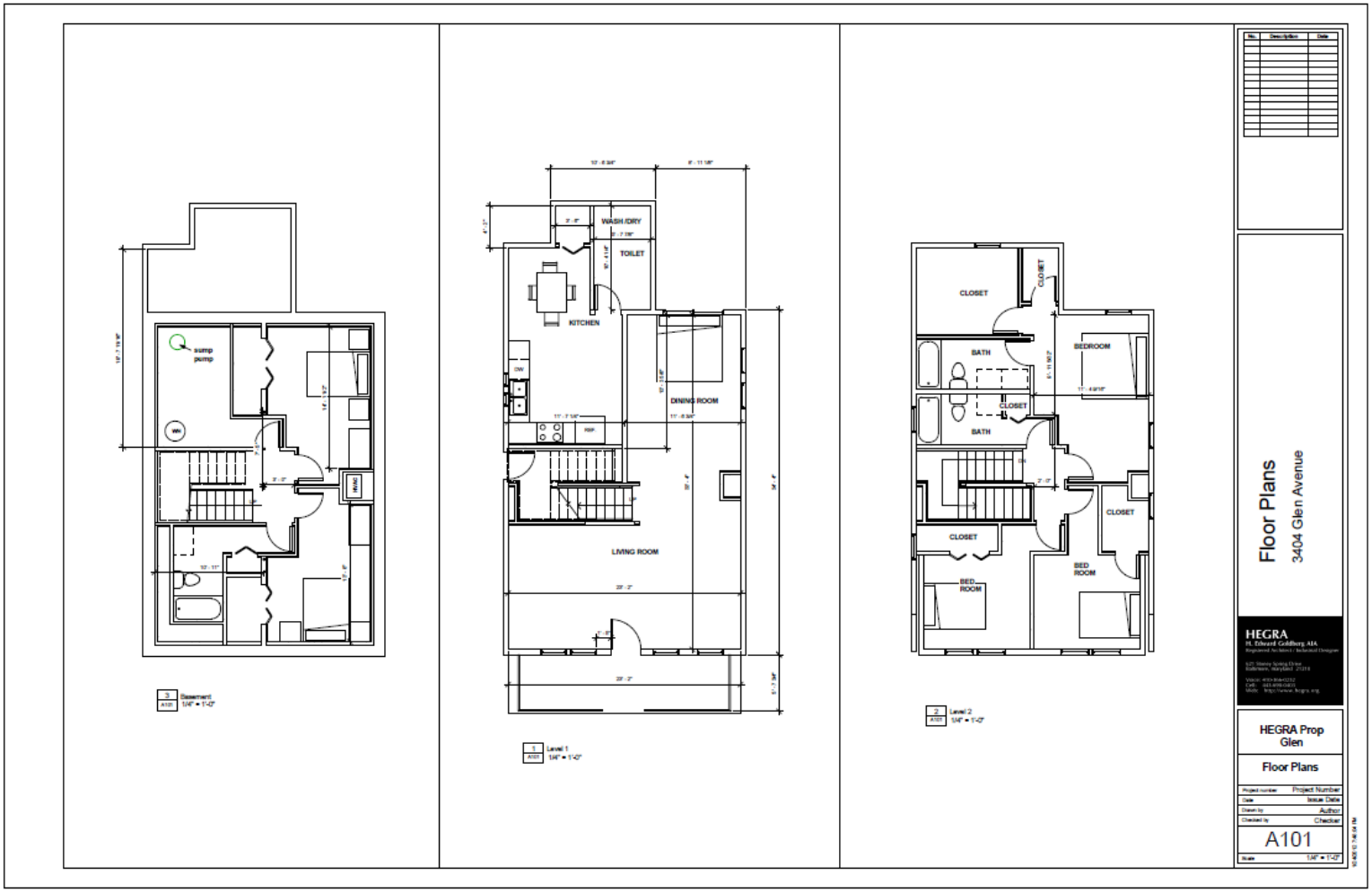








3404 Glen Avenue Baltimore, MD -- HEGRA Properties LLC



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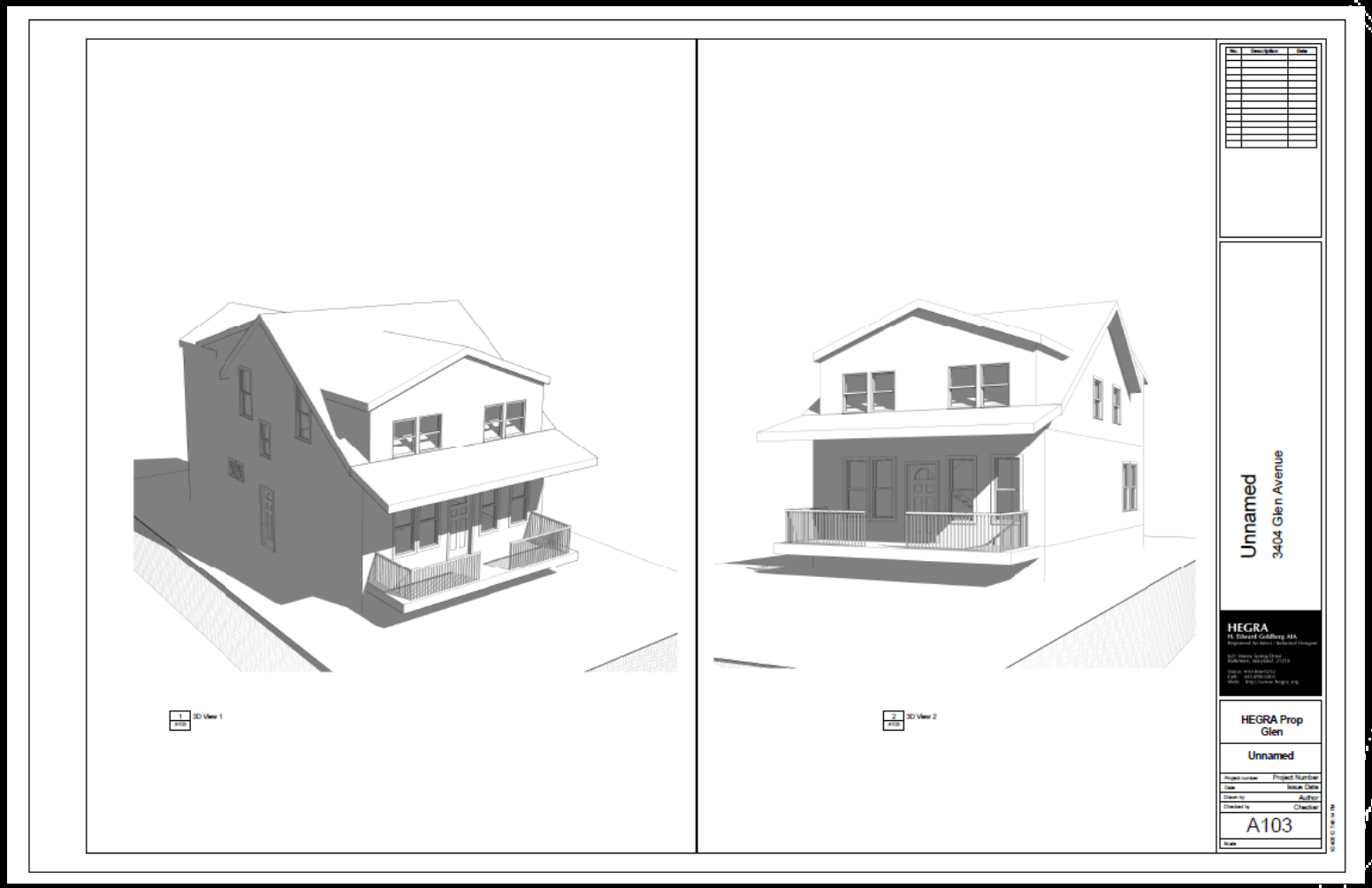

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- BIM problems:

1. Lack of knowledgeable BIM MEP engineer
2. Structural engineer not up and running with Tekla yet.
3. Angled wall reveals not available in Revit.
4. 2D in Hybrid views must be monitored.
5. Revit not backward compatible.

Jared Banks, AIA

Shoegnome, LLC – St. Paul, MN

Jared Banks, AIA

- **Architect, BIM Manager at SALA Architects - Minneapolis, MN 09/2007 – 02/2012**
- **BIM at SALA Architects**
  - In late 2007 we started consolidating to one platform (with exceptions)
  - Between 2007 and 2012 we did 200+ projects in a BIM platform
  - 10-15% of my time was related to BIM management.

- **ArchiCAD blogger, guru, consultant, TBD at Shoegnome, LLC 07/2010 – Current**
  - I started using ArchiCAD in 2006 and there was little talk of BIM.
  - For me it was about production. Do everything in 3D, connect more data, get better drawings, do things faster, reduce errors. More time for other things.

BIM at SALA Architects

Baby Steps

- **BIM** is not a plug-and-play solution. If you stop doing FlatCAD and just replace it with BIM, you'll either not really do BIM, not be profitable, or both. Switching to a BIM platform changes everything.

- **Start Slow.** First equal old production methods. Pretty drawings, good model, good visualizations, then what?

- **The Smart Architect**

BIM at SALA Architects

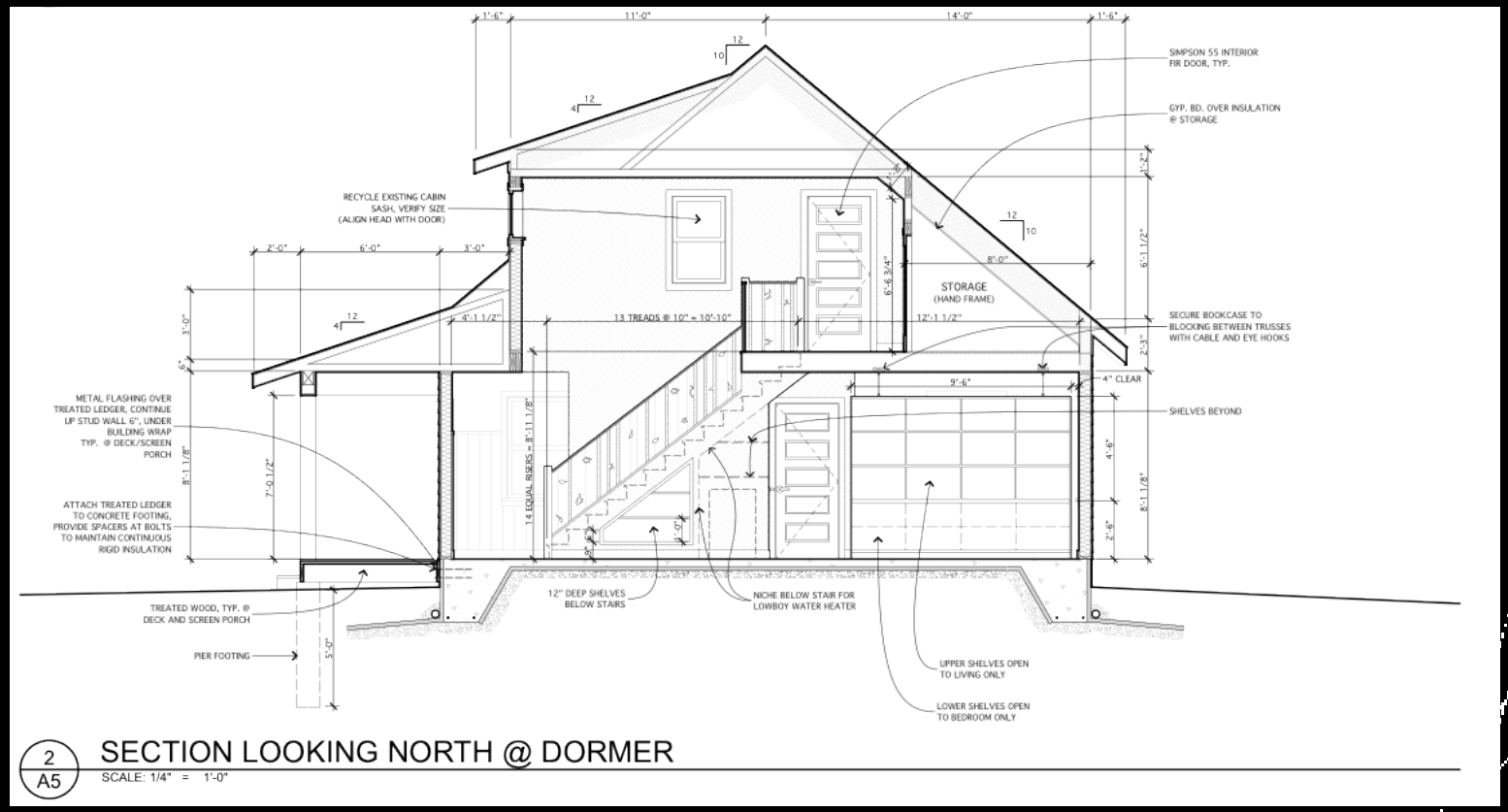
How Small is Too Small?

- **1120 sq ft Cabin plus another 450 sq ft for the screened porch**

BIM at SALA Architects

How Small is Too Small?

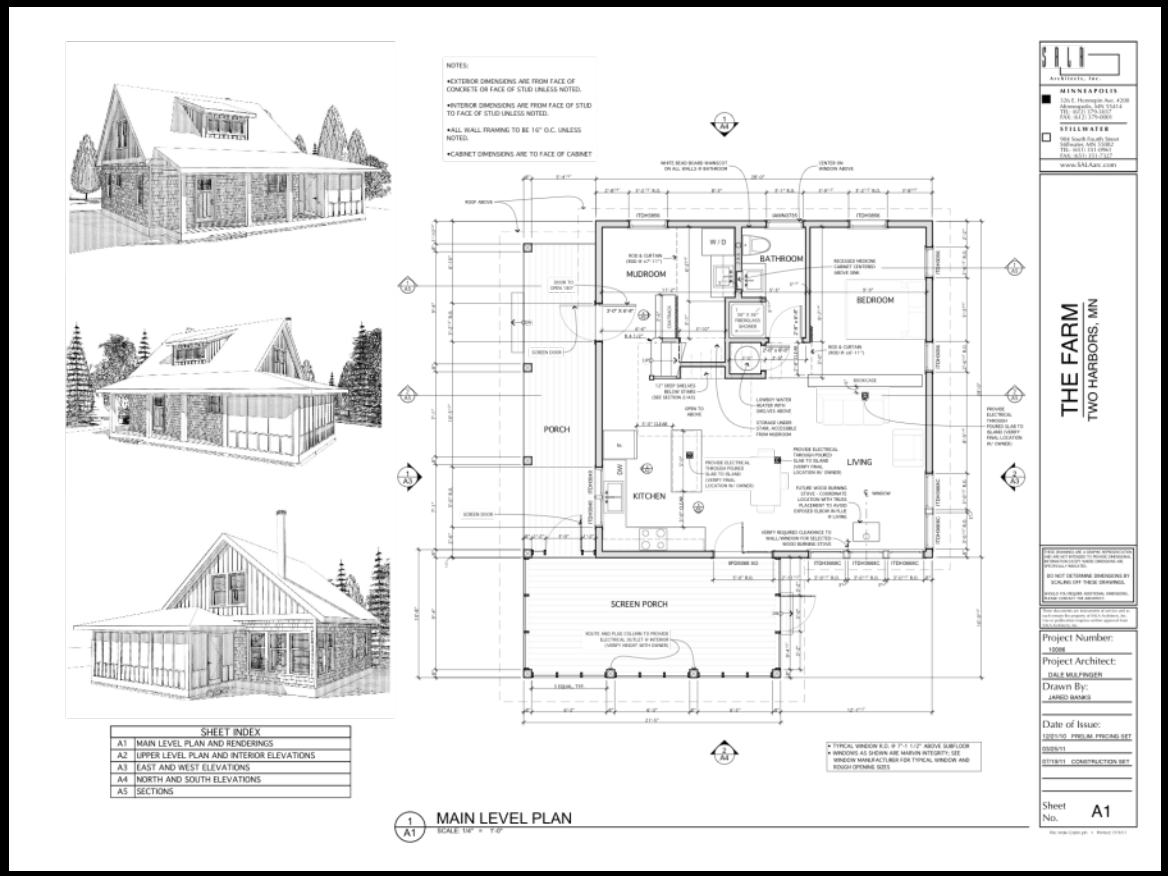
- ~$200,000 construction budget



BIM at SALA Architects

How Small is Too Small?

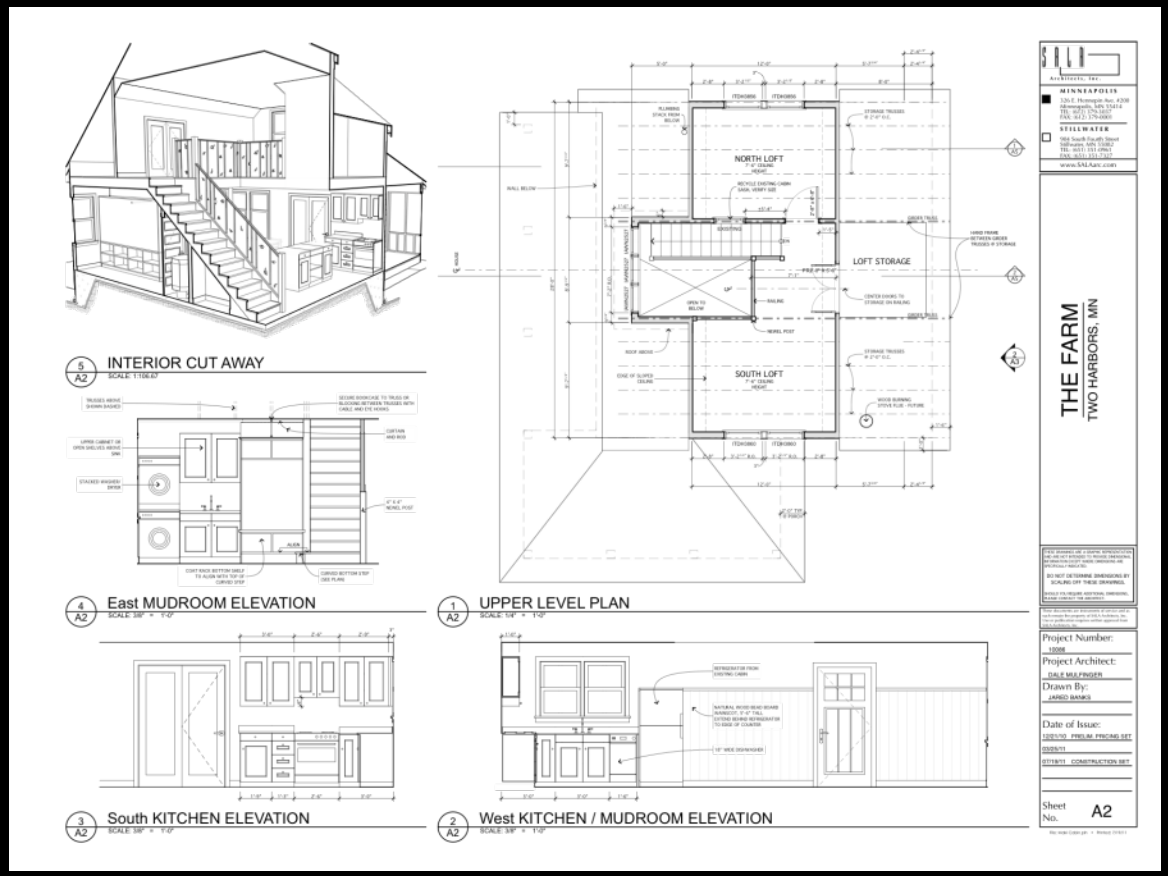
- **The construction documents were five 18 x 24 sheets**



BIM at SALA Architects

How Small is Too Small?

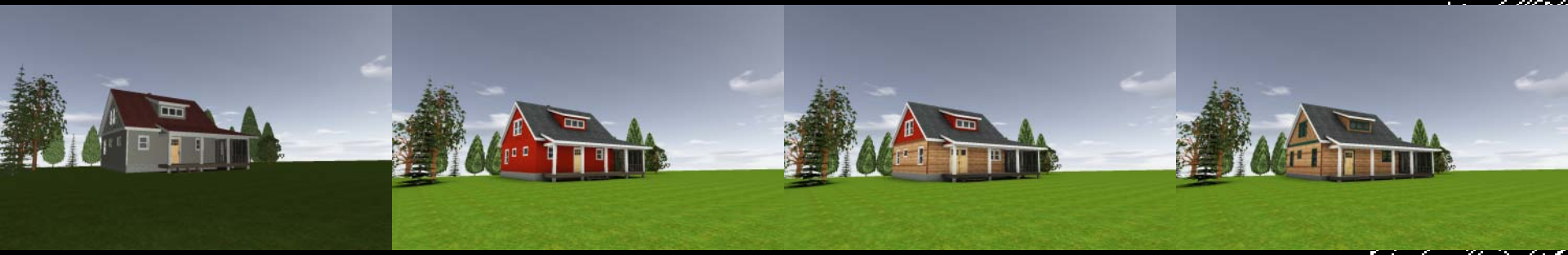
- **From first client meeting through CDs - 100 hrs**



BIM at SALA Architects

How Small is Too Small?

- Never met the Contractor
- No Construction Administration
- No Details
- No Spec
- No Engineering



BIM at SALA Architects

How Small is Too Small?

- **When you work hourly and a project takes half the time it used too… it's rethink your business plan.**

BIM at SALA Architects

A little bigger

- **5,300 sq ft house with a 1,600 sq ft attached garage**

BIM at SALA Architects

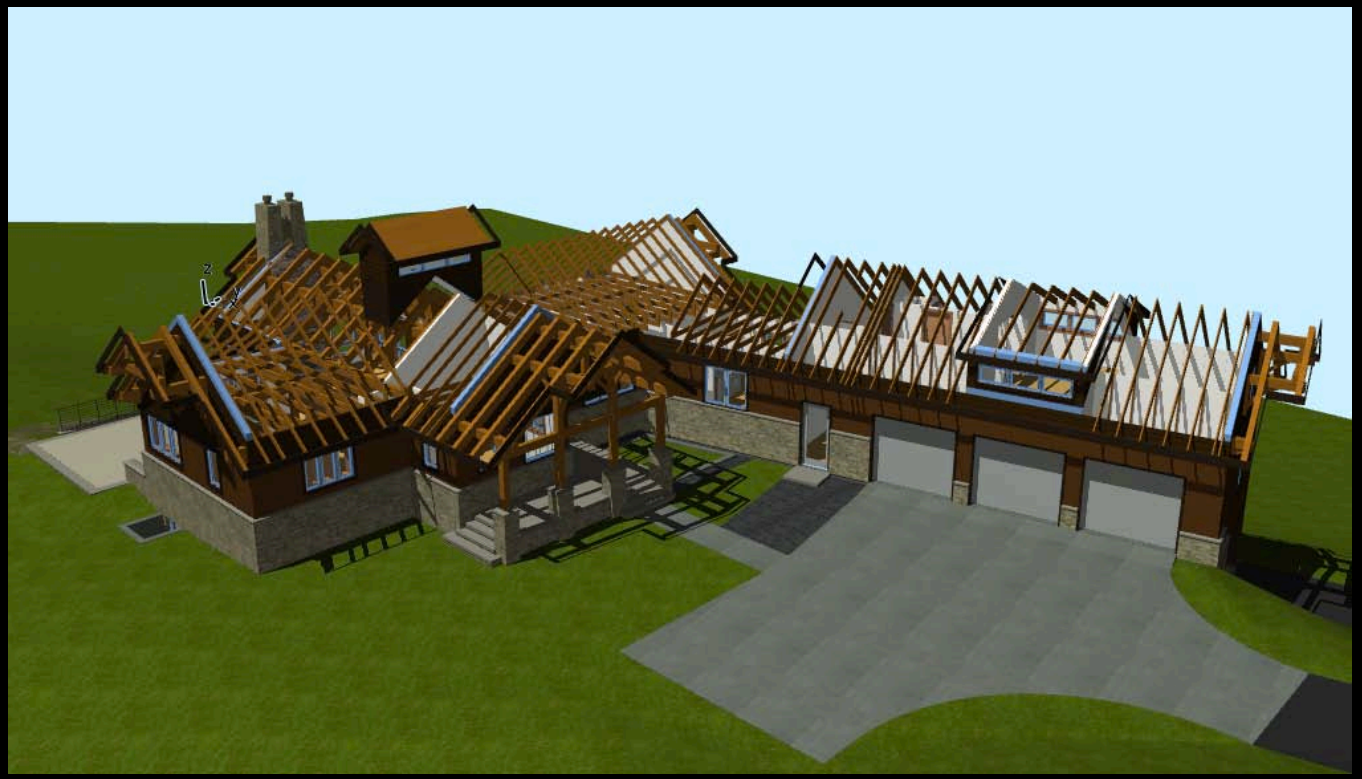
A little bigger

- **SD happened in SketchUp. DD and CD were done in ArchiCAD.**

BIM at SALA Architects

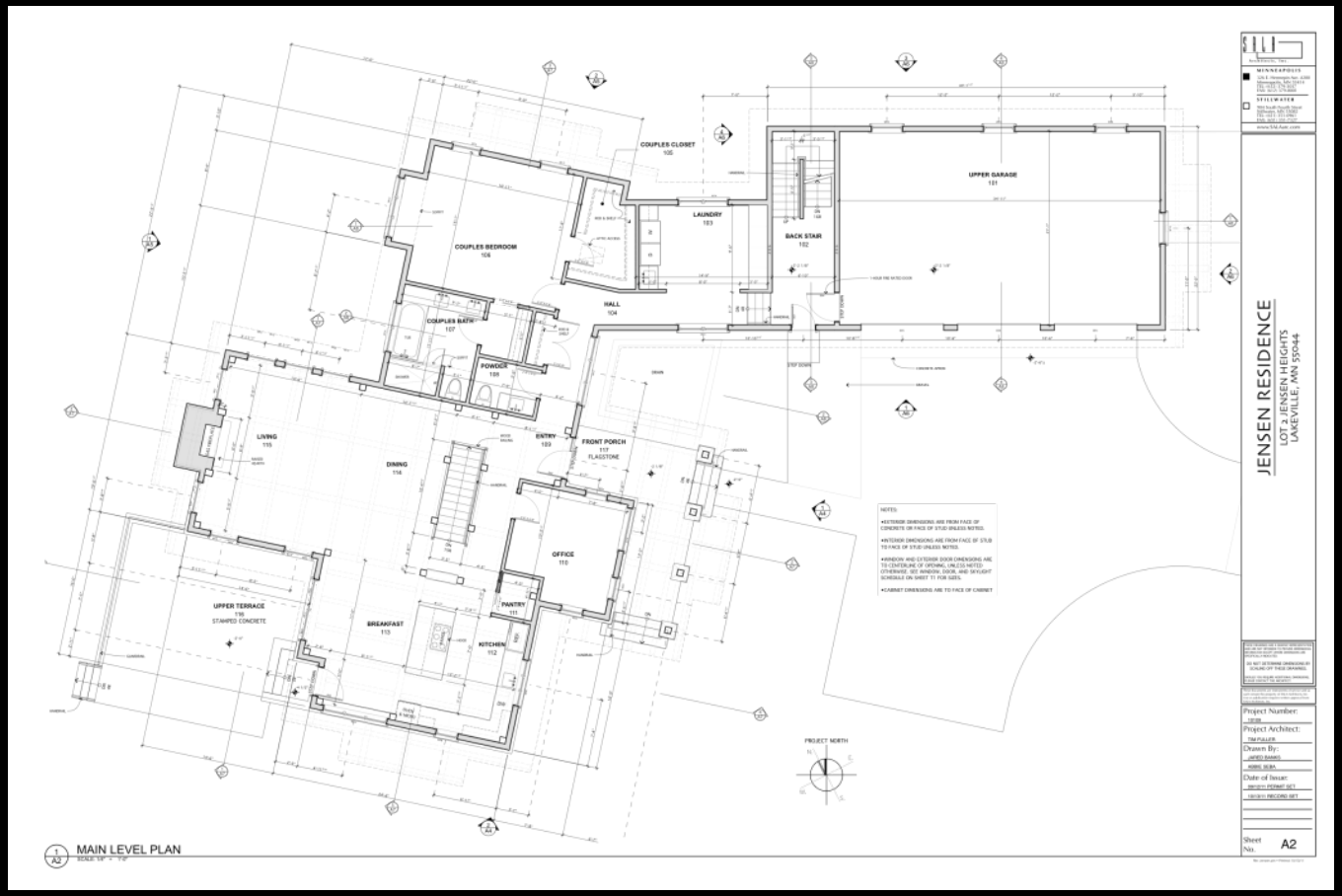
A little bigger

- **Model was built twice, translation happened by measuring the SketchUp model and exporting .dwgs. Not ideal.**



BIM at SALA Architects

A little bigger



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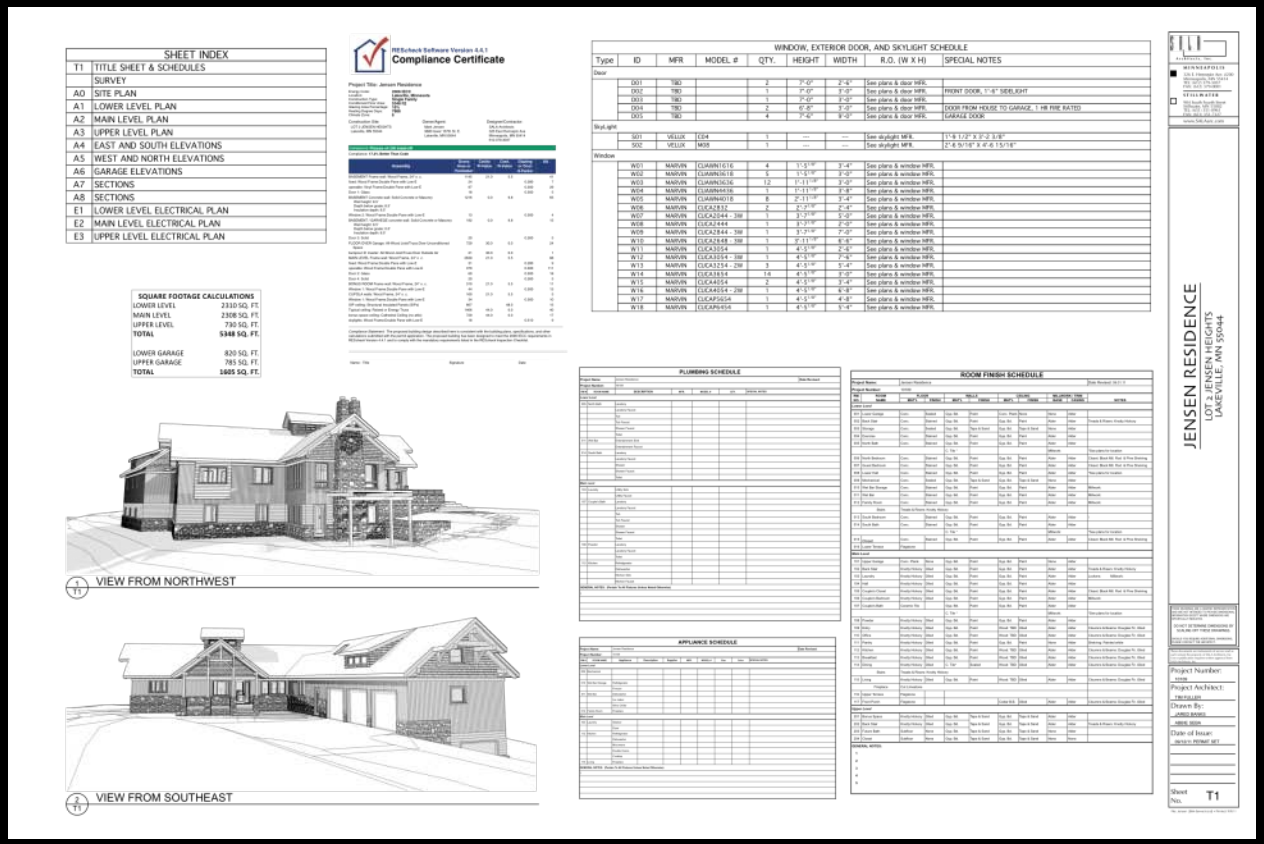
BIM at SALA Architects

A little bigger

BIM at SALA Architects

A little bigger

- **Window, Door, & Skylight schedules, room finish schedules**



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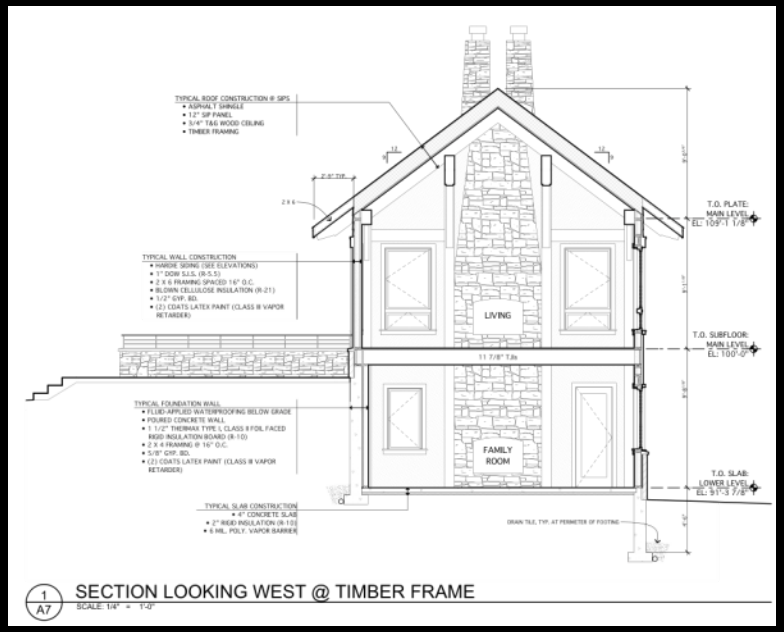
A little bigger

- **Flexible Team Size**
- **1 to 2 to 1 to 3 to 1**



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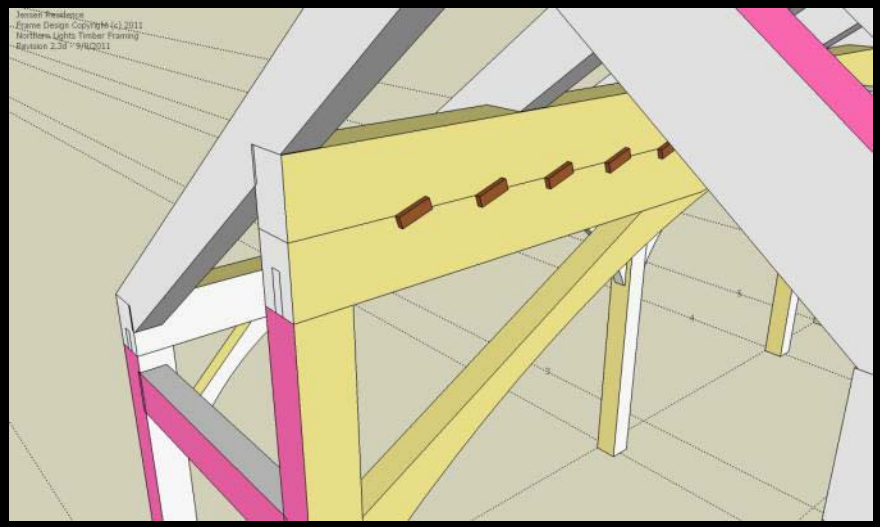
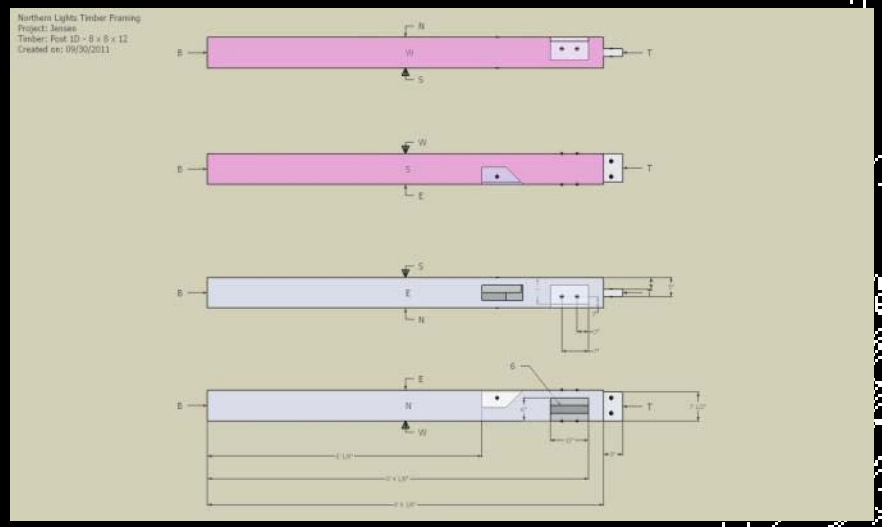
2 out of 3 ain't bad

- **Low-tech Structural Engineer, High-tech Timber Framer**





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An educational process pt. 1

- **Clients couldn't read drawings. Almost all communication was via model shots and in meeting walk-throughs.**

BIM at SALA Architects

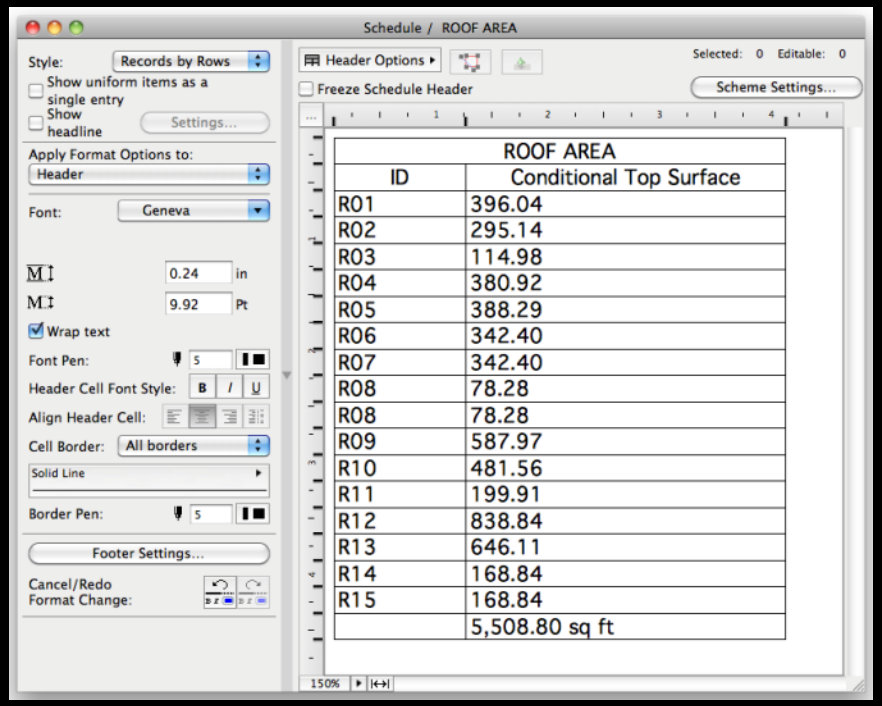
An educational process pt. 2

- **Did I mention the home owner was the GC?**

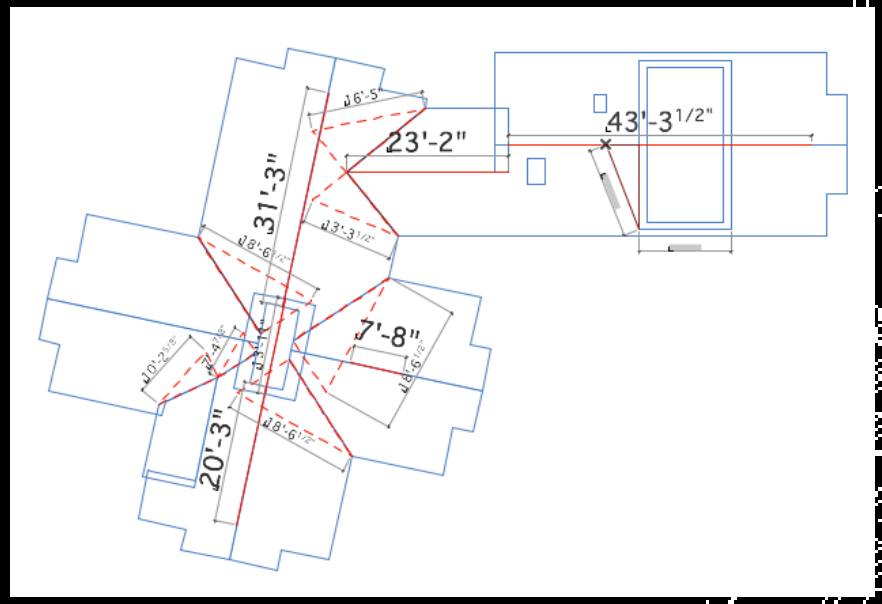
BIM at SALA Architects

Sure, we can do that.

- **Quantity take-offs. One part automatic, one part manual**



ROOF AREA	
ID	Conditional Top Surface
R01	396.04
R02	295.14
R03	114.98
R04	380.92
R05	388.29
R06	342.40
R07	342.40
R08	78.28
R08	78.28
R09	587.97
R10	481.56
R11	199.91
R12	838.84
R13	646.11
R14	168.84
R15	168.84
	5,508.80 sq ft



BIM at SALA Architects

The Sound of Doom, Reflections and What's Next

Shoegnome and Beyond

The Sound of Doom, Reflections and What's Next

- ***"A man ain't nothin' but a man, but if you bring that steam drill round, I'll beat it fair and honest. I'll die with my hammer in my hand, but I'll be laughing, because you can't replace a steel drivin' man."*** **- Johnny Cash**

- **But you can replace the hammer; just remember…**

- ***"You're the boss of the machine"*** **- Julia Child, "Baking with Julia"**

Shoegnome and Beyond

The Sound of Doom, Reflections and What's Next

- **Support from Leadership.** The firm leaders that control the culture of the firm, regardless of their knowledge of the software used, are the biggest factor.

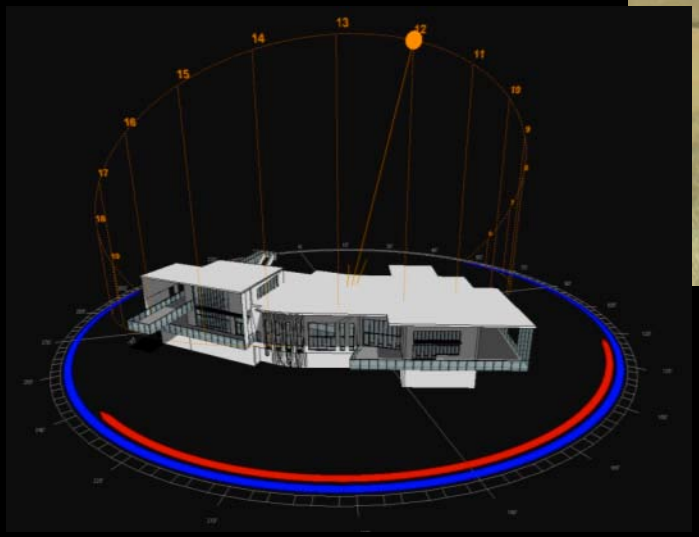
- **Training.** Training is important, but if there isn't a cultural shift within the firm, all the training in the world is useless.

- **People.** Find and keep a good team. Think about potential, not programs listed on a resume.

Shoegnome and Beyond

What's Next.

- **How small is too small? Wrong question.**



Brian Skripac, Assoc. AIA, LEED AP BD+C

DesignGroup – Columbus, OH

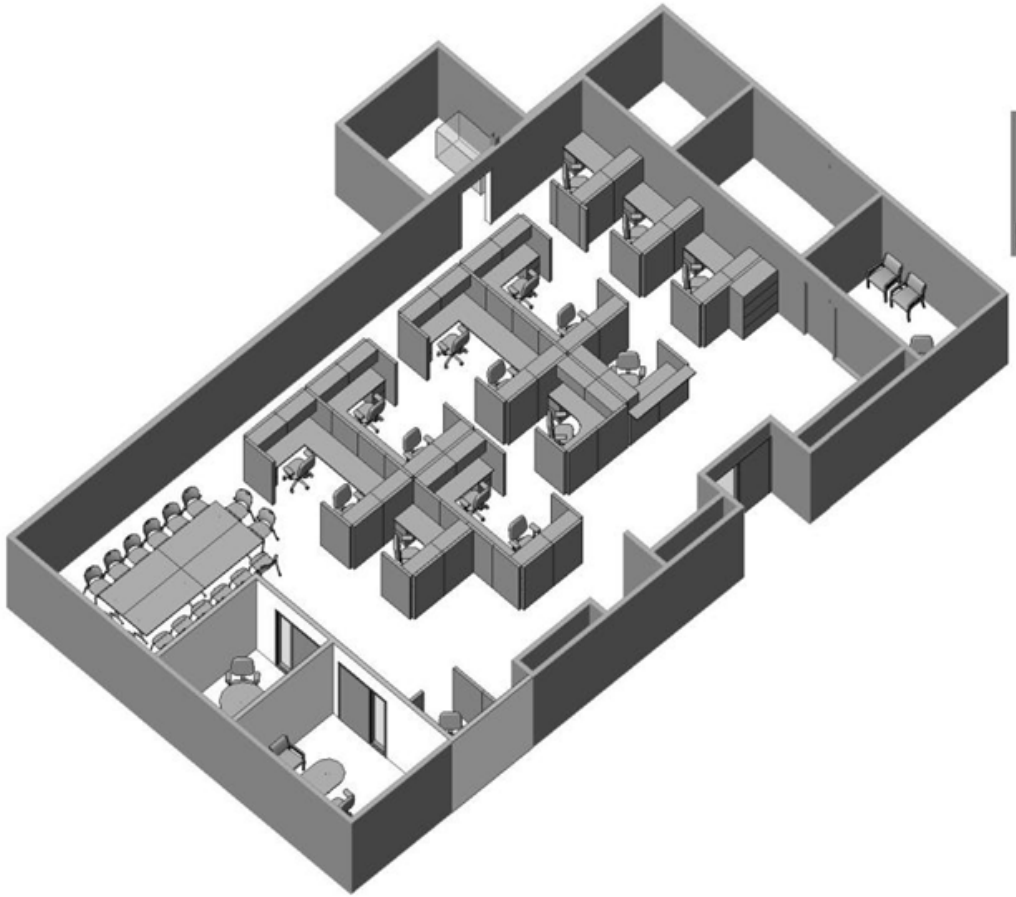
Brian Skripac, Assoc. AIA, LEED AP BD+C

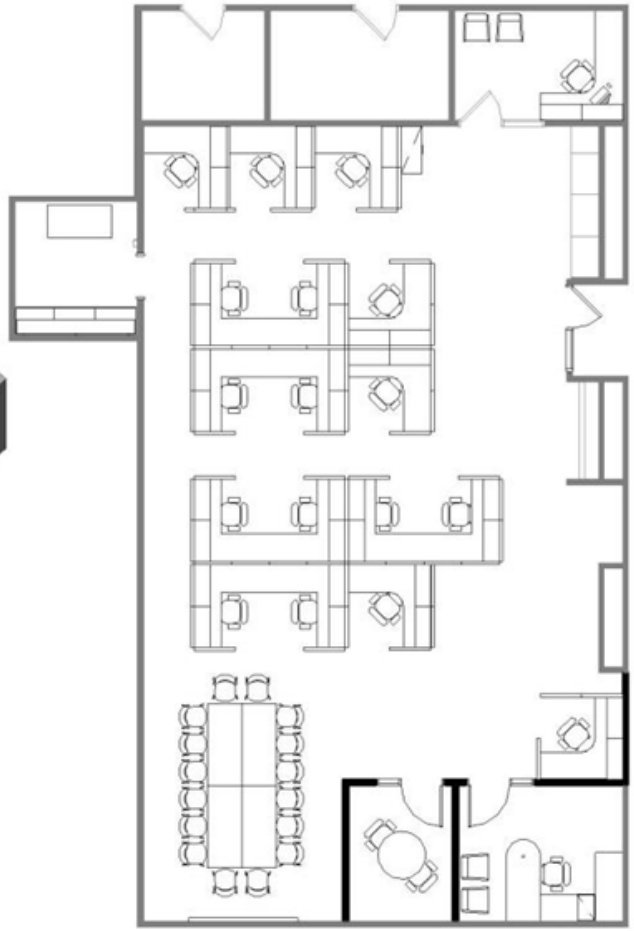
- **Director of BIM, DesignGroup – Columbus, Ohio**
- **40+ people**
- **37+ years in business with over 450 total clients served**
- **5 practice areas**

- **BIM at DesignGroup**
  - Merging Technology and Practice by Design
  - Adopted BIM in 2005
  - 100% BIM since January of 2009
  - Over 60 projects totaling 6,448,000 square feet
  - BIM Experience Award Winner in 2010

BIM at DesignGroup

BIM at DesignGroup



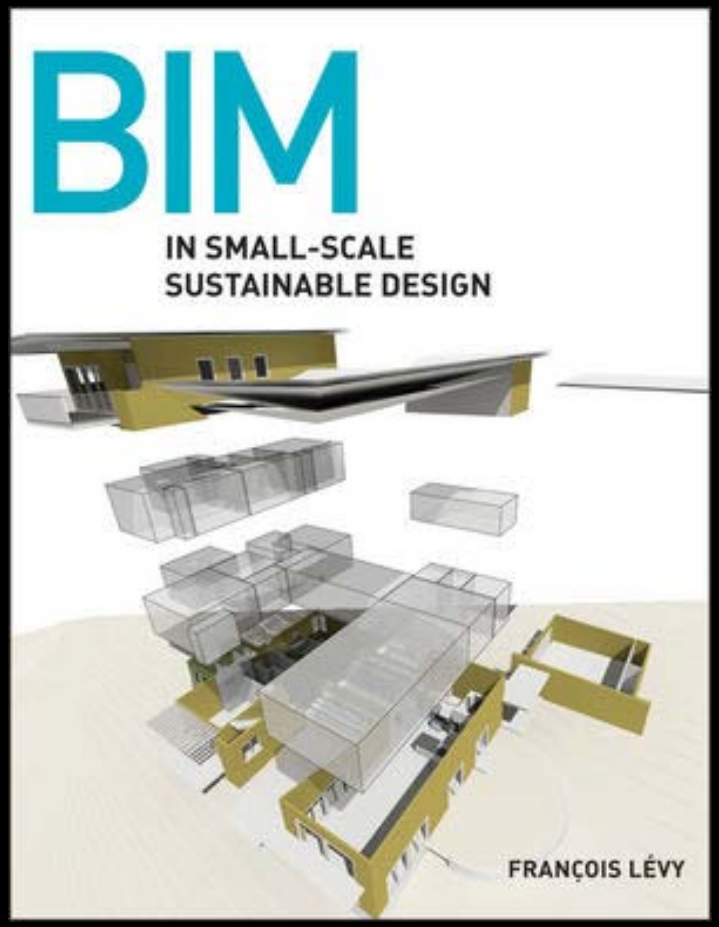


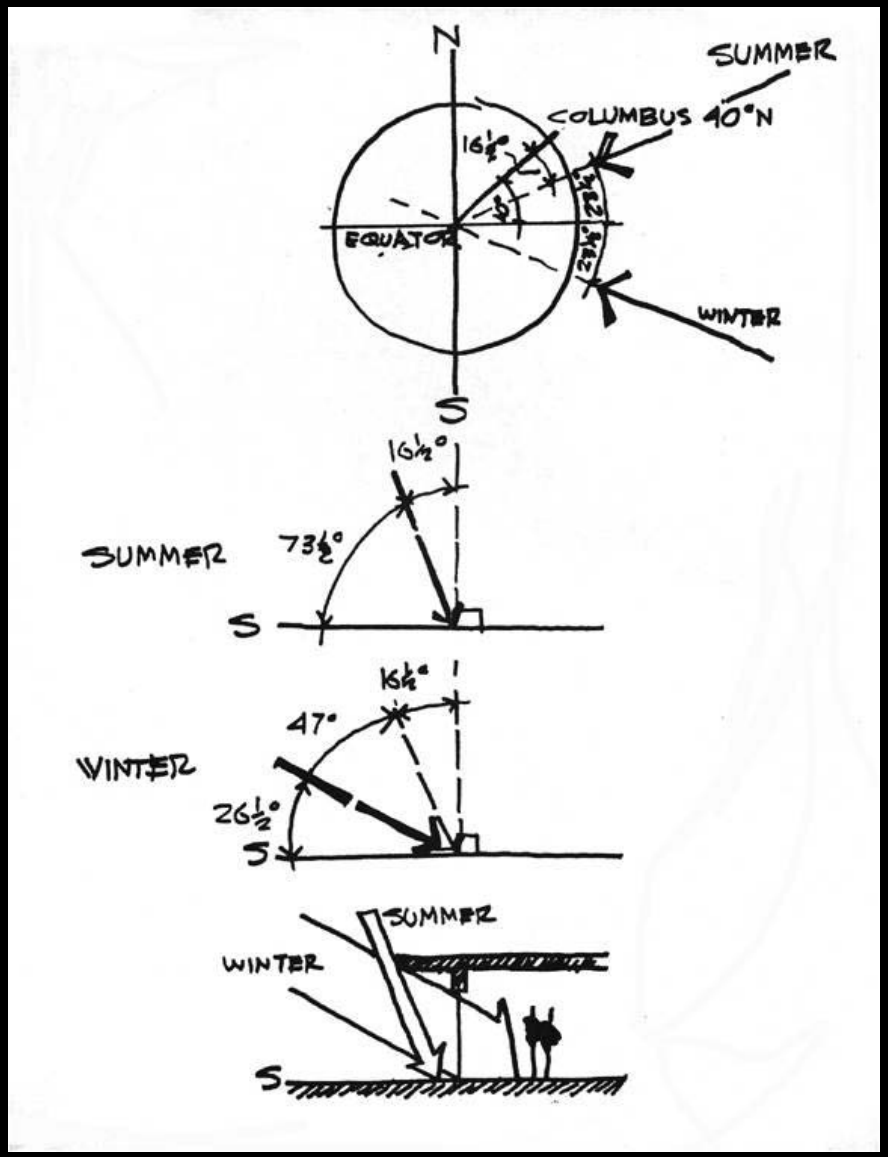
Project Overview

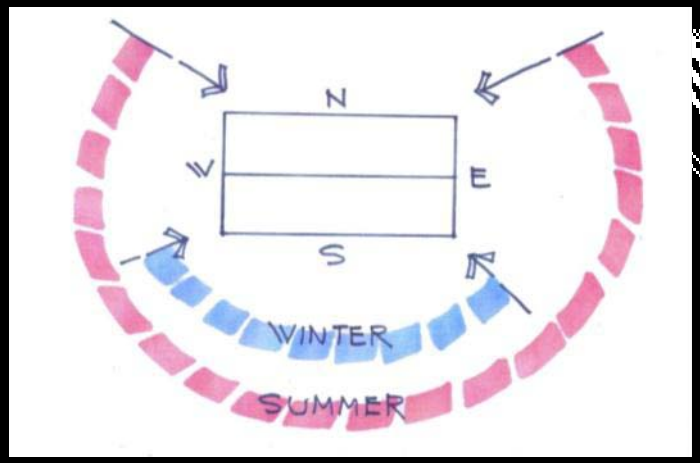
- **Battelle Darby Creek Metro Park Nature Center**
  - Client: Columbus and Franklin County Metro Park
  - Location: Columbus, OH
  - Project Size: 14,000 SF
  - Estimated Completion Date: Late 2012
  - Pursuing LEED Silver Certification

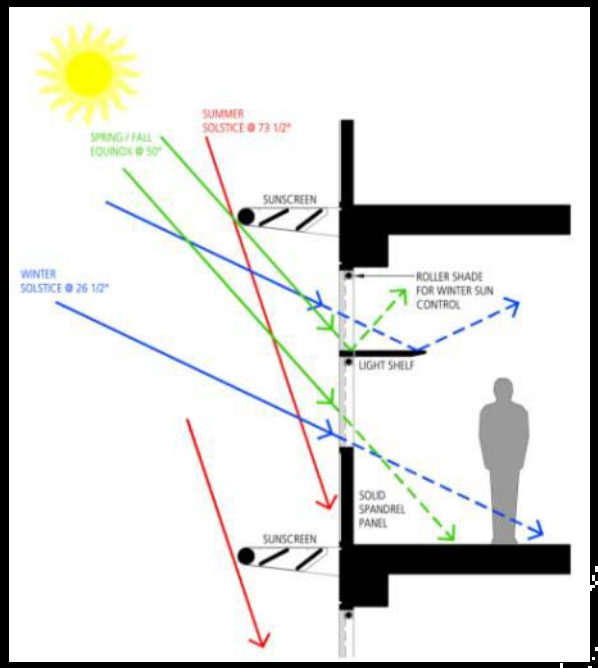
Published Case Study

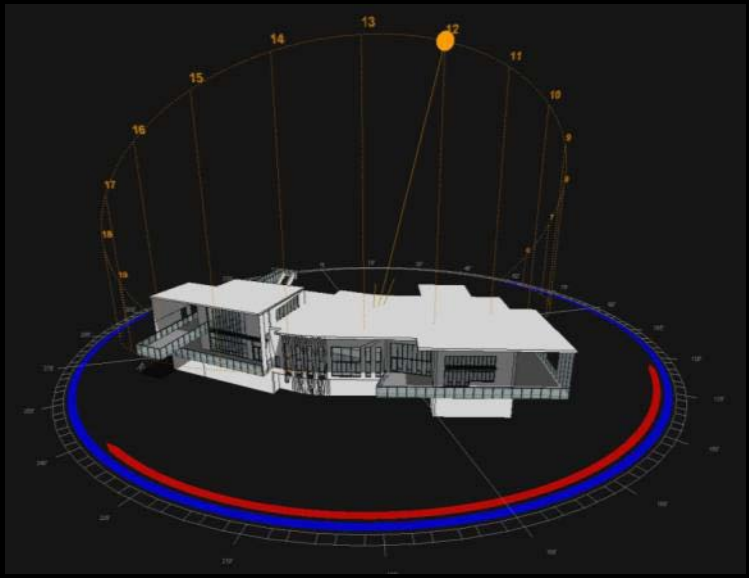
- **BIM in Small-Scale Sustainable Design by Francois Levy**
  - Chapter 6: Passive Cooling
  - Chapter 7: Passive Heating

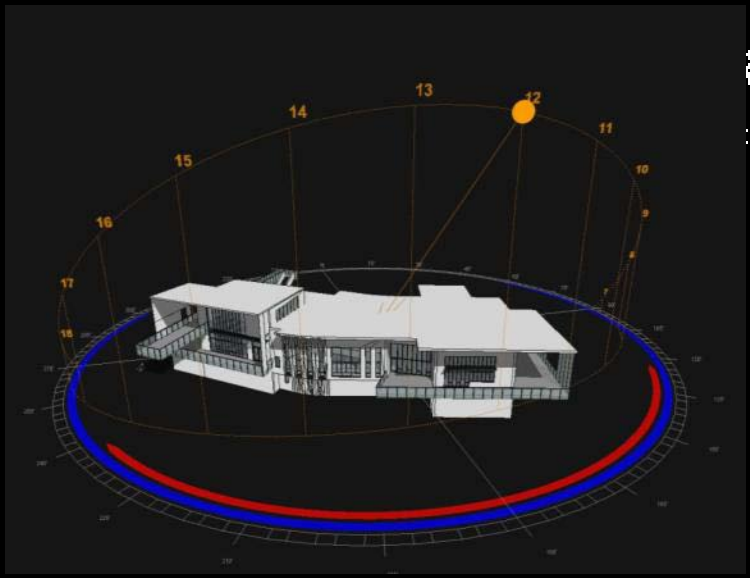


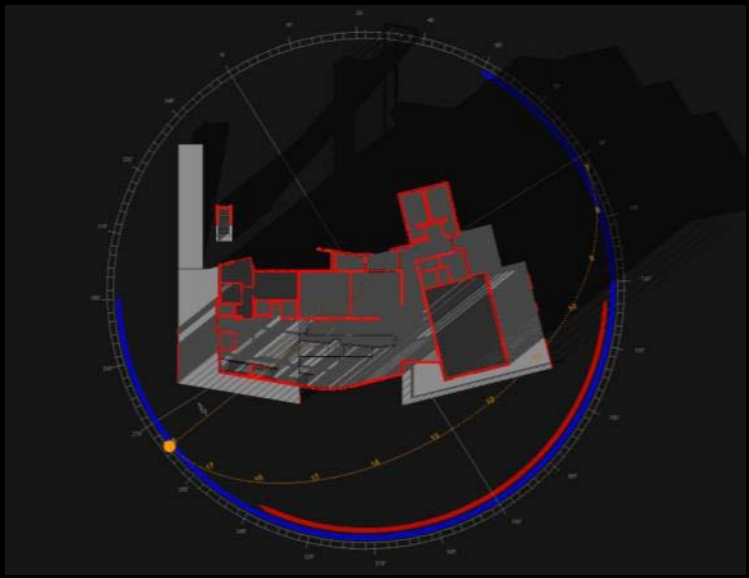

N
SUMMER
COLUMBUS 40°N
16½°
EQUATOR
23½°
WINTER
S
16½°
SUMMER
73½°
S
16½°
47°
WINTER
26½°
S
SUMMER
WINTER
S

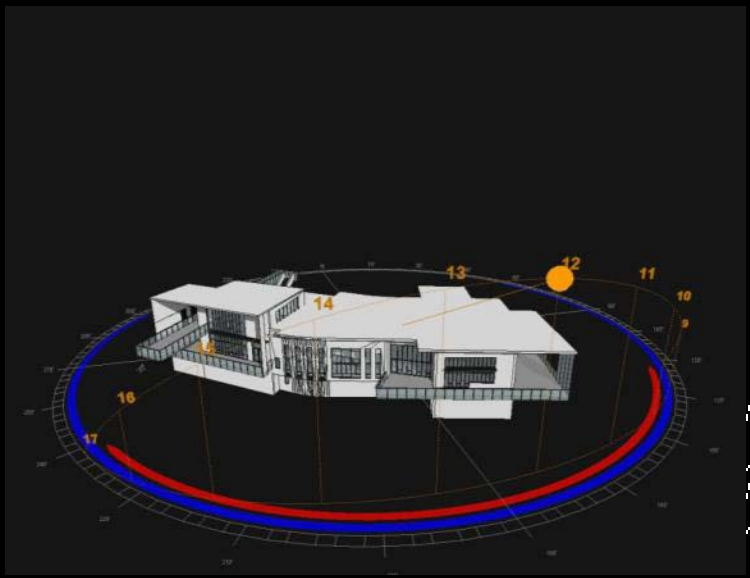

N
W
E
S
WINTER
SUMMER


SUMMER SOLSTICE @ 73 1/2°
SPRING / FALL EQUINOX @ 50°
SUNSCREEN
WINTER SOLSTICE @ 26 1/2°
ROLLER SHADE FOR WINTER SUN CONTROL
LIGHT SHELF
SOLID SPANDREL PANEL
SUNSCREEN









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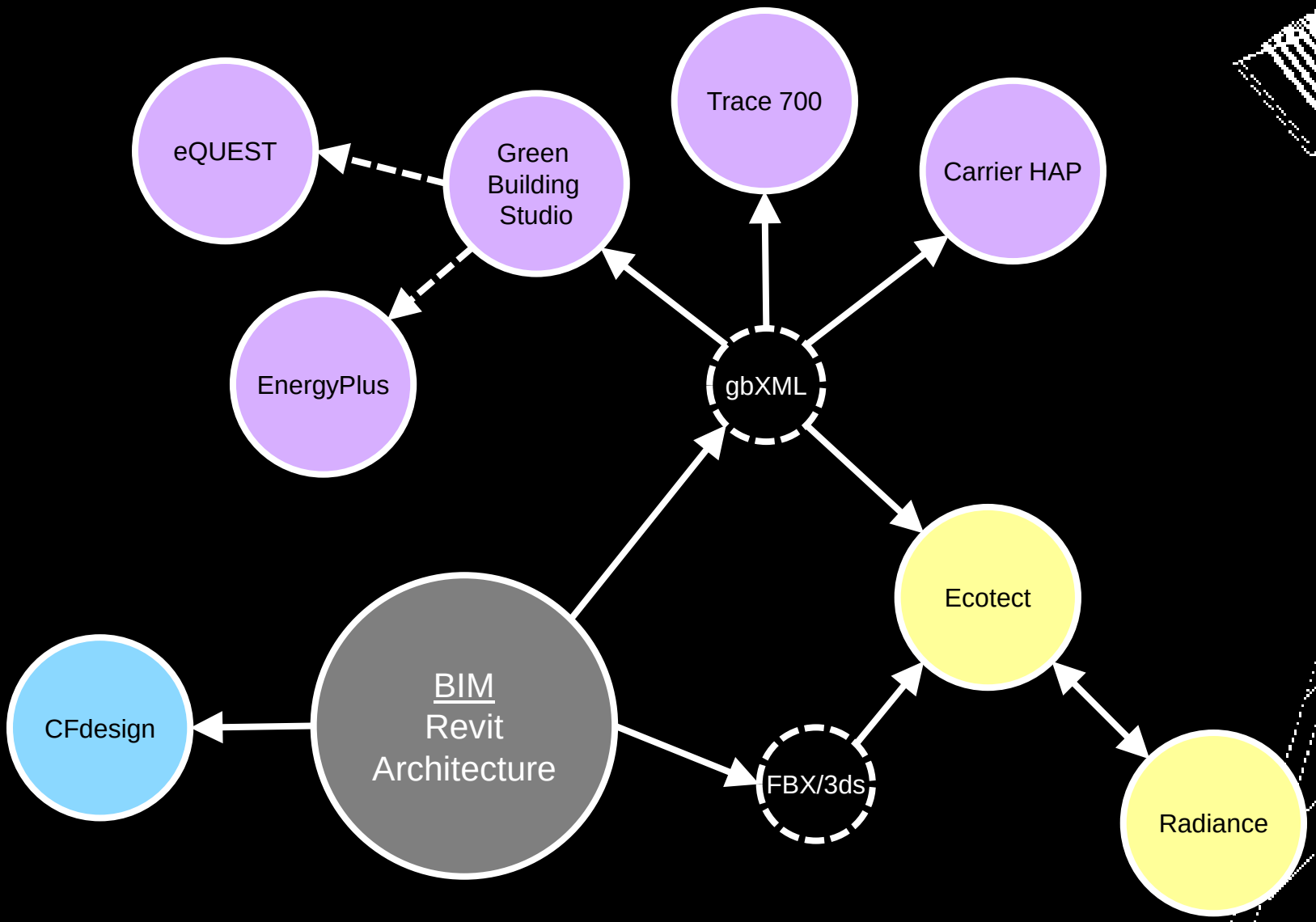
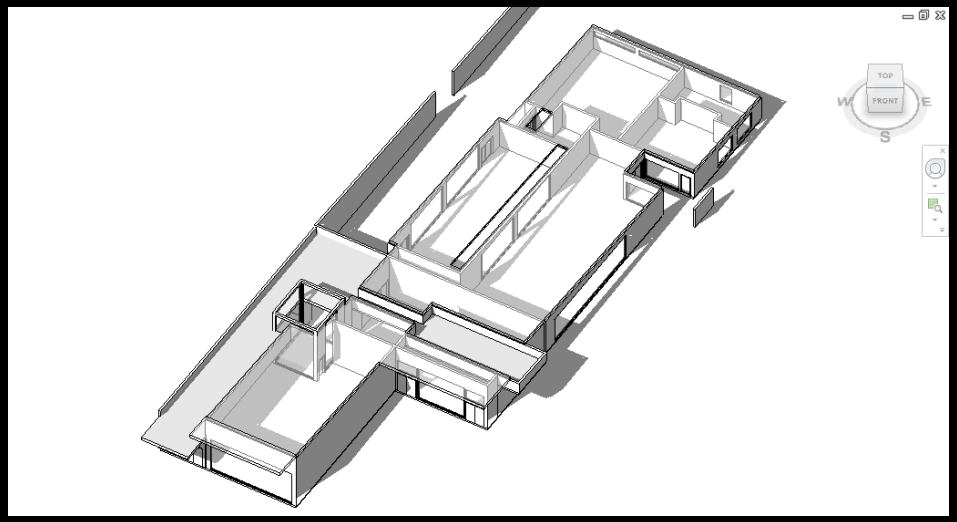

eQUEST
Green Building Studio
Trace 700
Carrier HAP
EnergyPlus
gbXML
Ecotect
CFdesign
BIM
Revit
Architecture
FBX/3ds
Radiance

Option A	
Exterior Wall Area	9,473 sf
Window Area	2,635 sf
Window to Wall Ratio (WWR)	28%

Option B	
Exterior Wall Area	8,418 sf
Window Area	3,881 sf
Window to Wall Ratio (WWR)	46%


TOP
FRONT
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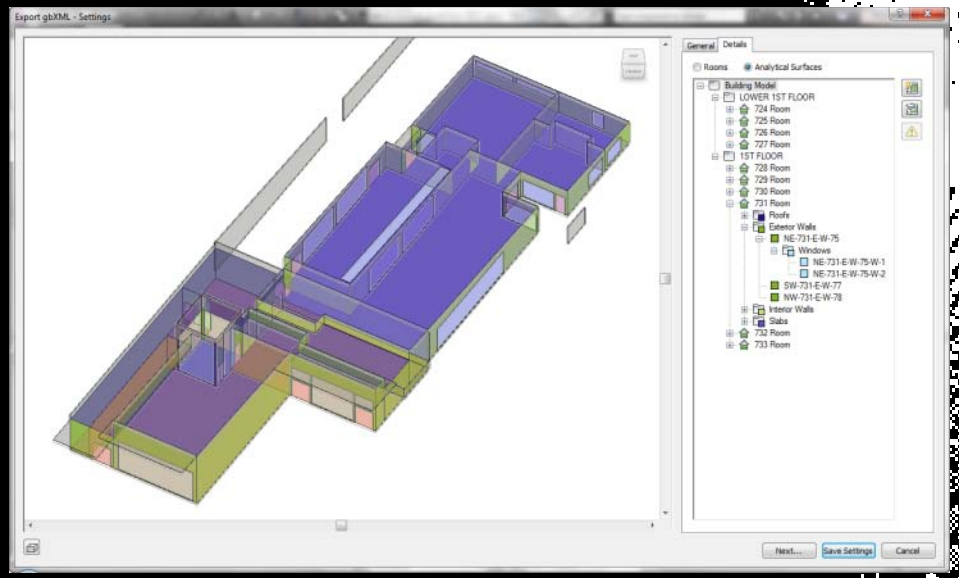
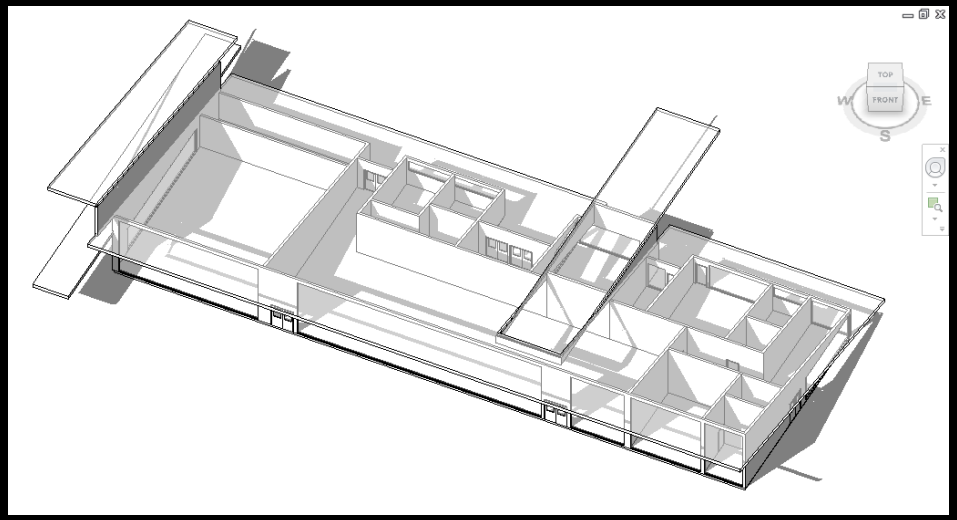

Export gbXML - Settings
General
Details
Rooms
Analytical Surfaces
Building Model
LOWER 1ST FLOOR
724 Room
725 Room
726 Room
727 Room
1ST FLOOR
728 Room
729 Room
730 Room
731 Room
Roofs
Exterior Walls
NE-731-E-W-75
Windows
NE-731-E-W-75-W-1
NE-731-E-W-75-W-2
SW-731-E-W-77
NW-731-E-W-78
Interior Walls
Slabs
732 Room
733 Room
Next...
Save Settings
Cancel


TOP
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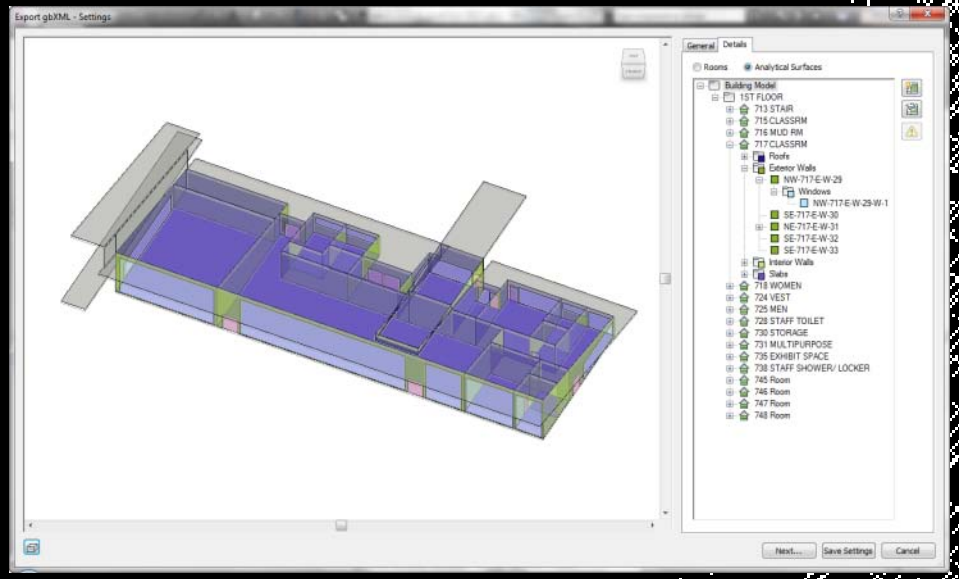
Export gbXML - Settings
General
Details
Rooms
Analytical Surfaces
Building Model
1ST FLOOR
713 STAIR
715 CLASSRM
716 MUD RM
717 CLASSRM
Roofs
Exterior Walls
NW-717-E-W-29
Windows
NW-717-E-W-29-W-1
SE-717-E-W-30
NE-717-E-W-31
SE-717-E-W-32
SE-717-E-W-33
Interior Walls
Slabs
718 WOMEN
724 VEST
725 MEN
728 STAFF TOILET
730 STORAGE
731 MULTIPURPOSE
735 EXHIBIT SPACE
738 STAFF SHOWER/ LOCKER
745 Room
746 Room
747 Room
748 Room
Next...
Save Settings
Cancel

Autodesk Green Building Studio

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My Projects | Dashboards | My Profile | My Account

Welcome, Brian!

My Projects > **Batelle Darby Creek Environmental Center**

Back to Project Runs

Project Runs | Project Defaults | Project Details | Project Members

Notes

Run Name: Yanitza_2.xml

Energy and Carbon Results | US EPA Energy Star | Water Usage | Photovoltaic Analysis | LEED Daylight | Weather | 3D VRML View | Export and Download Data Files | Design Alternatives

General Information

Project Title: Batelle Darby Creek Environmental Center
Template Title: Batelle Darby Creek Environmental Center_default (Last updated on: 10/4/2010 12:38:00 PM)
Run Title: Yanitza_2.xml
Building Type: SchoolOrUniversity
Floor Area: 9,716 ft²

Estimated Energy & Cost Summary

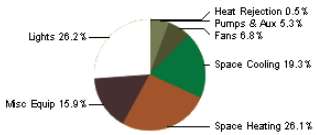
Annual Energy Cost		$19,972
Lifecycle* Cost		$272,023
Annual CO_2 Emissions		
	Electric†	156.4 tons
	Onsite Fuel	6.5 tons
	Large SUV Equivalent	14.8 Large SUV's
Annual Energy		
	Electric	197,523 kWh
	Fuel	1,117 Therms
Annual Peak Electric Demand		188.2 kW
Lifecycle* Energy		
	Electric	5,925,681 kWh
	Fuel	33,511 Therms

* 30 -year life and 6.1 % discount rate for costs. † Does not include electric transmission losses or the renewable and natural ventilation potential.

Energy End-Use Charts

Click on chart for more or less detail.

Annual Electric End Use



Annual Fuel End Use

Location Information

Building: Galloway, OH 43119
Electric Cost: $0.09 / kWh
Fuel Cost: $1.26 / Therm
Weather: Columbus, OH (TMY2)

Demo: Energy and Carbon Results
Play (wmv file)

Carbon Neutral Potential[1] (CO_2 Emissions)

Base Run:	162.9 tons
Onsite Renewable Potential:	-195.9 tons
Natural Ventilation Potential:	-25.1 tons
Onsite Fuel Offset/Biofuel Use:	-6.5 tons
Net CO_2 Emissions:	-64.7 tons
Large SUV Equivalent:	-5.9 Large SUV's

1. Carbon neutrality is defined here as eliminating or offsetting fossil based electricity and fuel use. For example, if the electricity grid is 60% fossil fuel and 40% hydroelectric, reducing grid electricity use by 60% and eliminating/offsetting on-site fuel use will make the project carbon neutral. Use any combination of efficiency, natural ventilation, renewable energy, carbon credits and biofuels to reach this goal. Renewable potential is the sum of photovoltaic and wind potential shown below.

Electric Power Plant Sources[2]

Fossil:	76%
Nuclear:	23%
Hydroelectric:	1%
Renewable:	0%
Other:	0%

2. Based on US EPA EGRID 2006 Data (2004 Plant Level Data).

Water Usage and Cost[3]

Total:	714,534 Gal/yr	$4,096 / yr
Indoor:	697,434 Gal/yr	$4,051 / yr
Outdoor:	17,100 Gal/yr	$44 / yr

3. Based on AWWA Research Foundation 2000 Residential / Commercial and Institutional End Uses of Water.

Photovoltaic Potential[4]

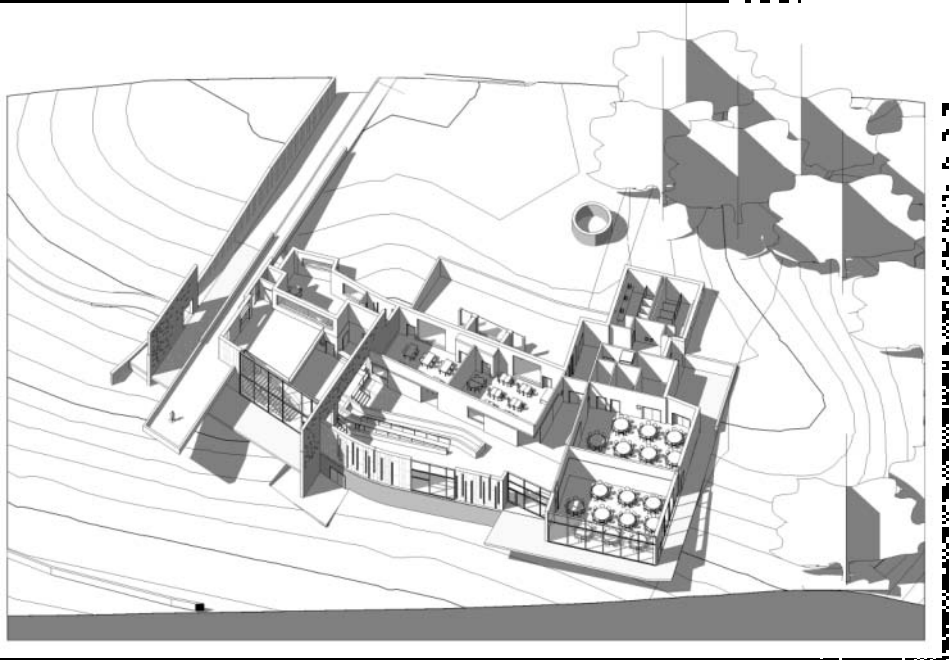
Annual Energy Savings:	186,683 kWh
Total Installed Panel Cost:	$1,069,271 / yr
Nominal Rated Power:	134 kW
Total Panel Area:	10,396 ft²
Maximum Payback Period:	40 yrs @ $0.09 / kWh

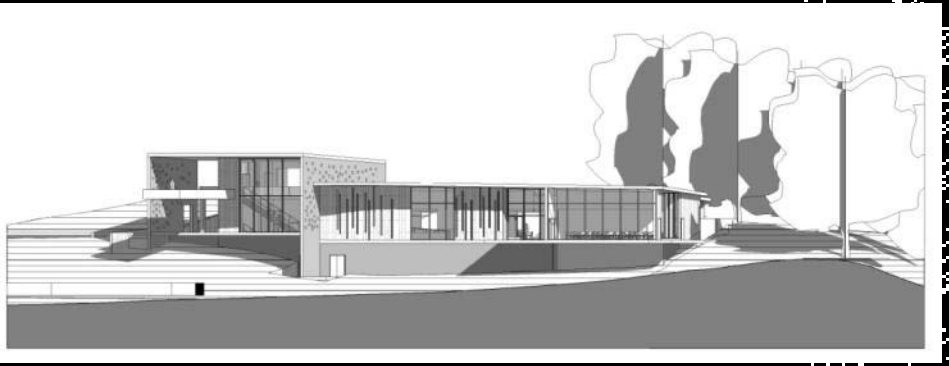
4. Results based on all exterior surfaces being analyzed. Escalation rate of 2% applied to electric rate. Payback calculation does not include federal or state incentives, loan information, or tax breaks.

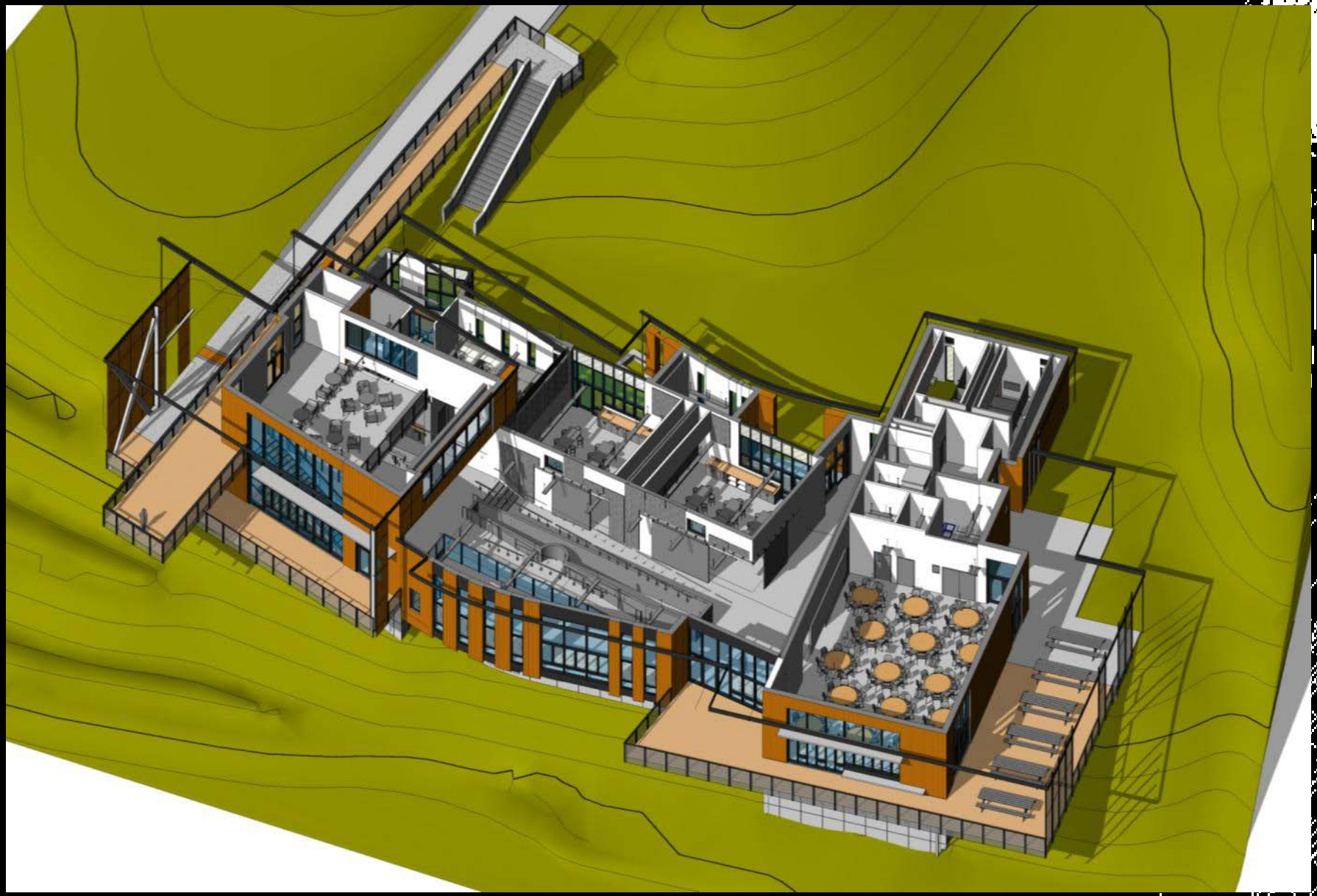
LEED Daylight[5]

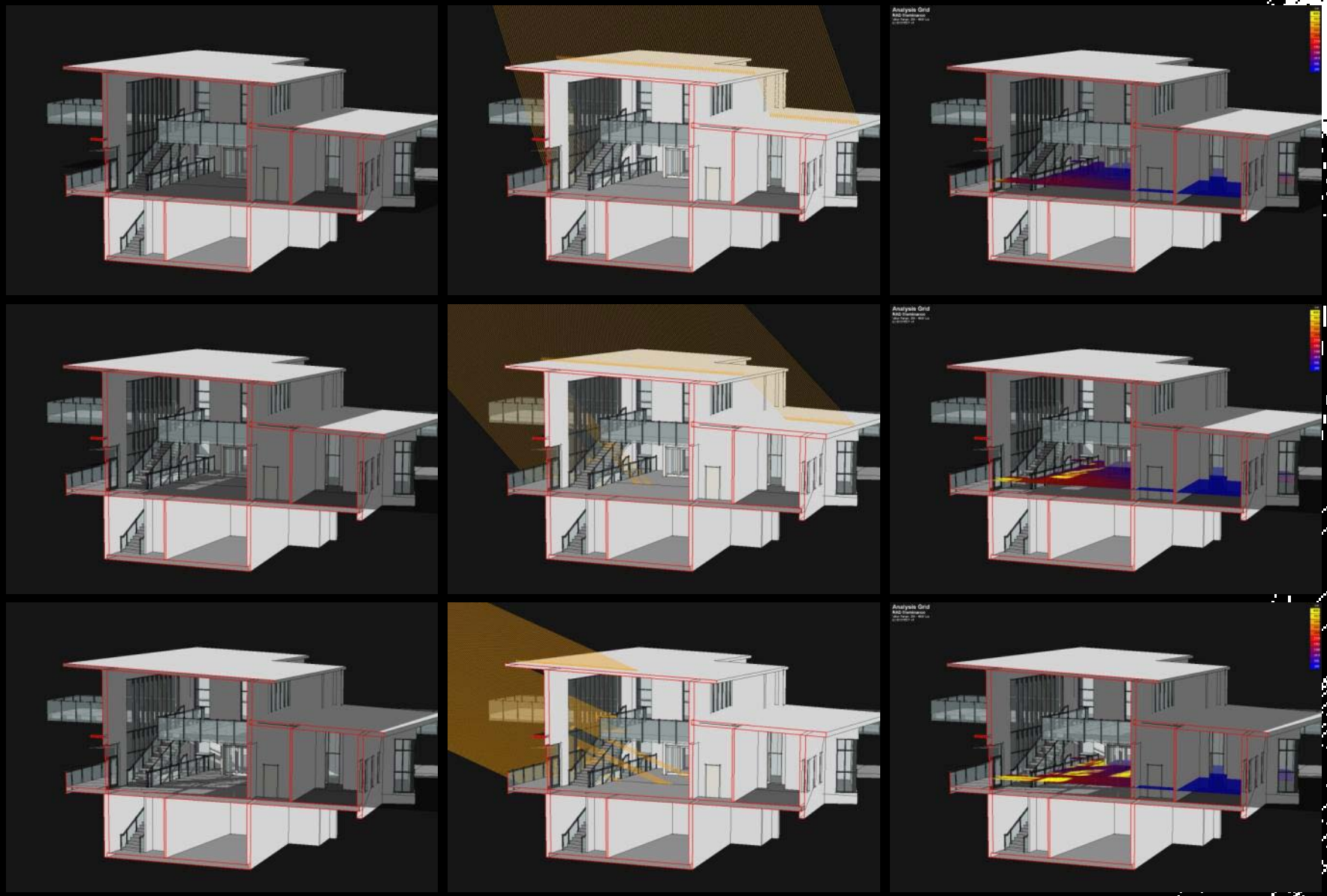
Area w/ Glazing Factor > 2%:	0.0% - No LEED Credit

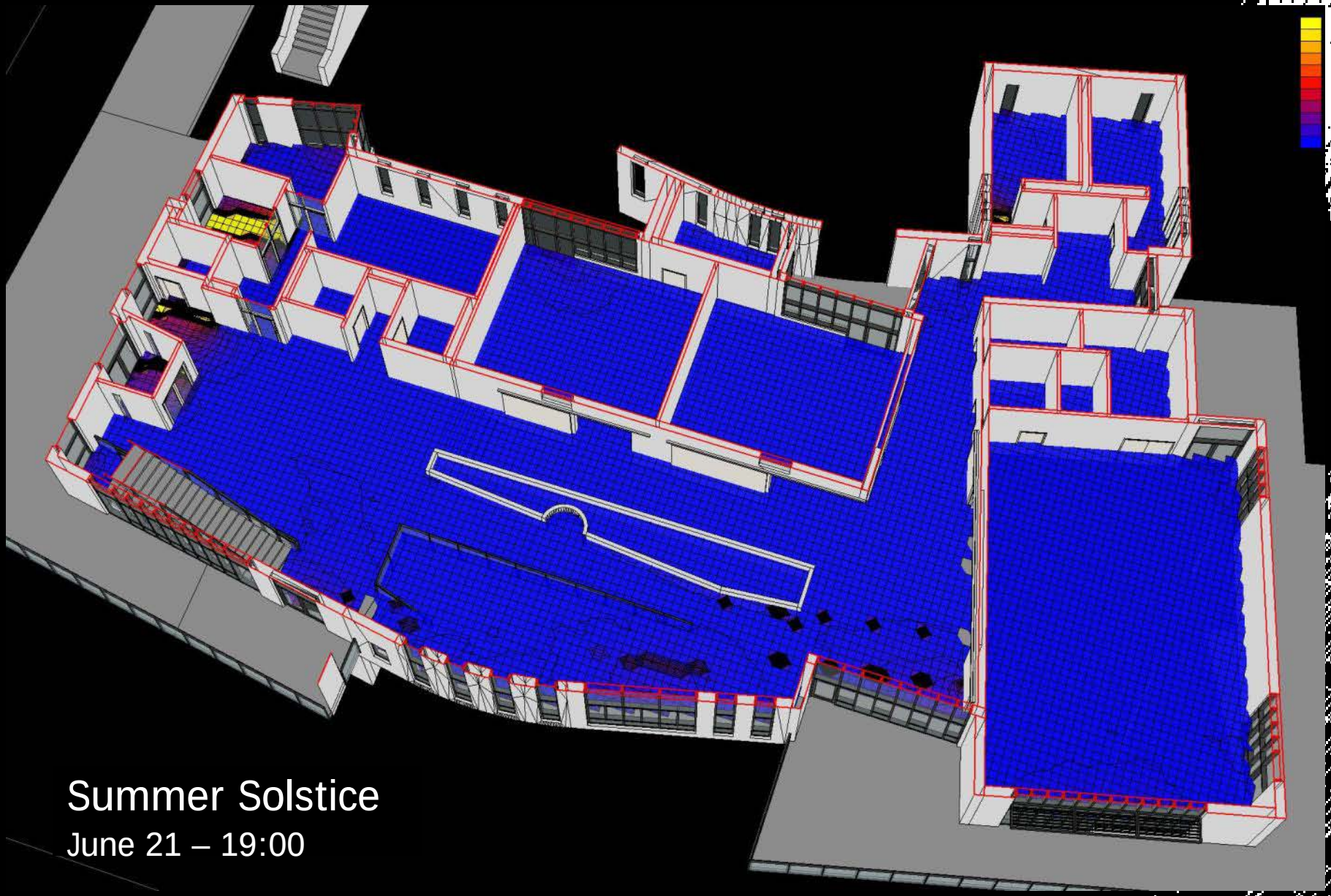
Final Schematic Design	
Exterior Wall Area	7,698 sf
Window Area	3,406 sf
Window to Wall Ratio (WWR)	44%








Analysis Grid
Analysis Grid
Analysis Grid



Summer Solstice

June 21 – 19:00

Autodesk Revit Architecture 2011 - [1035_skripbr.rvt - Sheet: LEED 8.1 - LEED Daylight Credit]

Area Plan (8.1 Daylight_Occupiable Space): LOWER 1ST FLOOR - 1035_skripbr.rvt

Area Plan (8.1 Daylight_9 am Minimum 25 fc): LOWER 1ST FLOOR - 1035_skripbr.rvt

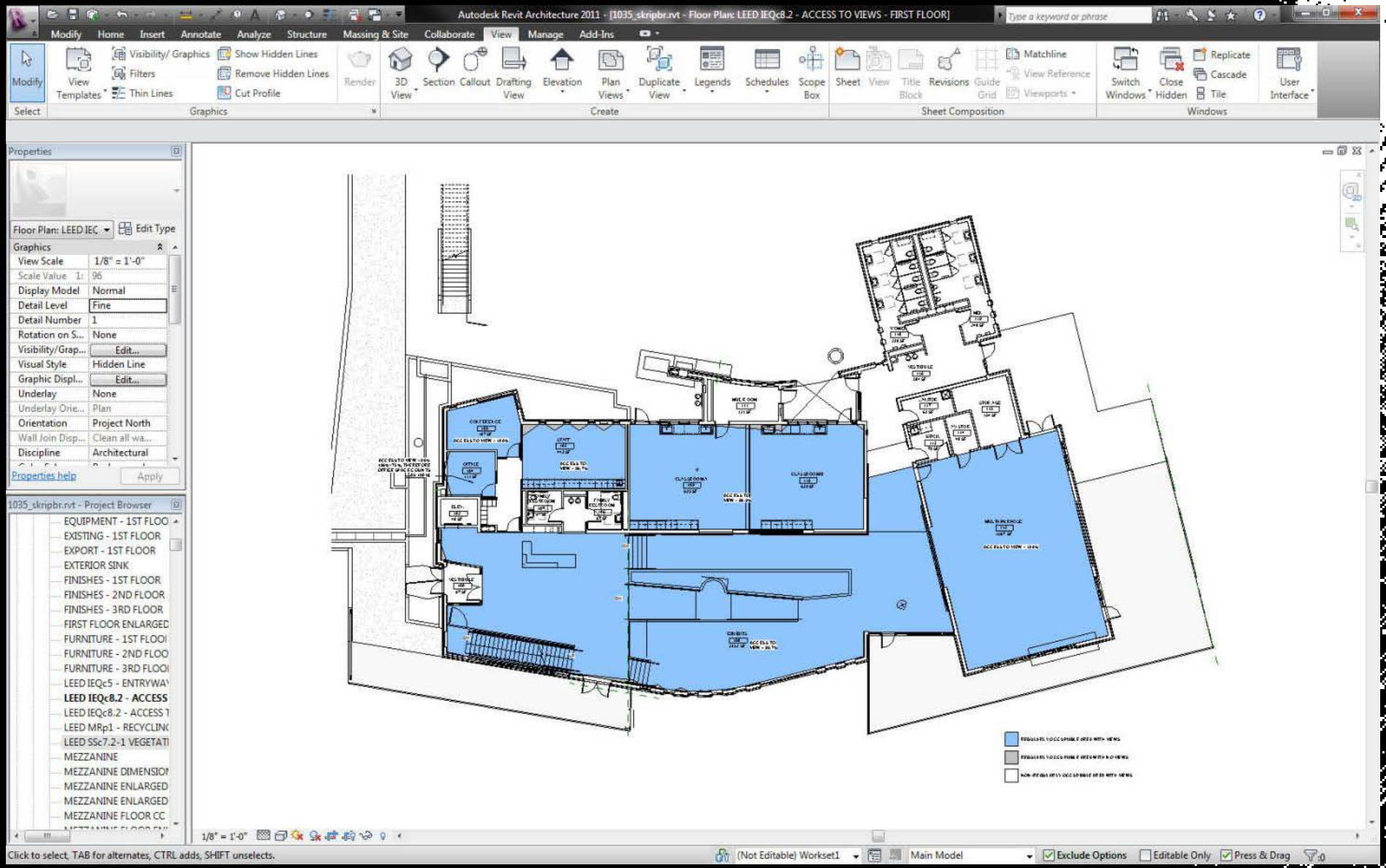
Sheet: LEED 8.1 - LEED Daylight Credit - 1035_skripbr.rvt

LEED EQc8.1 Daylight_Regularly Occupied Space	7,058 SF
LEED EQc8.1 Daylight at 9 am_ Minimum 25 fc	5,533 SF
LEED EQc8.1 Daylight at 3 pm_ Minimum 25 fc	6,570 SF

5,533 SF / 7,058 SF = **79%**

6,570 SF / 7,058 SF = **93%**

Area Plan (8.1 Daylight_3 pm Minimum 25 fc): LOWER 1ST FLOOR - 1035_skripbr.rvt



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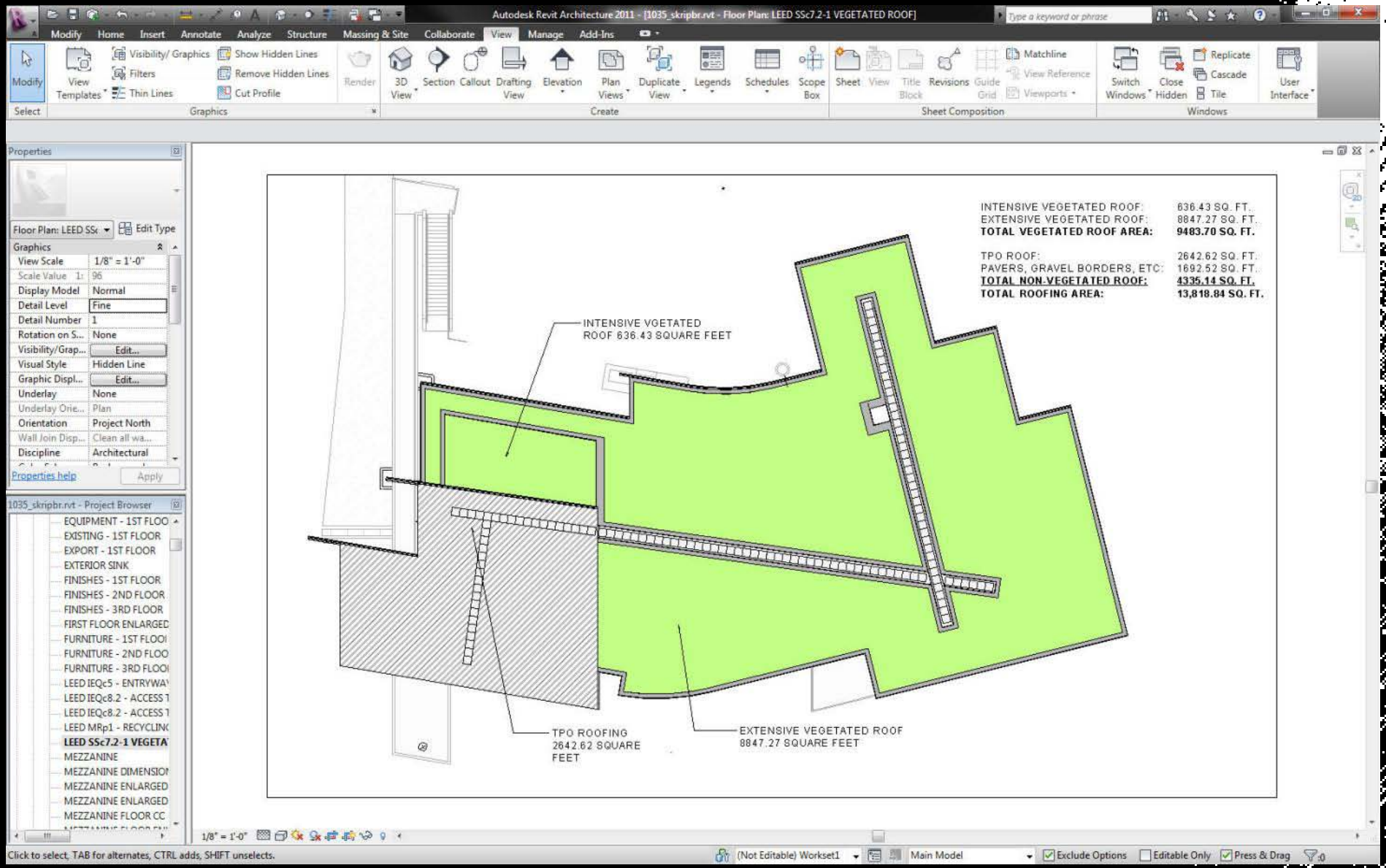

Technology in Architectural Practice
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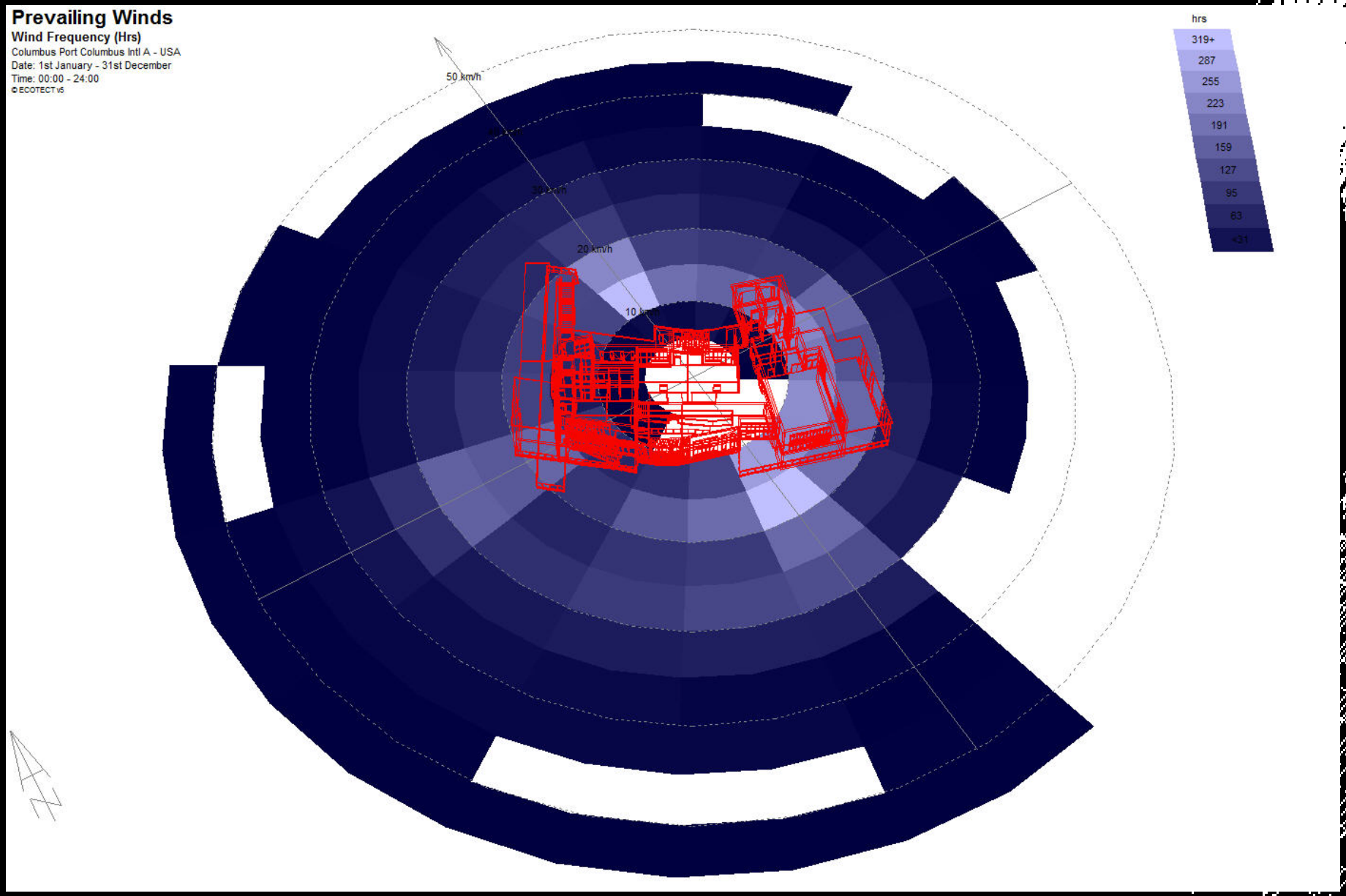

Prevailing Winds
Wind Frequency (Hrs)
Columbus Port Columbus Intl A - USA
Date: 1st January - 31st December
Time: 00:00 - 24:00
© ECOTECT v5
50 km/h
40 km/h
30 km/h
20 km/h
10 km/h
hrs
319+
287
255
223
191
159
127
95
63
<31

Autodesk Revit Architecture 2011 - [1035_skripbr.rvt - Schedule: Operable Curtain Panel Schedule]

Modify | Home | Insert | Annotate | Analyze | Structure | Massing & Site | Collaborate | View | Manage | Add-Ins | Modify Schedule/Quantities

Properties | Group | Ungroup | New | Delete | Hide | Unhide All | Highlight in Model

Properties | Headers | Rows | Columns | Element

Modify Schedule/Quantities

Properties

Schedule: Operable | Edit Type

Graphics
Visibility/Grap... Edit...

Identity Data
View Name: Operable Curta...
Dependency: Independent
Default View ...: None
Workset: View "Sched...
Edited by:

Phasing
Phase Filter: Show Previo...
Phase: New Constr...

Other
Fields: Edit...
Filter: Edit...
Sorting/Grou...: Edit...

Properties help | Apply

1035_skripbr.rvt - Project Browser

- Views (all)
  - Floor Plans
    - 1ST FLOOR
    - 1ST FLOOR CO
    - 1ST FLOOR DIMENSION
    - 1ST FLOOR ENLARGED E
    - 1ST FLOOR ENLARGED E
    - 1ST FLOOR ENLARGED F
    - 1ST FLOOR ENLARGED F
    - 1ST FLOOR ENLARGED S
    - 1ST FLOOR ENLARGED S
    - 1ST FLOOR ENLARGED S
    - 1ST FLOOR FURNITURE I
    - 1ST FLOOR PLAN - PRES
    - 1ST FLOOR W OBSERVA
    - 1ST FLOOR w site
    - 1ST FLOOR W SITE OUTS
    - 1ST FLOOR_FINISH PLAI
    - 1ST FLOOR_LIFE SAFET
    - BASEMENT
      - BASEMENT 10-5-20

Schedule: Room Schedule - % Operable Window Area - 1035_skripbr.rvt

Room Schedule - % Operable Window Area

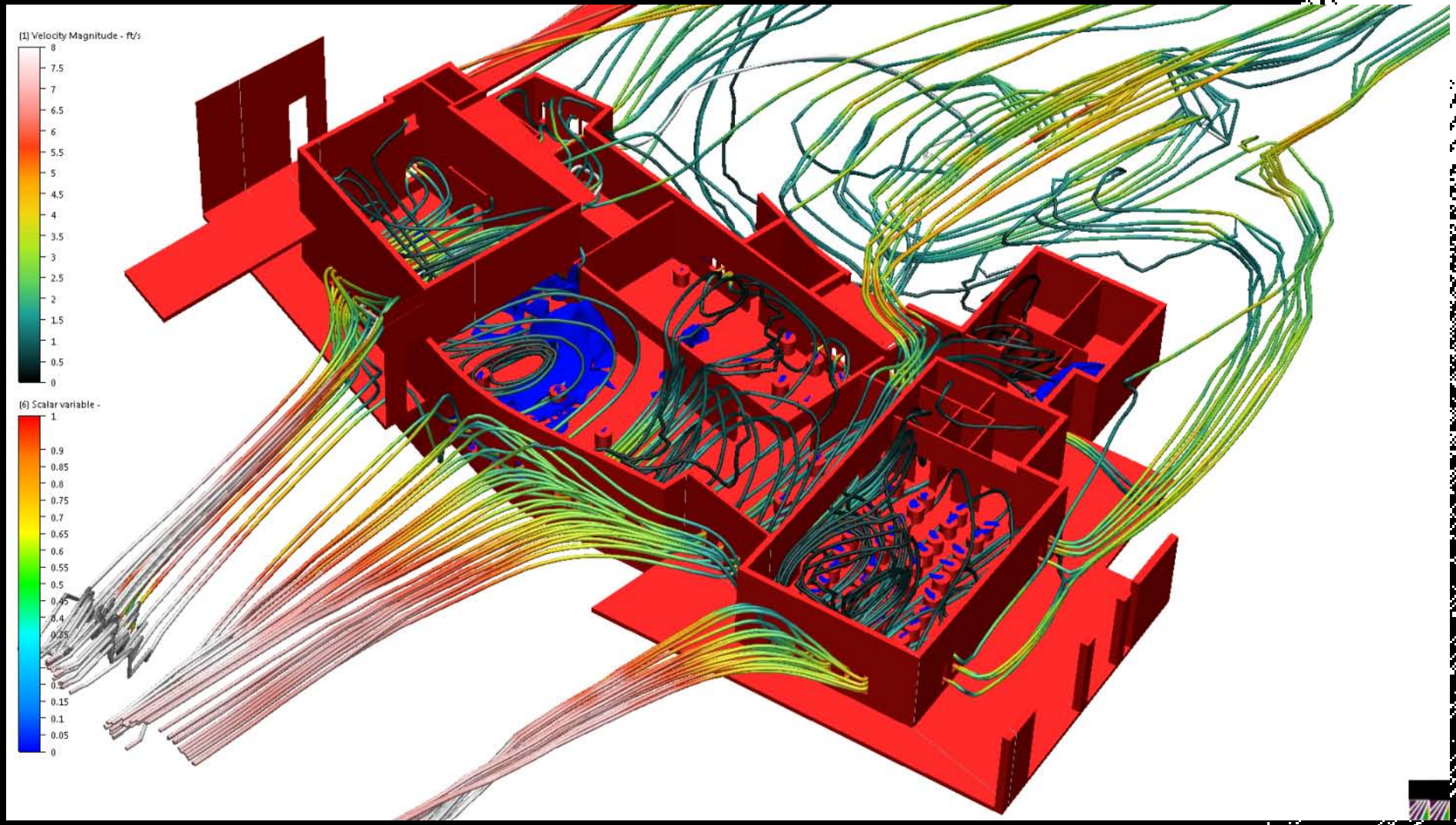
Number	Name	Area	Operable Window Area	% of Operable Window Area	Regularly Occupied
001	ELEV	48 SF	0 SF	0%	✓
002	ELEV EQ	6 SF	0 SF	0%	✓
003	CORRIDOR	310 SF	0 SF	0%	✓
004	VESTIBULE	287 SF	0 SF	0%	✓
005	MECHANICAL	546 SF	0 SF	0%	✓
006	ANIMAL CARE	561 SF	0 SF	0%	✓
007	SHOWER	50 SF	0 SF	0%	✓
008	CORRIDOR	192 SF	0 SF	0%	✓
009	STORAGE ROOM	714 SF	0 SF	0%	✓
010	SERVER/ SEC.	45 SF	0 SF	0%	✓
100	VESTIBULE	67 SF	0 SF	0%	
101	LOBBY	1,219 SF	99 SF	8%	✓
102	ELEV.	48 SF	0 SF	0%	
103	STAFF	443 SF	25 SF	6%	✓
104	OFFICE	111 SF	15 SF	13%	✓
105	CONFERENCE	187 SF	41 SF	22%	✓
106	FAMILY RESTROOM	67 SF	0 SF	0%	
107	FAMILY RESTROOM	57 SF	0 SF	0%	
108	EXHIBITS	2,352 SF	162 SF	7%	✓
109	CLASSROOM A	635 SF	34 SF	5%	✓
110	CLASSROOM B	639 SF	34 SF	5%	✓
111	MUD ROOM	121 SF	0 SF	0%	
112	MULTI-PURPOSE	1,567 SF	74 SF	5%	✓
113	KITCH.	70 SF	0 SF	0%	
114	AV STOR.	48 SF	0 SF	0%	
115	STORAGE	154 SF	0 SF	0%	
116	VESTIBULE	384 SF	33 SF	9%	
117	JANITOR	63 SF	0 SF	0%	
118	WOMEN	238 SF	0 SF	0%	
119	MEN	248 SF	0 SF	0%	
200	ELEV	48 SF	0 SF	0%	
201	MEZZANINE	617 SF	122 SF	20%	✓

Schedule: Operable Curtain Panel Schedule - 1035_skripbr.rvt

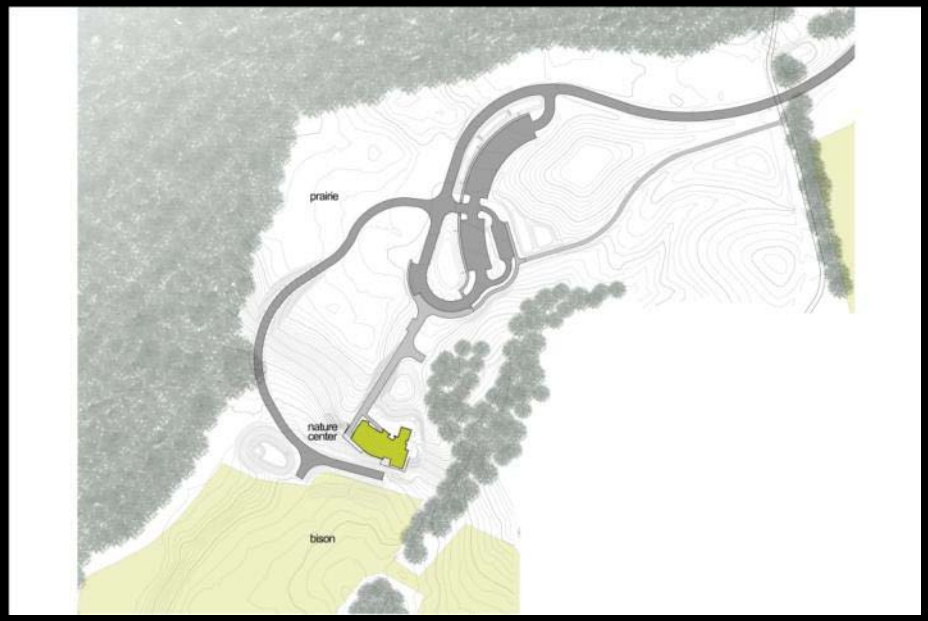
Operable Curtain Panel Schedule

Family and Type	Area	Curtain Panel Room Number
101		
Operable Panel_Casement: Clear Glazing- Operable- Casement	13 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	13 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
Operable Panel_Casement: Clear Glazing- Operable- Casement	9 SF	101
101: 10	99 SF	
103		
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	103
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	103
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	103
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	103
103: 4	25 SF	
104		
Operable Panel_Casement: Clear Glazing- Operable- Casement	15 SF	104
104: 1	15 SF	
105		
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	105
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	105
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	105
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	105
105: 4	41 SF	
108		
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	12 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	10 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	10 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	10 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	10 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
Operable Panel_Casement: Clear Glazing- Operable- Casement	11 SF	108
108: 15	162 SF	
109		
Operable Panel_Casement: Clear Glazing- Operable- Casement	10 SF	109
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	109
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	109
Operable Panel_Casement: Clear Glazing- Operable- Casement	6 SF	109

Ready | (Not Editable) Workset1 | Main Model


(1) Velocity Magnitude - ft/s
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
(6) Scalar variable -
1
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.2
0.15
0.1
0.05
0

	Energy Cost Budget Report			
	Proposed Model		Baseline Model	
	Energy 106 Btu/yr	Peak kBtuh	Energy 106 Btu/yr	Peak kBtuh
Lighting - Conditioned	189.2	47	209.4	52
Space Heating	64.5	33	312.1	316
Space Cooling	124.4	64	80.1	158
Pumps	18.0	5	0.0	0
Heat Rejection	0.0	0	9.7	6
Fans - Conditioned	271.5	65	364.7	83
Receptacles - Conditioned	37.4	10	37.4	10
Stand-alone Base Utilities	6.7	2	6.7	2
Total Building Consumption	711.7		1,020.2	
	Energy 106 Btu/yr	Cost/yr	Energy 106 Btu/yr	Cost/yr ($)
Total	711.7	$17,600	1,020.2	$25,227



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Q & A

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