Design Communication: Dashboards, Immersive VR & Algorithmic Design

FR114

Friday, June 22, 2018 7:00 AM – 8:00 AM

Learning Units 1.00

A'18 AIA Conference on Architecture 2018
June 21-23, New York City

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Questions related to specific products and services may be addressed at the conclusion of this presentation.

Speaker List

Scott Kelsey
FAIA

Managing Principal
CO Architect

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AIA

Principal
CO Architects

Nuri A. Miller
Assoc. AIA

Director of Digital Design & Technology
CO Architects

Course / Learning Objectives

- Identify **how internal design practices can be translated** into open and accessible tools for improved knowledge sharing.
- **Understand data-driven design** and the benefits to rapid early-design iteration and designer-builder collaboration.
- Participate in "live" data visualizations for **more informed decision-making** with a broader owner-architect-contractor team.
- Experience the building design changes in an **immersive virtual reality experience**, and evaluate the benefits as a tool for design communication.

CO ARCHITECTS

OUR THESIS

> Make Informed Decision **Earlier**

> Mine **Increasing** Levels of Data

> Iterate **Rapidly**

> Enhance **Quality** of Engagement

2012
STELLAR ARCHITECTURE IN BIM AWARD
AIA TECHNOLOGY IN ARCHITECTURAL PRACTICE (TAP)
COMPUTATIONAL DESIGN
VR / AR
2010
BIM EXCELLENCE AWARD AIA TECHNOLOGY IN ARCHITECTURAL PRACTICE (TAP)
BIM
2004 - PRESENT
2015
AIA TAP BUILDING INFORMATION MODEL AWARDS DELIVERY PROCESS EXCELLENCE HONORABLE MENTION
2006
REVIT BIM EXPERIENCE AWARD AUTODESK
1992 - 2004
AUTOCAD
1986 - 1992
GDS SOFTWARE
ANSHEN + ALLEN
ANSHEN + ALLEN LOS ANGELES
CO ARCHITECTS
1986
1996
2005
2017
1993
MOLECULAR SCIENCES BUILDING / UCLA
1995 BOURNS HALL – COLLEGE OF ENGINEERING / UCR
1995
EAST BUILDING
THE SALK INSTITUTE
2004
ENGINEERING 2
UCSC
2004
ENGINEERING-SCIENCES BUILDING / UCSB
2010
MEDICAL EDUCATION BUILDING
UNIVERSITY OF VIRGINIA
2010
PALOMAR MEDICAL CENTER
ESCONDIDO, CALIFORNIA
2012
HEALTH SCIENCES EDUCATION BUILDING / UNIV. OF ARIZONA
2014 – COLLABORATIVE LIFE SCI. BLDG. & SKOURTES TOWER
OHSU / OUS / PSU
2015
LIFE SCIENCES BUILDING
LOYOLA MARYMOUNT UNIVERISTY
2017
SCHOOL OF NURSING
COLUMBIA UNIVERSITY
2018
HEALTH SCIENCES INNOVATION BUILDING / UNIV. OF ARIZONA
2019
SCHOOL OF MEDICINE
UNIVERSITY OF MIAMI

AGENDA

Plan
Visualize
Interact
Build

AGENDA

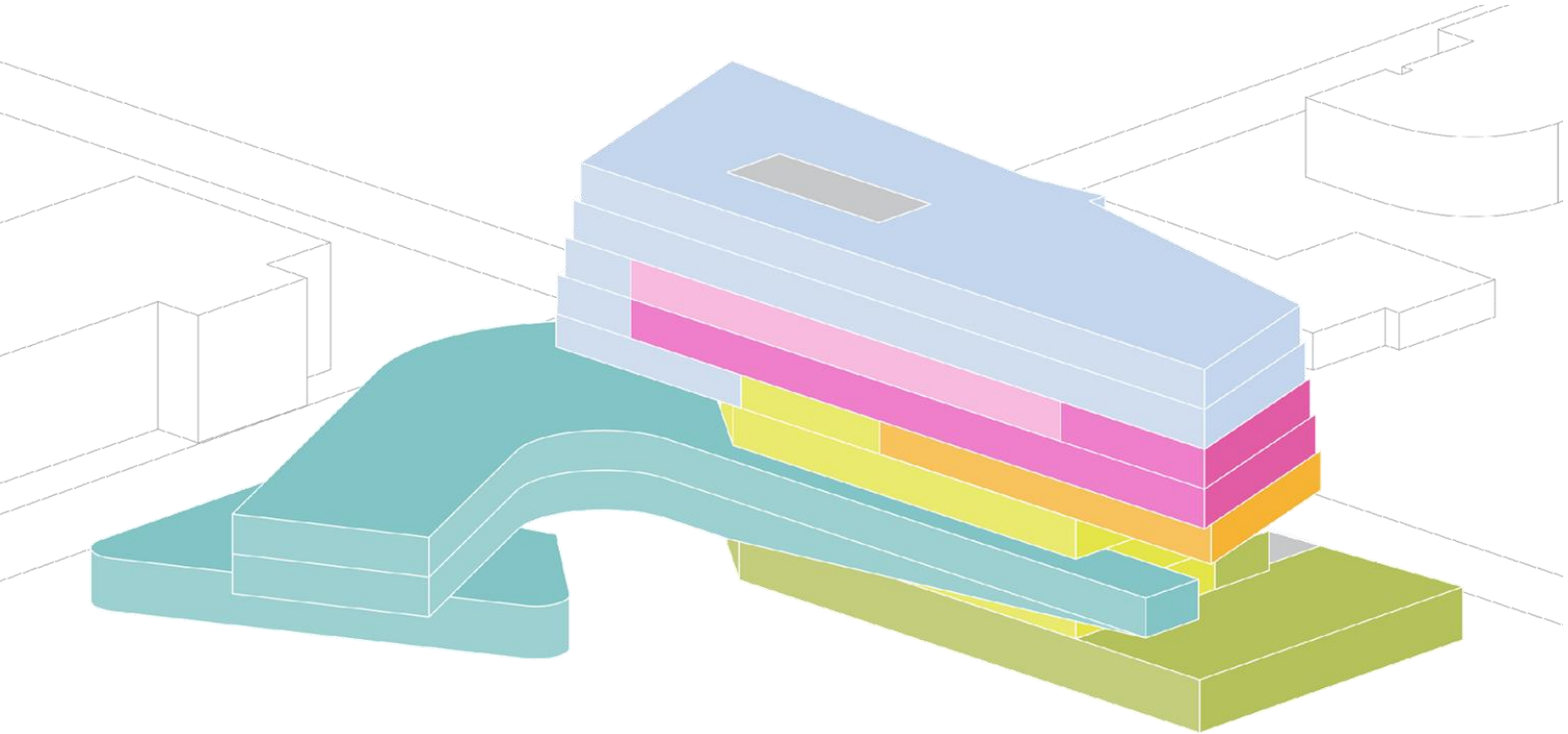
Plan

Visualize

Interact

Build

Project Scheme and Summary Report



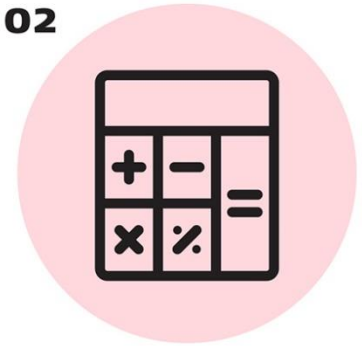
- CLINICAL SKILLS
- SIMULATION
- VIRTUAL ANATOMY
- CLASSROOMS
- COMMUNITY LIFE
- HEALTH SCIENCES LIBRARY
- BASE ADMINISTRATIVE WORKPLACE
- CLINICIAN & DEPT OFFICES
- BUILDING SUPPORT

Dashboard Goals

01

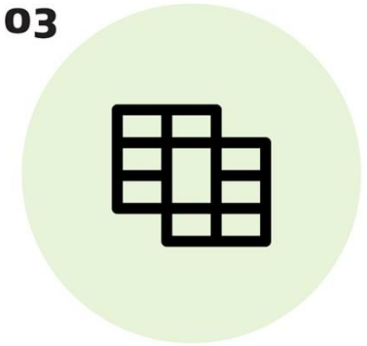
Accessible to Staff

02



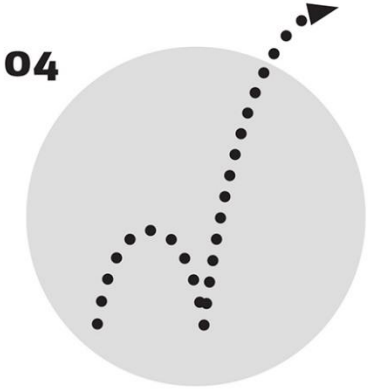
It is Not a Calculator

03



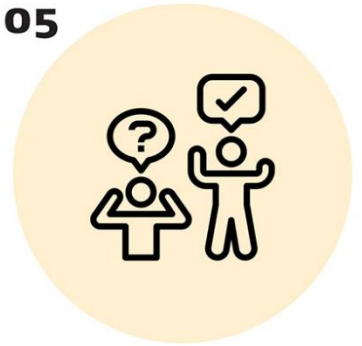
Consolidating Resources

04



Leapfrogging To The Unique

05



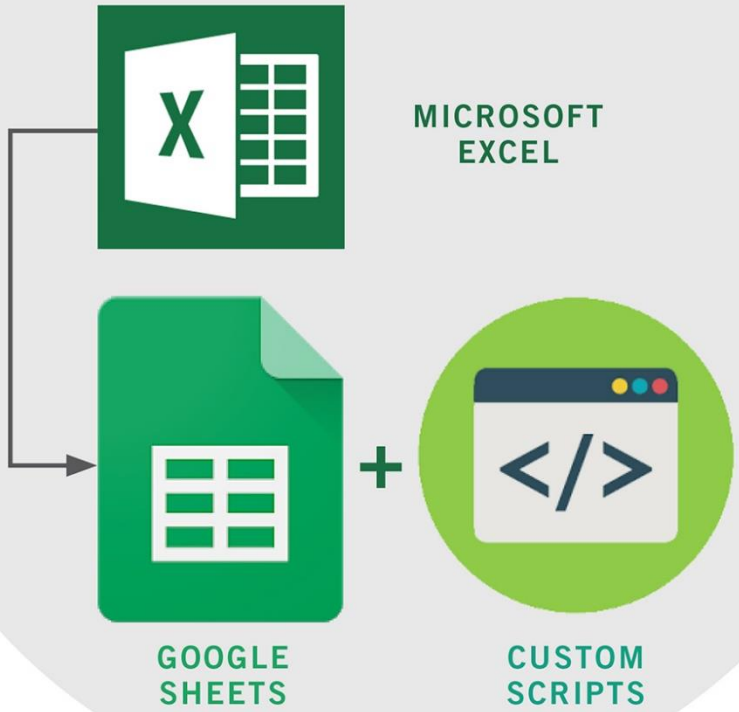
Engaged User Experience

Medical Education Building & Health Sciences Campus / University of Nevada, Las Vegas

Medical Education Building & Health Sciences Campus / University of Nevada, Las Vegas

Medical Education Building & Health Sciences Campus / University of Nevada, Las Vegas

Data Engine



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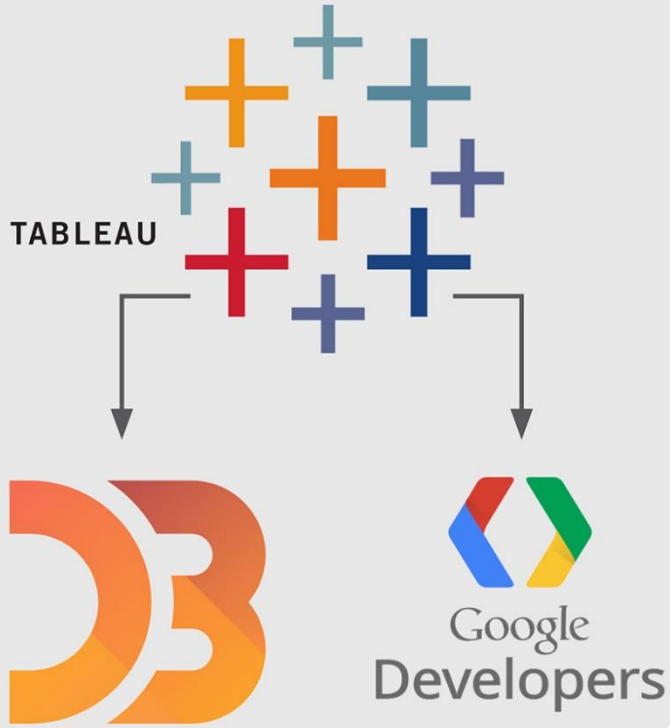
Data Visualization



Questions - Med Ed Prog

Secure | https://sites.google.com/site/copromeded/questions

nuri.miller@gmail.com

CO ARCHITECTS

Med Ed Programming

QUESTIONS | OPTIONS | PROJECT PROGRAM | PROGRAM CATEGORIES

Questions

Medical Education Program Questions

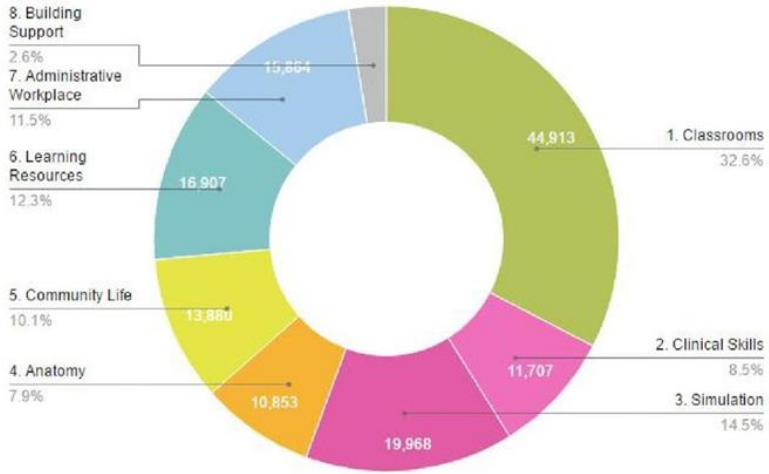
* Required

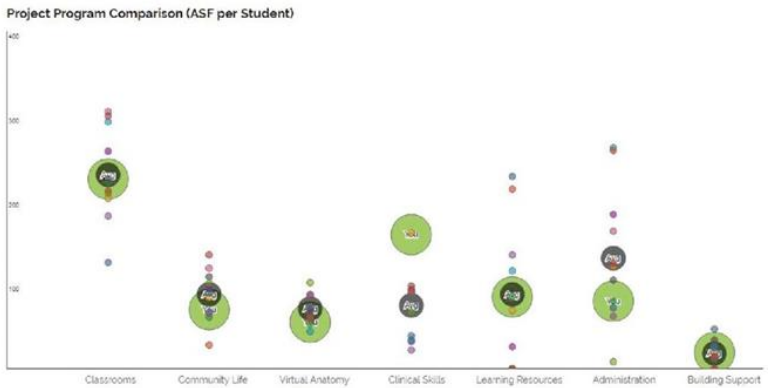
Option Name *

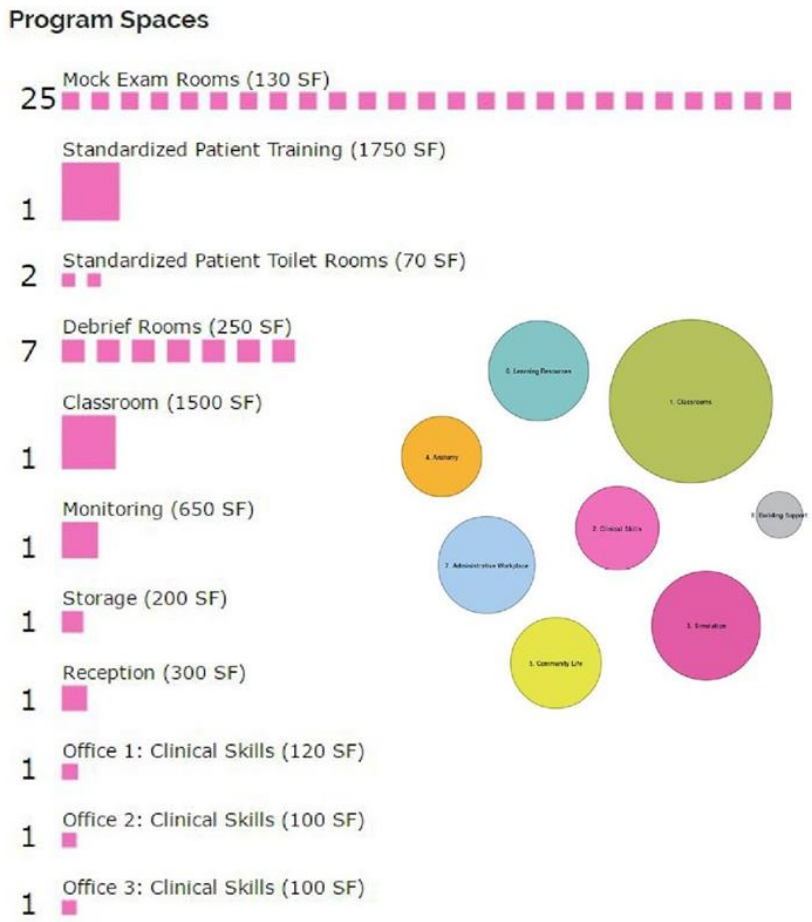
Your answer

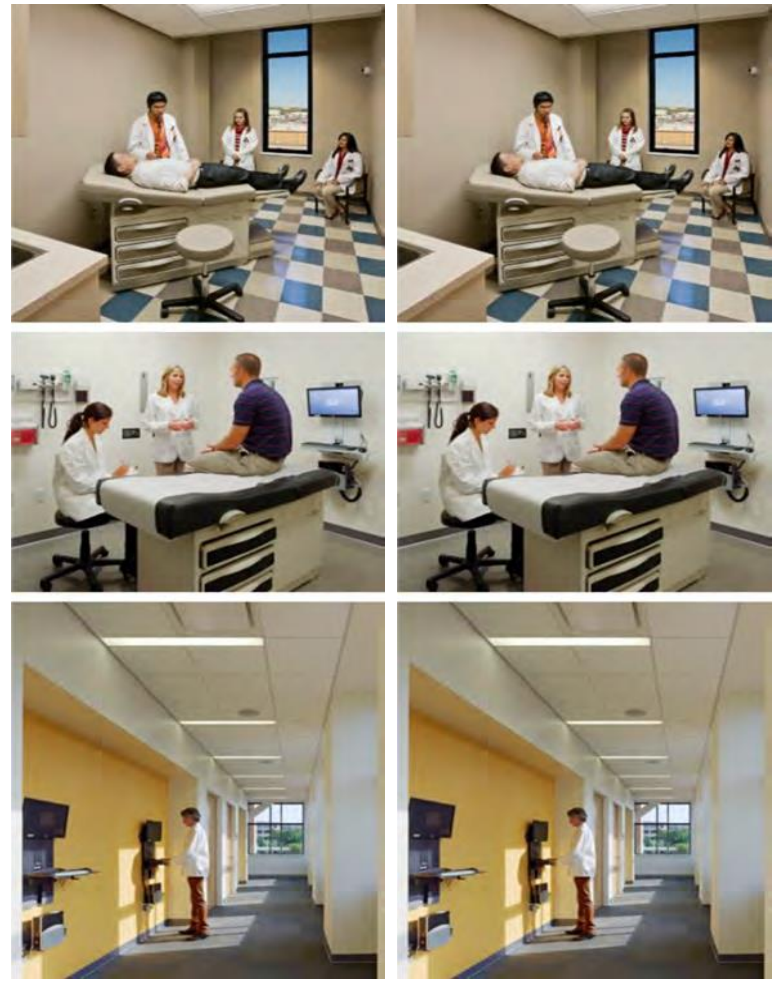
What is your target class size? *

Program Dashboard Elements

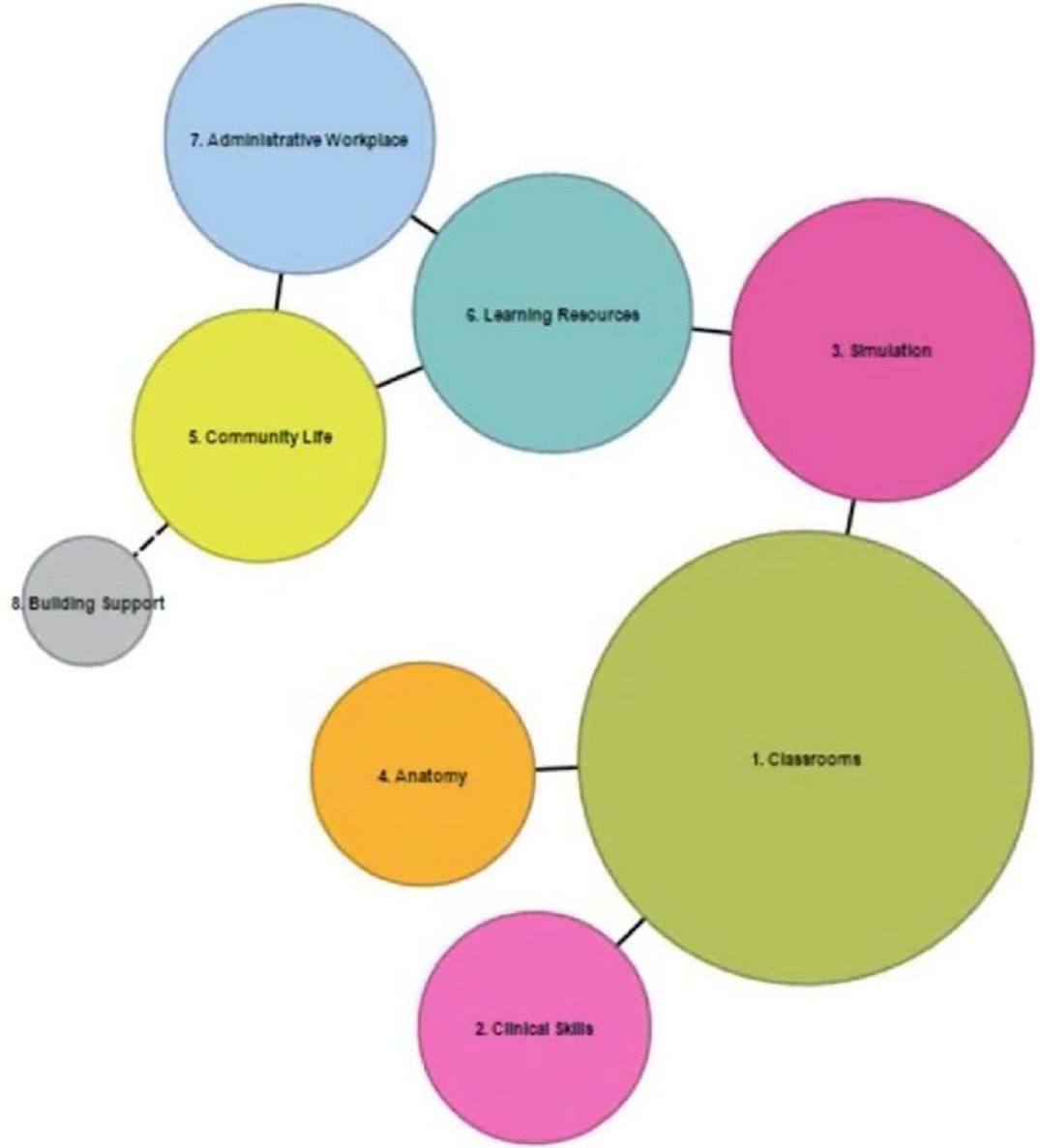


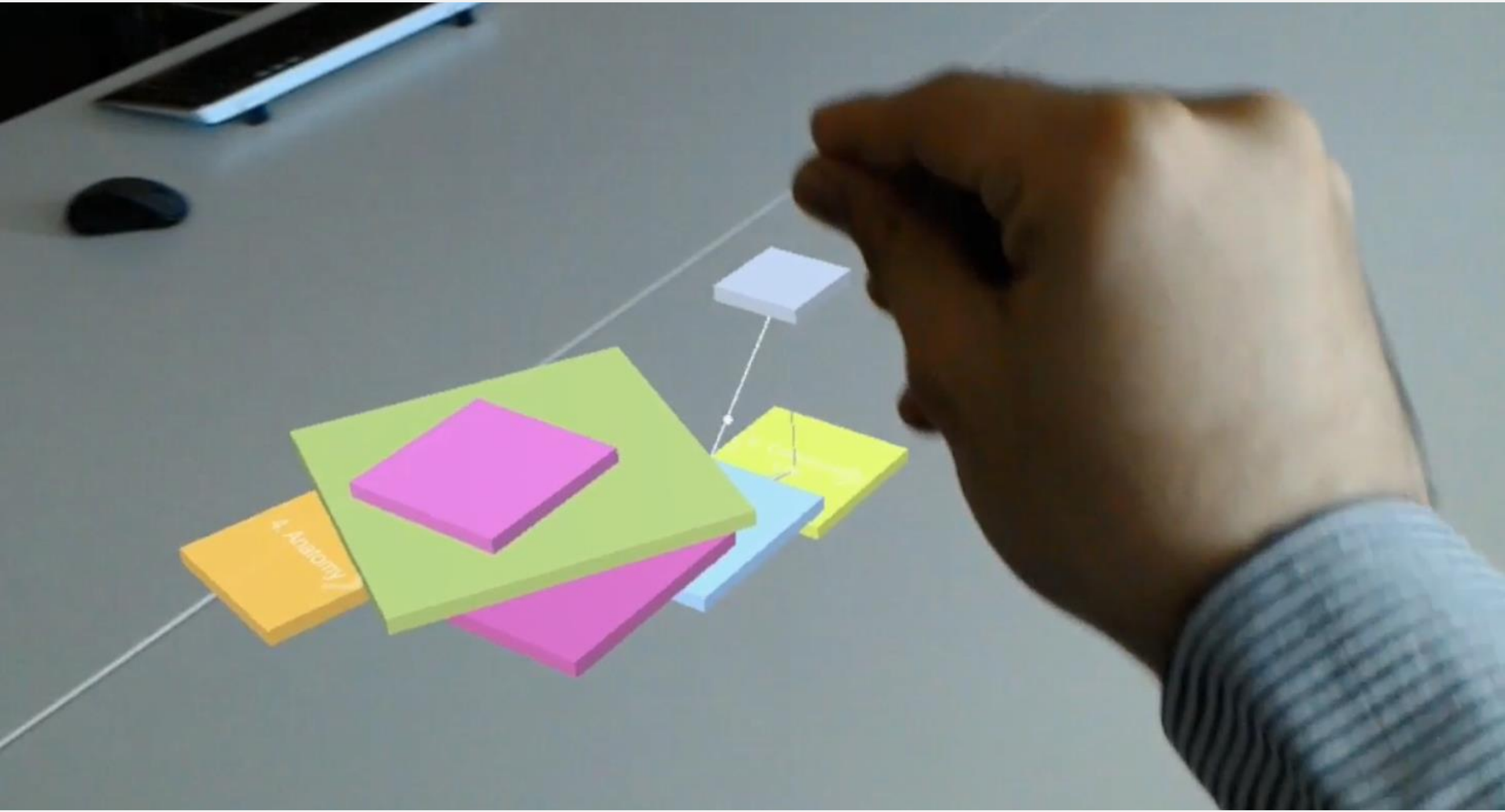




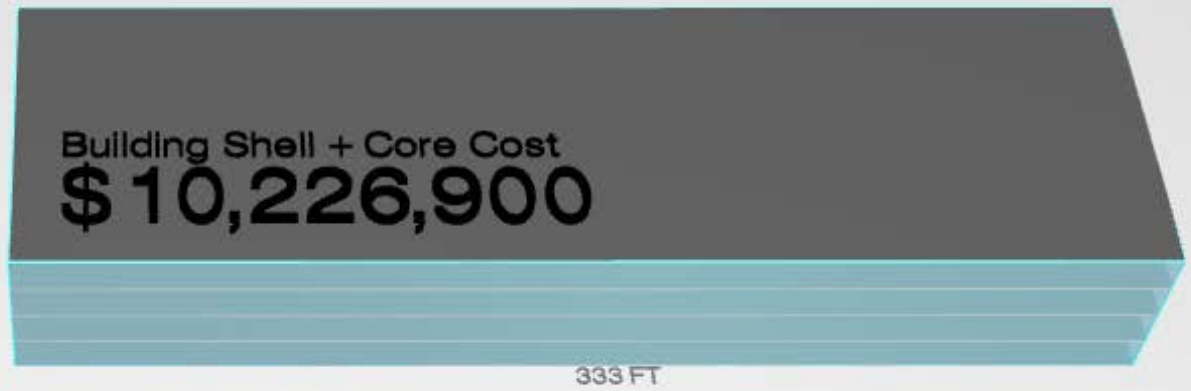


Demo Spatial Adjacencies & Stacking




4. Anatomy

Parametric Cost Model



Facade ($95 / SF)
$3,944,400

Roof ($30 / SF)
$997,500

Slab-on-grade ($20 / SF)
$665,000

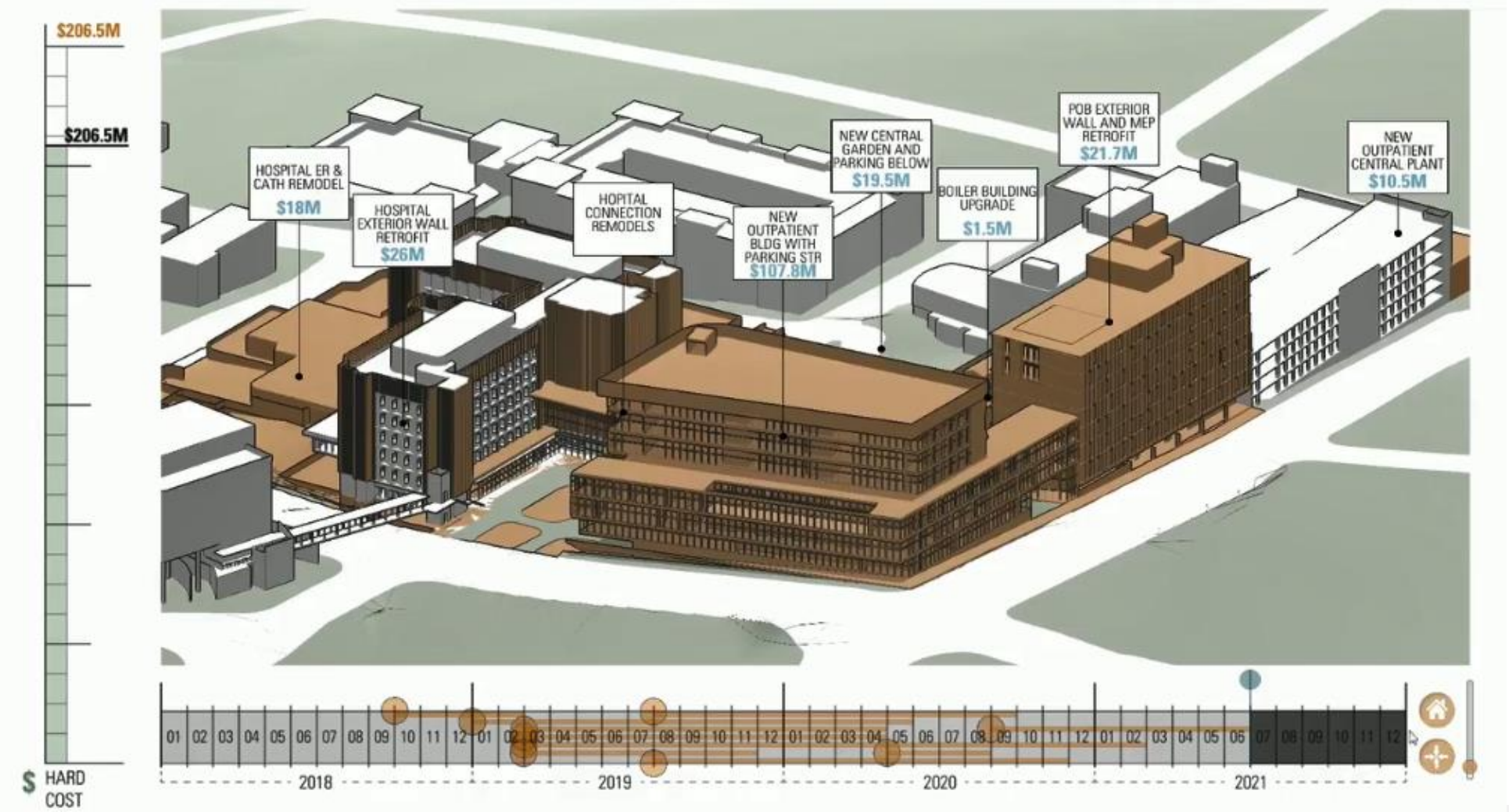
Framed Floors ($40 / SF)
$3,990,000

Vertical Circulation ($210000 / Level)
$630,000

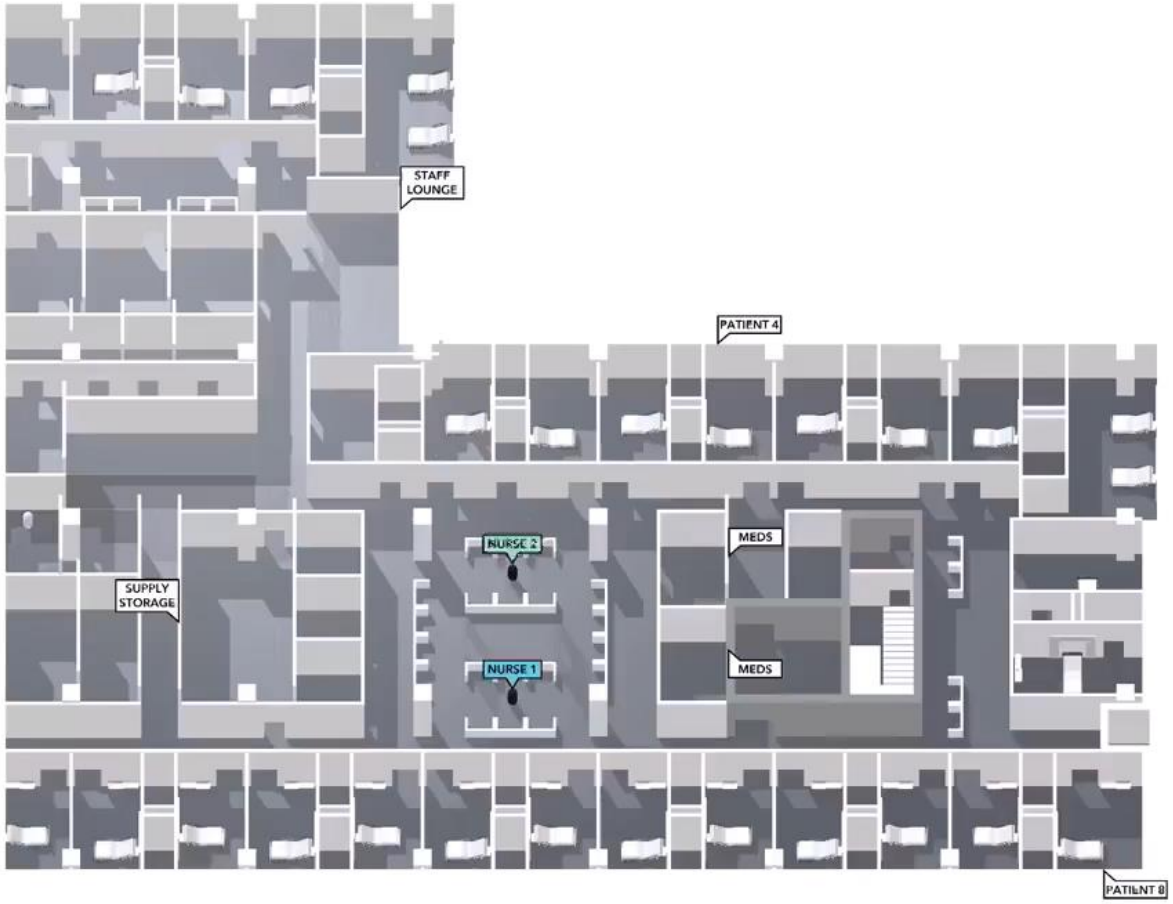
Building Cost Model

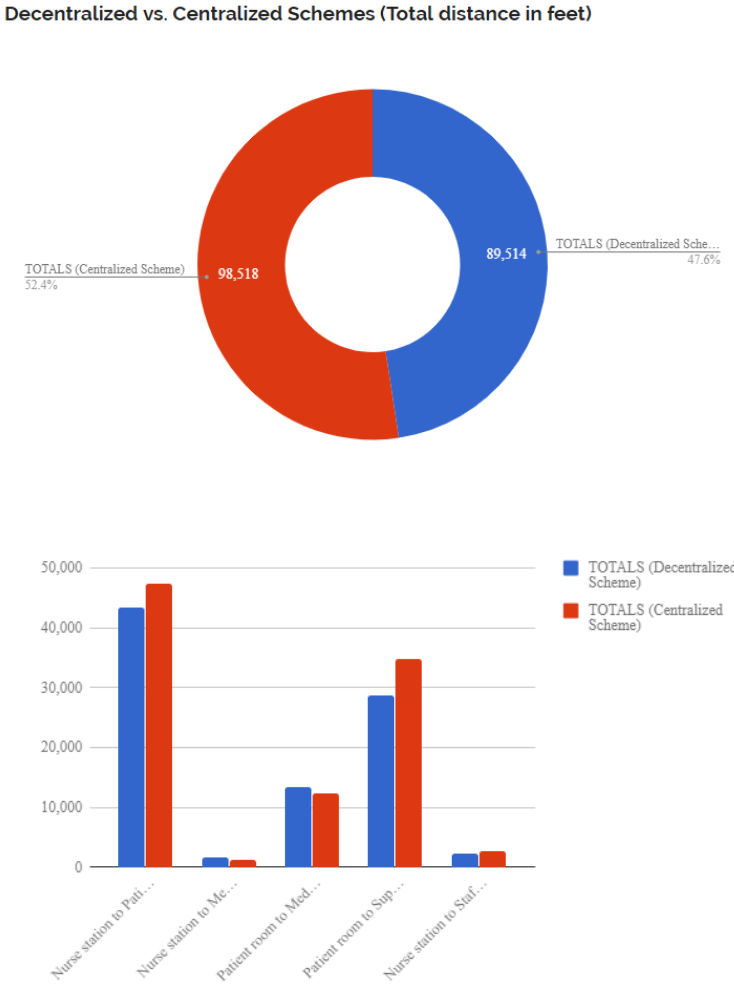
LEVELS	4
BUIDING WIDTH	100
FACADE COST ($/SF)	95
ROOF COST ($/SF)	30
SOG COST ($/SF)	20
FLOOR COST ($/SF)	40
VERTICAL COST ($/L...	210000

4D Animation Medical Center (Model + Schedule)



Hospital Travel Distance Study





AGENDA

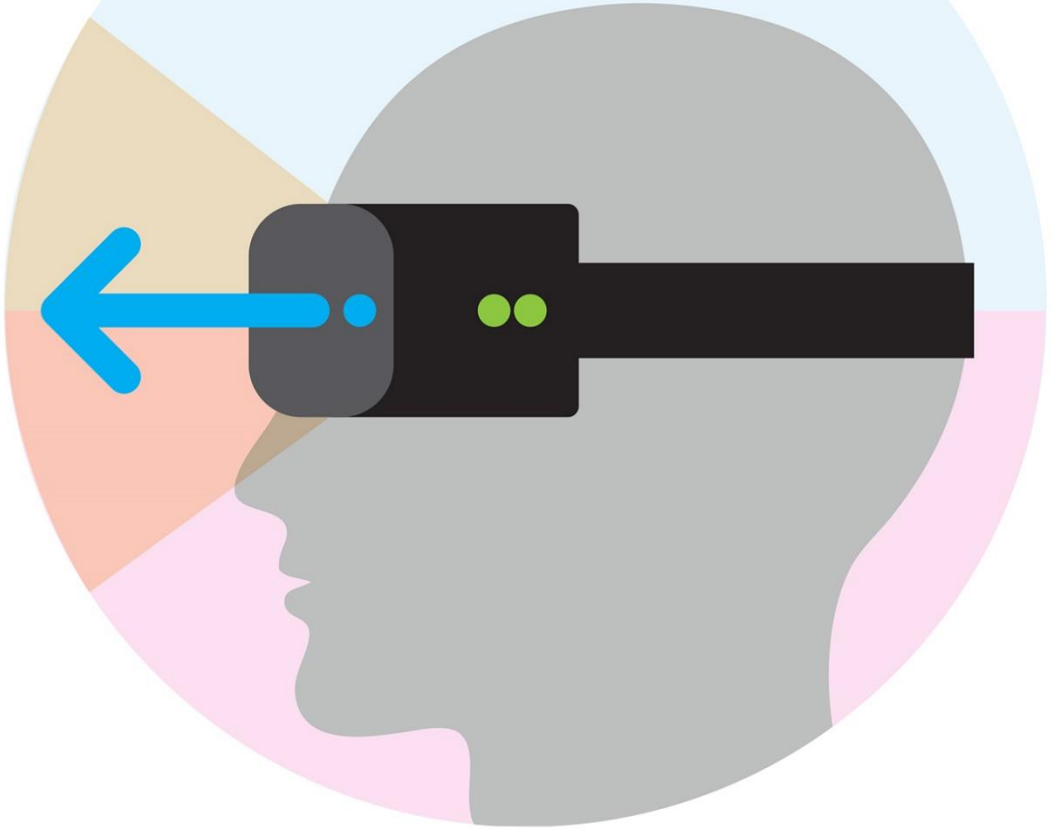
Plan

Visualize

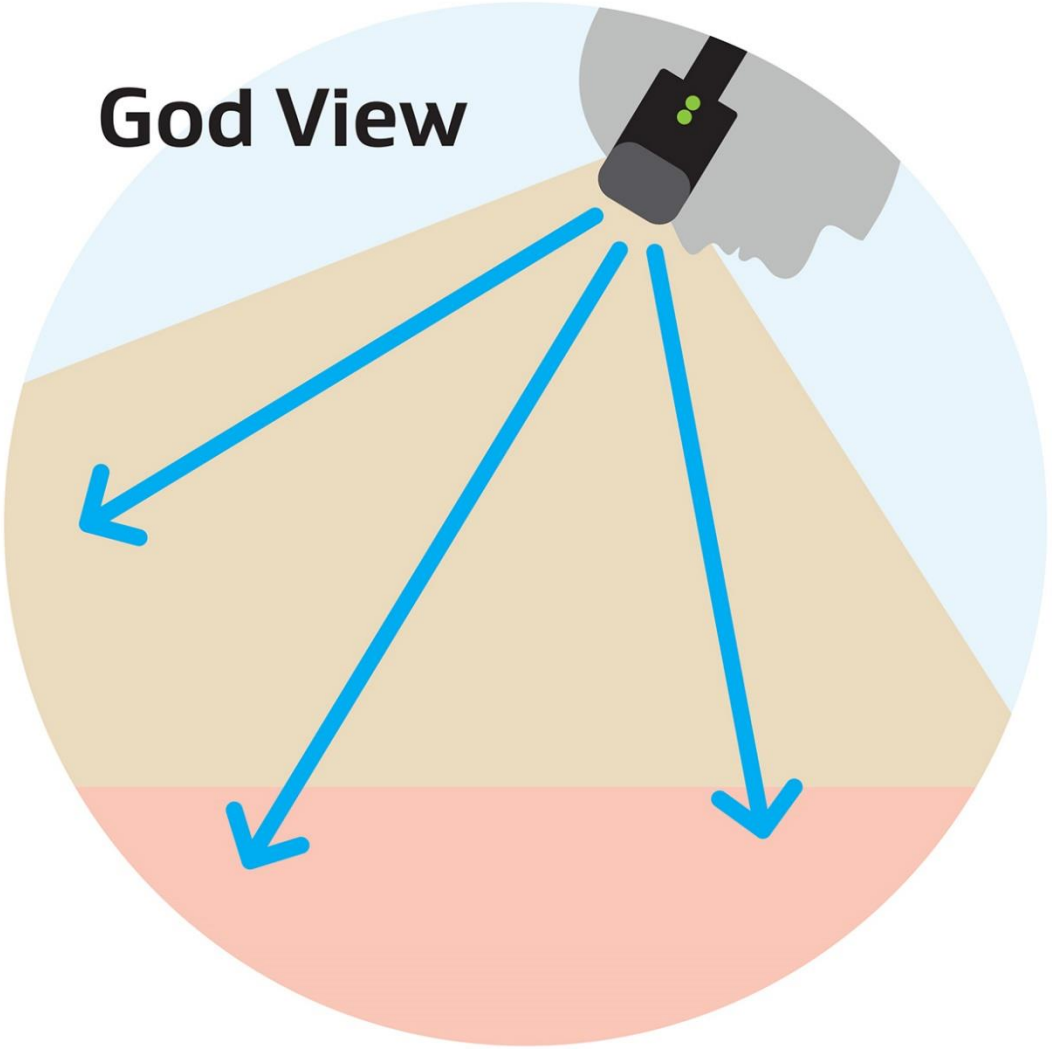
Interact

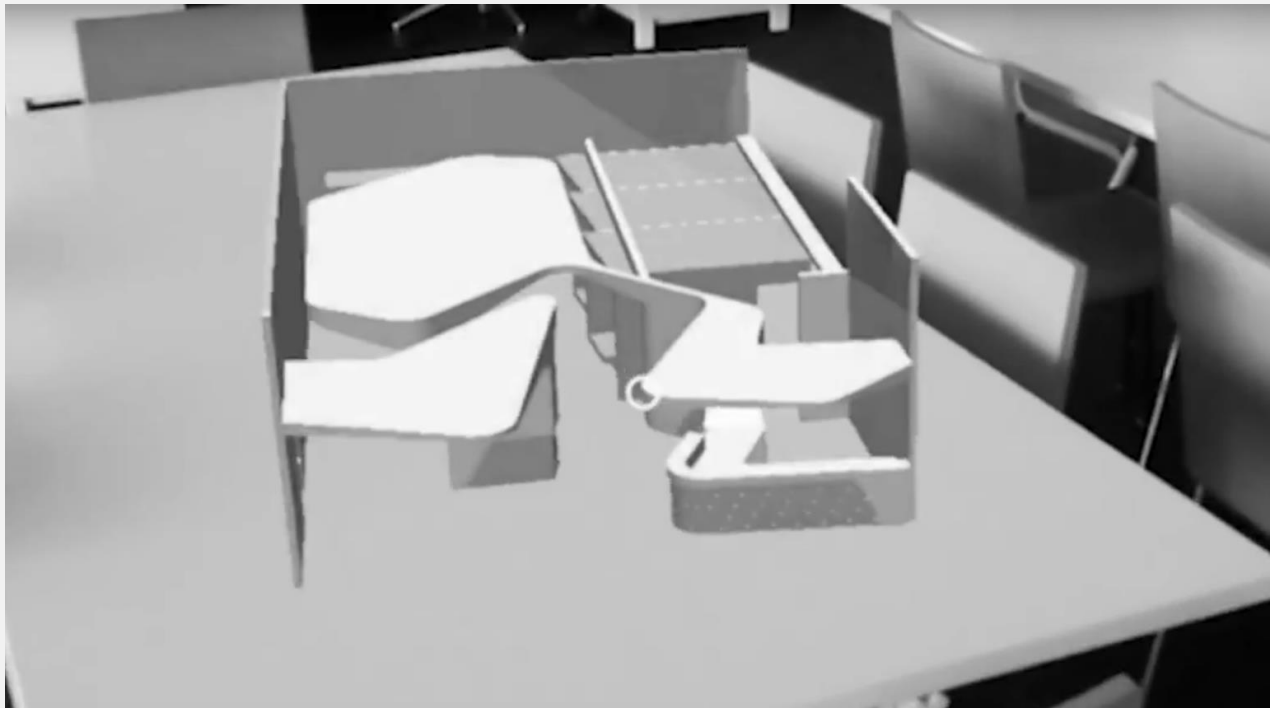
Build

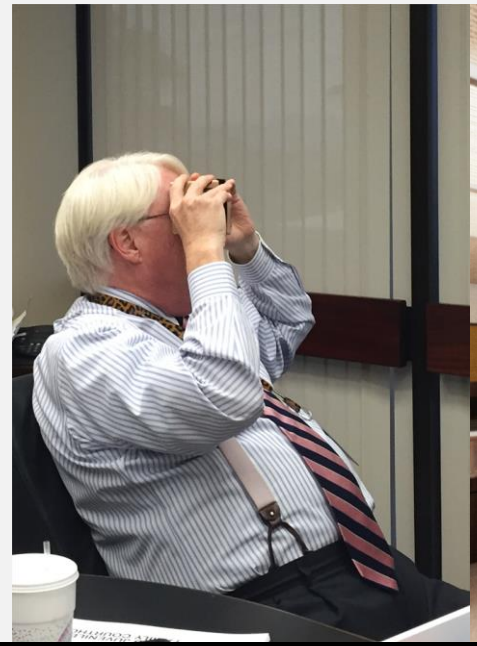
Individual View

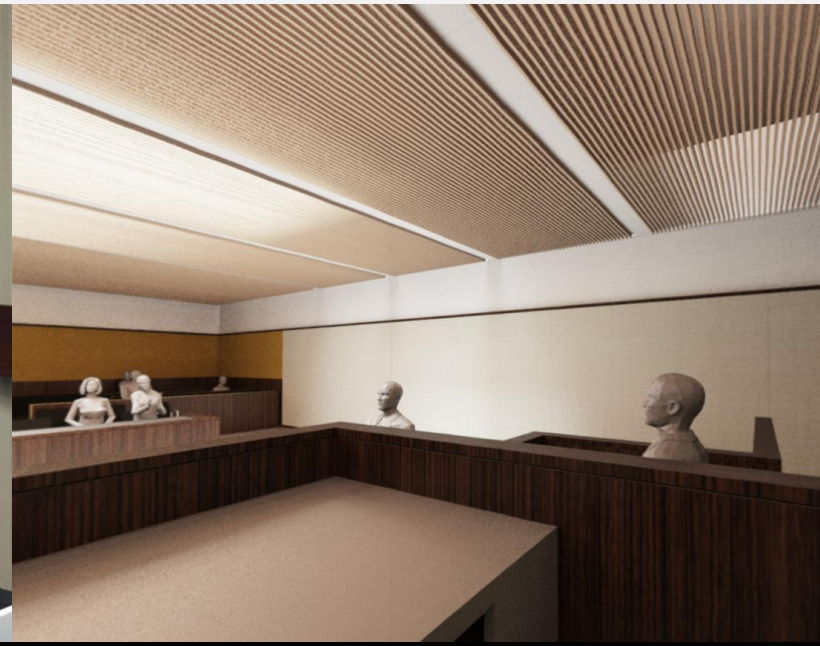


God View





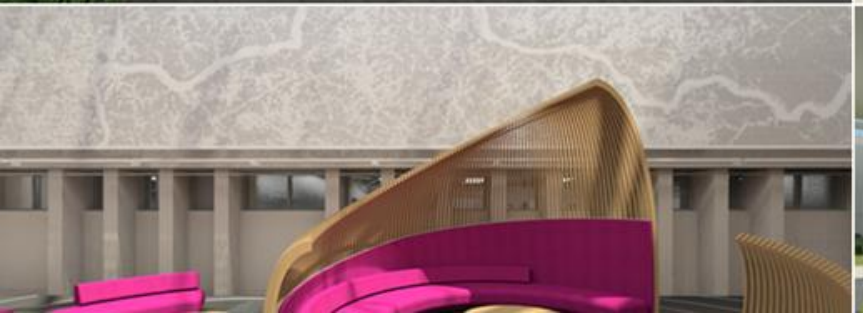




Indio Juvenile & Family Courthouse / Superior Courts of California, Riverside

The Digital Future

360 VIEWS



PANEL SIZES
PER ENLARGED
ATIONS
BACK-UP
AS W2

AGENDA

Plan

Visualize

Interact

Build

SPACE TYPE: Gross Anatomy **SPACE NAME:** Gross Anatomy Lab 2

OCCUPANTS: 72 **QUANTITY:** 1
ASF: 2,645

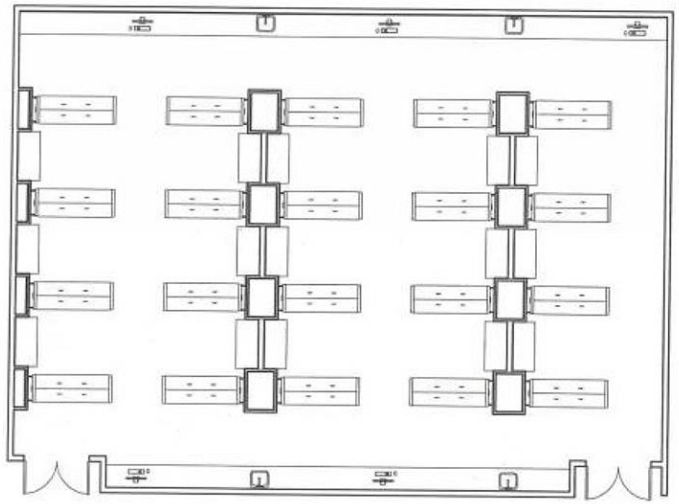
DESCRIPTION: General description of the space.

ADJACENCIES:

UTILIZATION		PLUMBING		CHEMICALS	
Hours of Use		Laboratory Gas (LG)		Bases	
8 hours/day		Laboratory Vacuum (LV)	●	Acids	
14 hours/day		Laboratory Air (LA)		Solvents	
24 hours/day	●	Compressed Air, 100 psi (A)	●	Radioisotopes	
		Industrial Hot Water (IHW)		Carcinogens/Regulated	
ENVIRONMENTAL QUALITY		Industrial Cold Water (ICW)		Chemical Waste Storage	
LEED Daylighting	●	Potable Hot Water (HW)	●	Biological Storage	●
Direct Views	●	Potable Cold Water (CW)	●	Radioisotope Storage	
Natural Ventilation	●	High Purity Water (DE)		Chemical Storage	●
Pollutant Control	●	Chilled Water (CHW S/R)			
Other Innovation		Steam/Condensate Return			
		Carbon Dioxide (C02)		**MECHANICAL**	
ARCHITECTURAL		Nitrogen Gas (N2)		Temperature	
Floor		Cylinder Gases		72°F ± 2°F	●
Resilient		Inert		68°-75° ± 2°F	
Carpet		Flammable		Other	
Epoxy, (No VOC)	●	Toxic		Humidity	
Sealed Concrete		Floor Drain (FD)	●	50% ± 2%	●
Other		Floor Sink (FS)		Other	
Partitions		Safety Shower/Eyewash (SS)	●	# Air Changes/Hour	6
Gyp Board, Paint	●	Drench Hose (DH)		Recirculated Air Allowed	
CMU, Paint				Air Pressure Positive	
Other		**ELECTRICAL**		Air Pressure Negative	●
Base		110V, 20A, 1 Phase	●	Air Filtration/Supply	
4" Rubber		208V, 30A, 1 Phase		Air Filtration/Exhaust	
Integral w/floor	●	208V, 30A, 3 Phase			
Wood		480V, 100A, 3 Phase		**HOODS**	
Other		Isolated Ground Outlet		Chemical Fume Hood	●
Ceiling		Emergency Power		Radioisotope Hood	
Open		UPS (OFOI)		Laminar Flow Hood	
Acoustic Tile	●	Phone	●	Biological Safety Cabinet	●
Gyp Board, Paint		Video	●	Snorkel	
Height	9'-0"	Data	●	Canopy Hood	
Doors		"Room In Use" Light		Low Slotted Exhaust	
3' x 7'	●	Task Lighting	●	Other	
1'-6" X 7'		Lighting Level			
Paired		fc at bench/desk	75	**LABORATORY EQUIPMENT**	
Other		Dimmable to		Vibration Sensitive	
Vision Panel		Safe Light		Light Sensitive	
Transom/Sidelight		Zoned Lighting		Vibration Producing	
Acoustic Criteria		Special Lighting		Heat Producing	
Security Criteria	●	Other		Noise Producing	

NOTES:

Space ID: Gross Anatomy Space Name: Lab 2



SYMBC

Telephone	Telecom/Data	Duplex	
Data	Combined Floor Box	Cable	

SCALE : 1/16" = 1'-0"

FURNISHINGS:

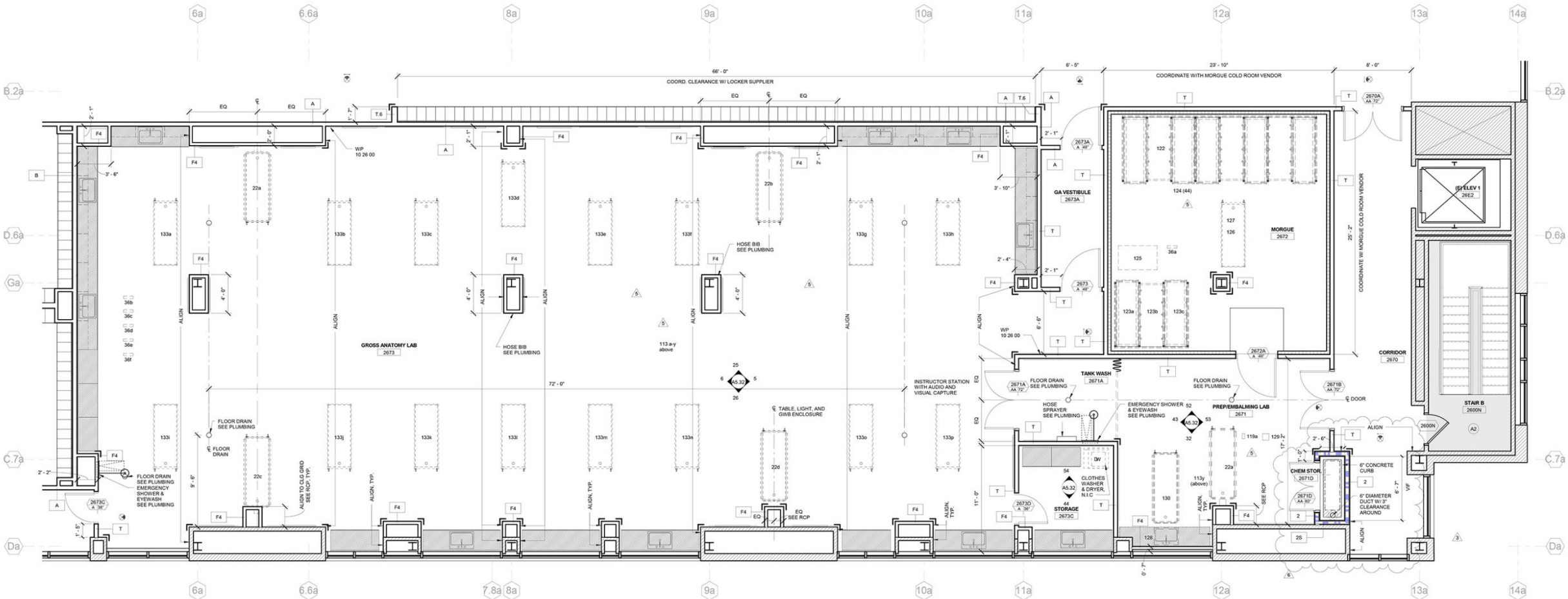
GROUP 1 - CFCI

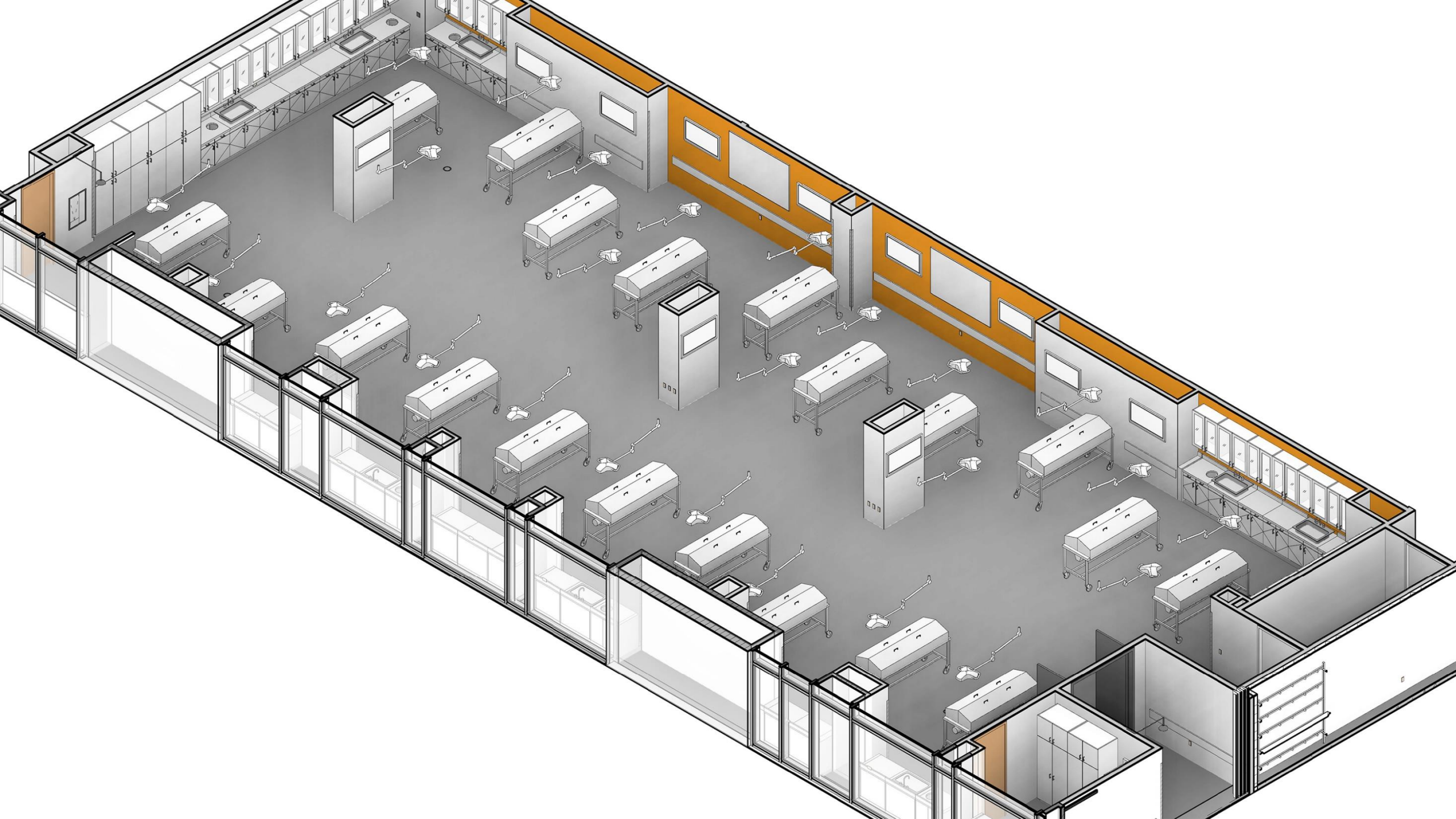
1. White Marker Board
2. Tack Board
3. Base Cabinet
4. 12" Wall Cabinet
5. Countertop
6. Tall Cabinet
7. Sink w/garbage disposal
8. Hand Sanitizer Dispenser
9. Paper Towel Dispenser
10. Under Counter Raceway
11. Flat Panel Monitors
12. AV Rack
13. Mutimedia Projector
14. Video Camera
15. Projection Screen
16. Lectern
17. Storefront Glass
18. Adjustable Open Shelving
19. Wire Shelving
20. Bed
21. Exam Table
22. Mock Headwall
23. Autoclave
24. Equipment Space
25. Chemical Fume Hood
26. Biological Safety Cabinet
27. Radioisotope Hood
28. Vented Workstation
29. Snorkel Exhaust
30. Lab Bench, Standing Height
31. Lab Bench, Sitting Height
32. Safety Shower/Eyewash
33. Flam. Storage Cabinet
34. Overhead Service Carrier
35. Cylinder Rack
36. Moveable Laboratory Table
37. Moveable Demonstration Bench
38. Laboratory Sink
39. Cup Sink
40. Pipe Drop Chase
41. Scullery Sink
42. Hand Wash Sink

GROUP 2 - OFOI

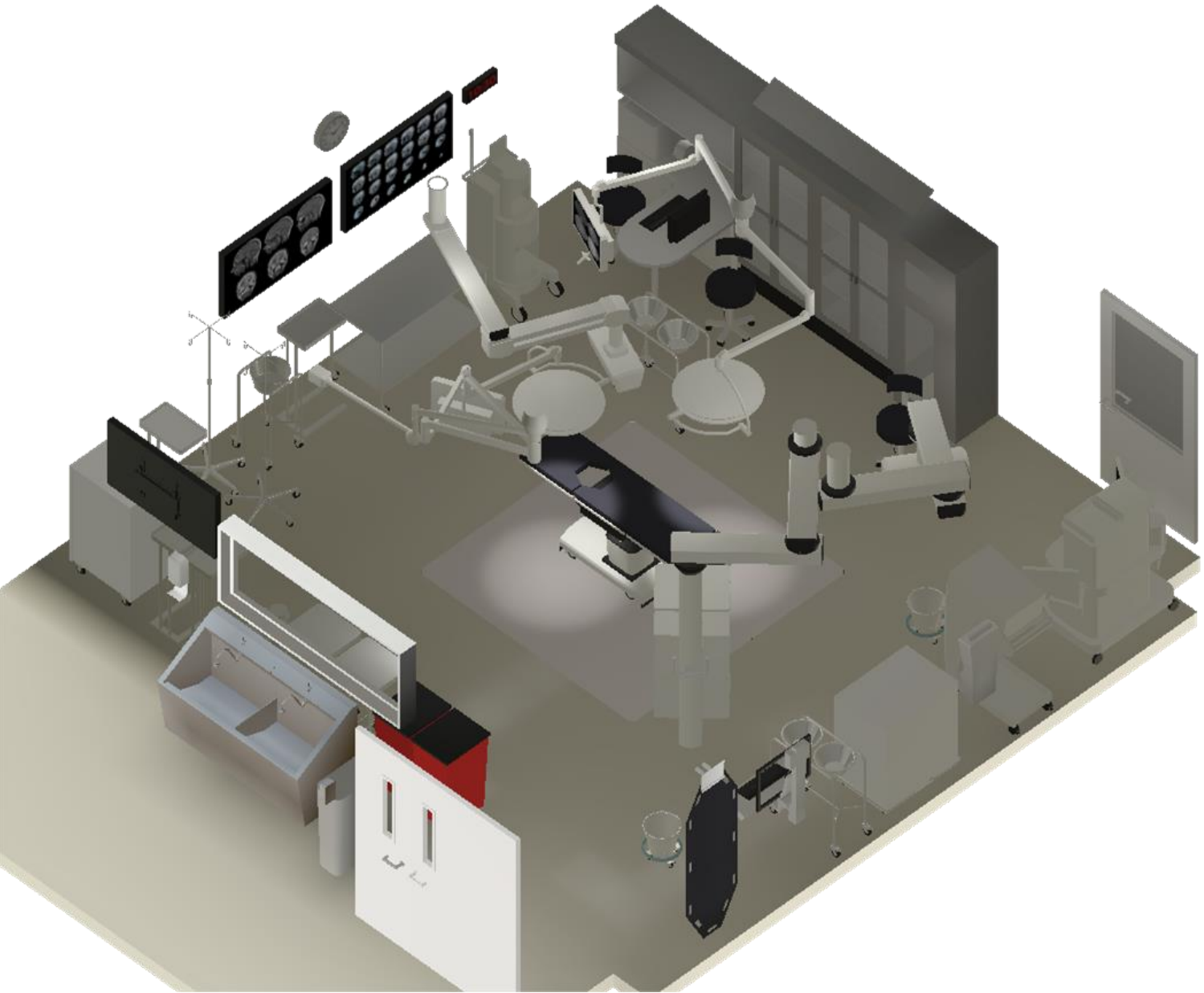
A. Desk
B. Chair/Stool
C. Clock
D. Trash Bin
E. Recyling Bin
F. Table
G. File Cabinet
H. Computer Terminals
I. Copier
J. Printer
K. Sofa
L. Arm Chair
M. Refrigerator
N. Microwave

2D FLOORPLAN





Virtual Operating Room Features



- 5 Operating Rooms
- First Person & Overall Axon View
- Move/Rotate Objects, Booms, Lights
- Toggle on/Off Ceiling Lights and Glass Opacity
- Clash Detection between Booms and Lights
- Add/Remove objects from the library
- Multi-user experience

CO ARCHITECTS
VIRTUAL OR

CO ARCHITECTS
MIXED REALITY

Administrative Replacement Building / California State Polytechnic University, Pomona

CO ARCHITECTS
AUGMENTED REALITY
DEFINE TARGETS
TAGS
CONCEPT DIAGRAMS
EXPLODE

AGENDA

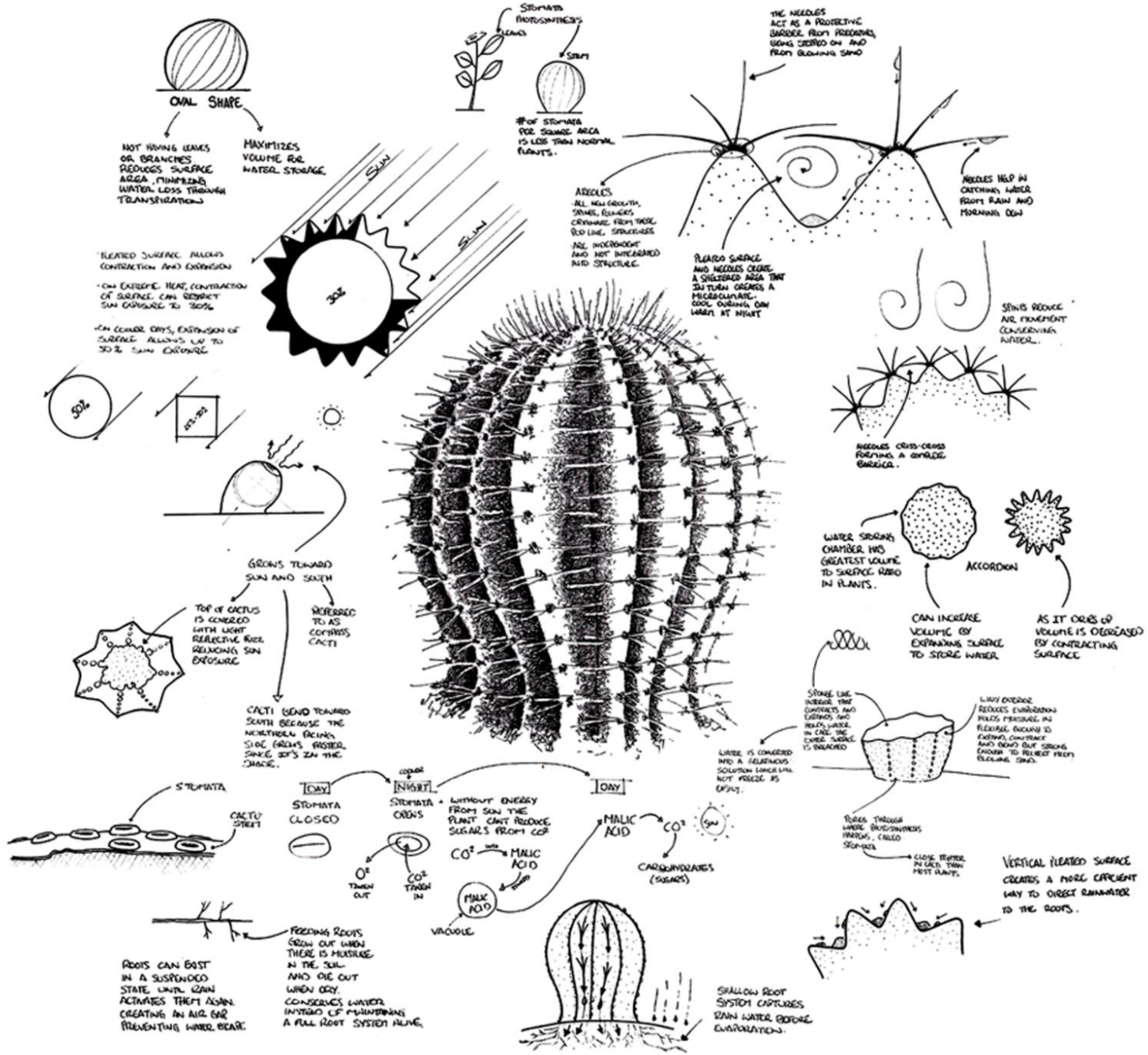
Plan

Visualize

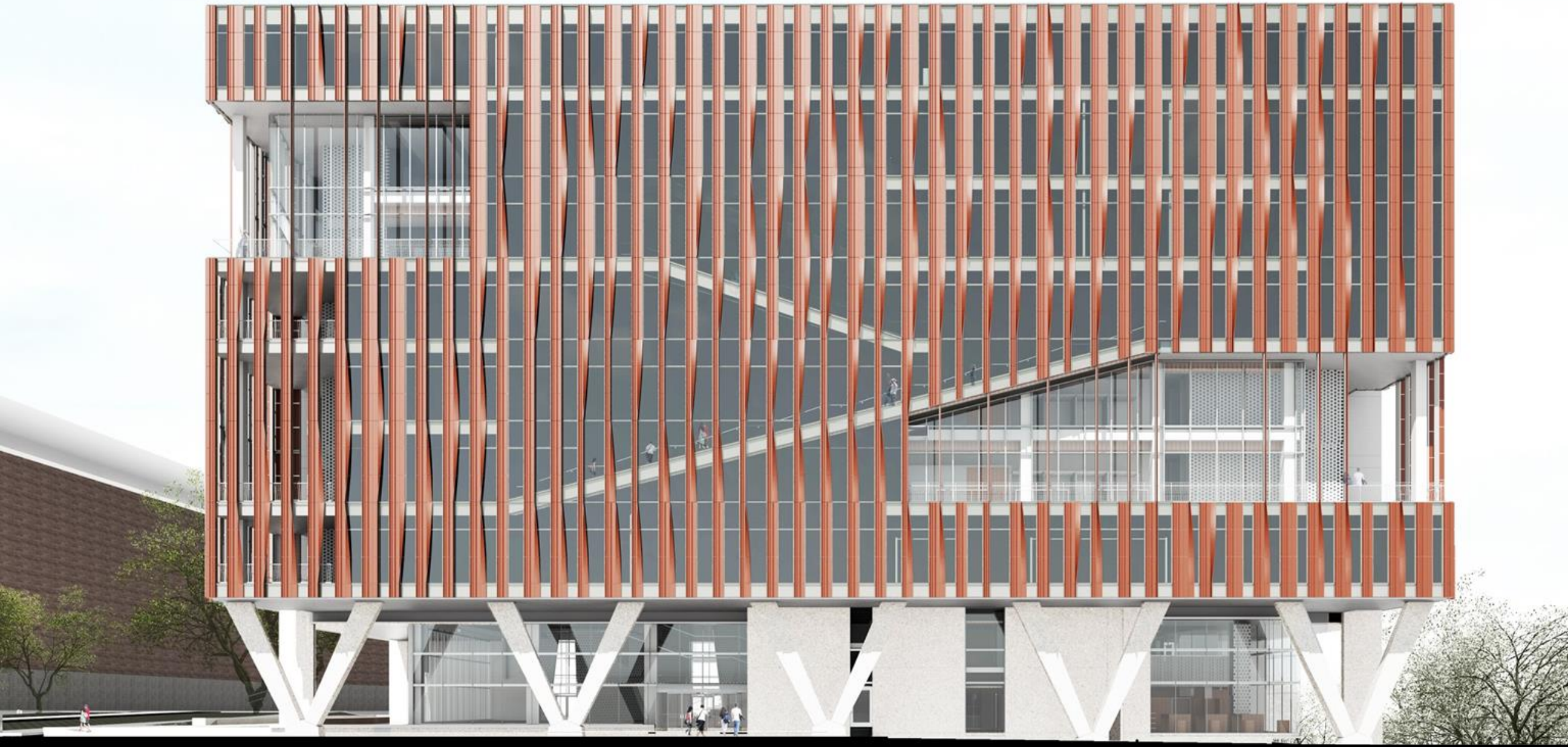
Interact

Build

Health Sciences Innovation Building / University of Arizona, Tucson

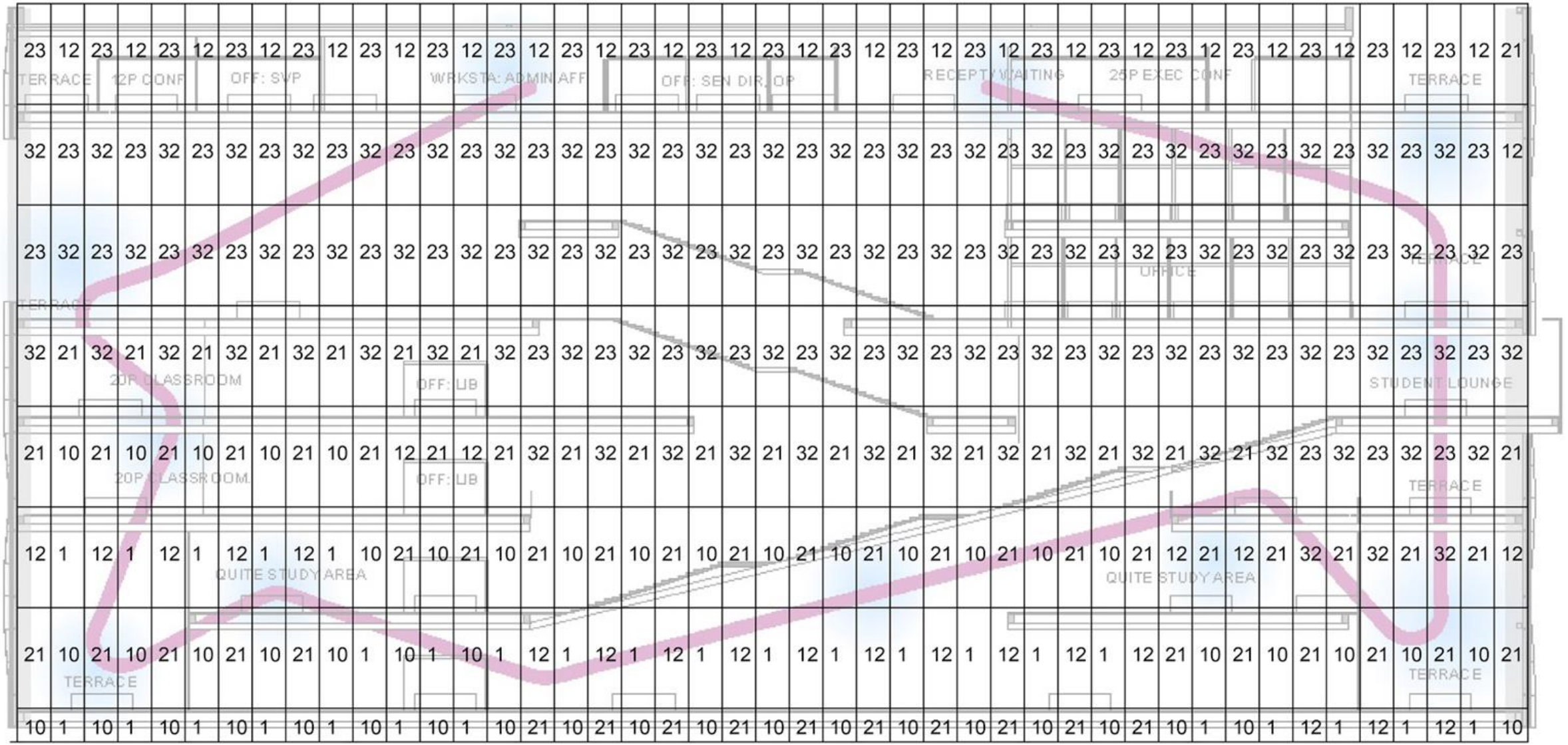


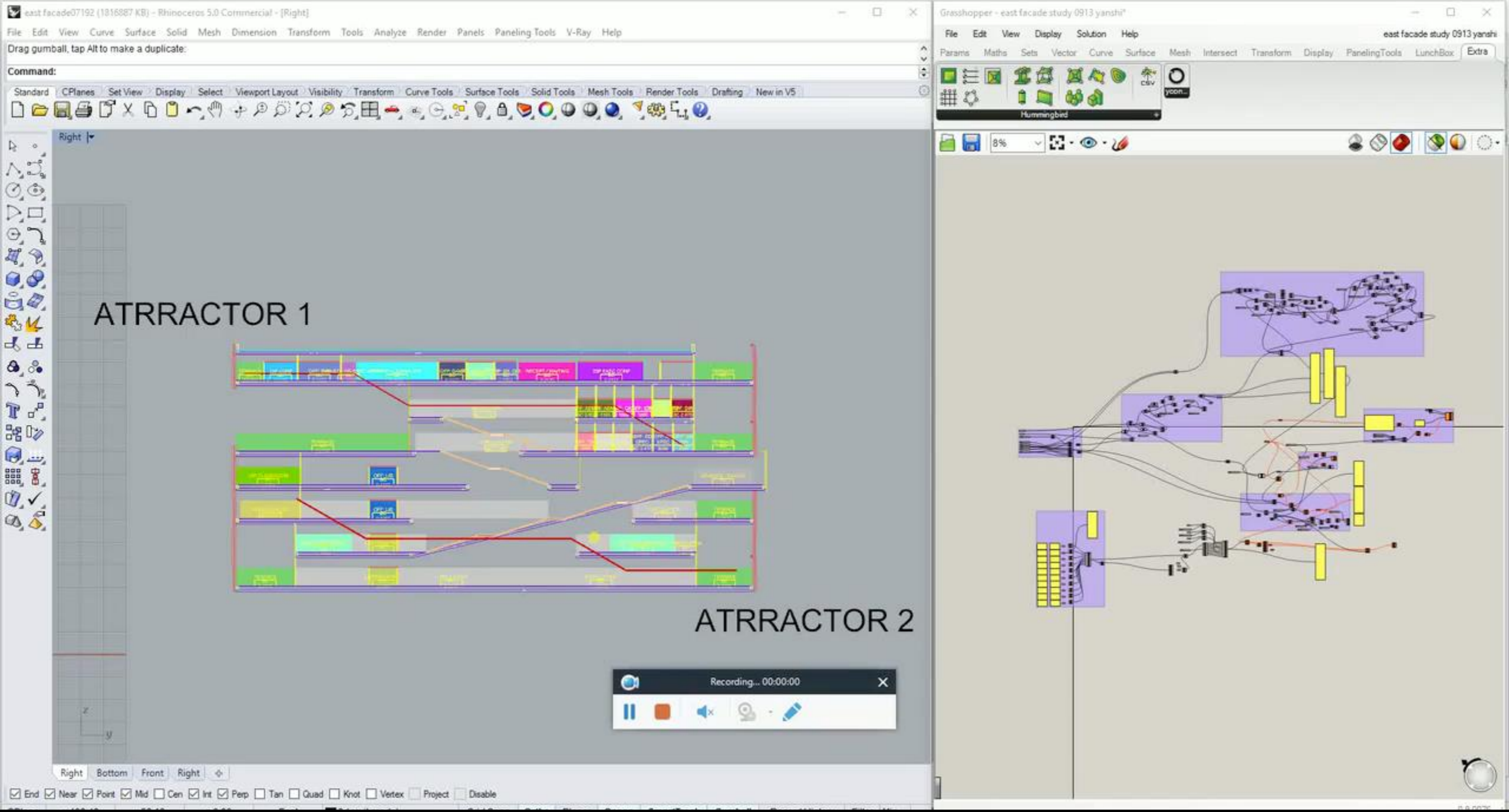
https://bouncingideas.wordpress.com/2011/12/14/learning-from-a-barrel-cactus/



Health Sciences Innovation Building / University of Arizona, Tucson

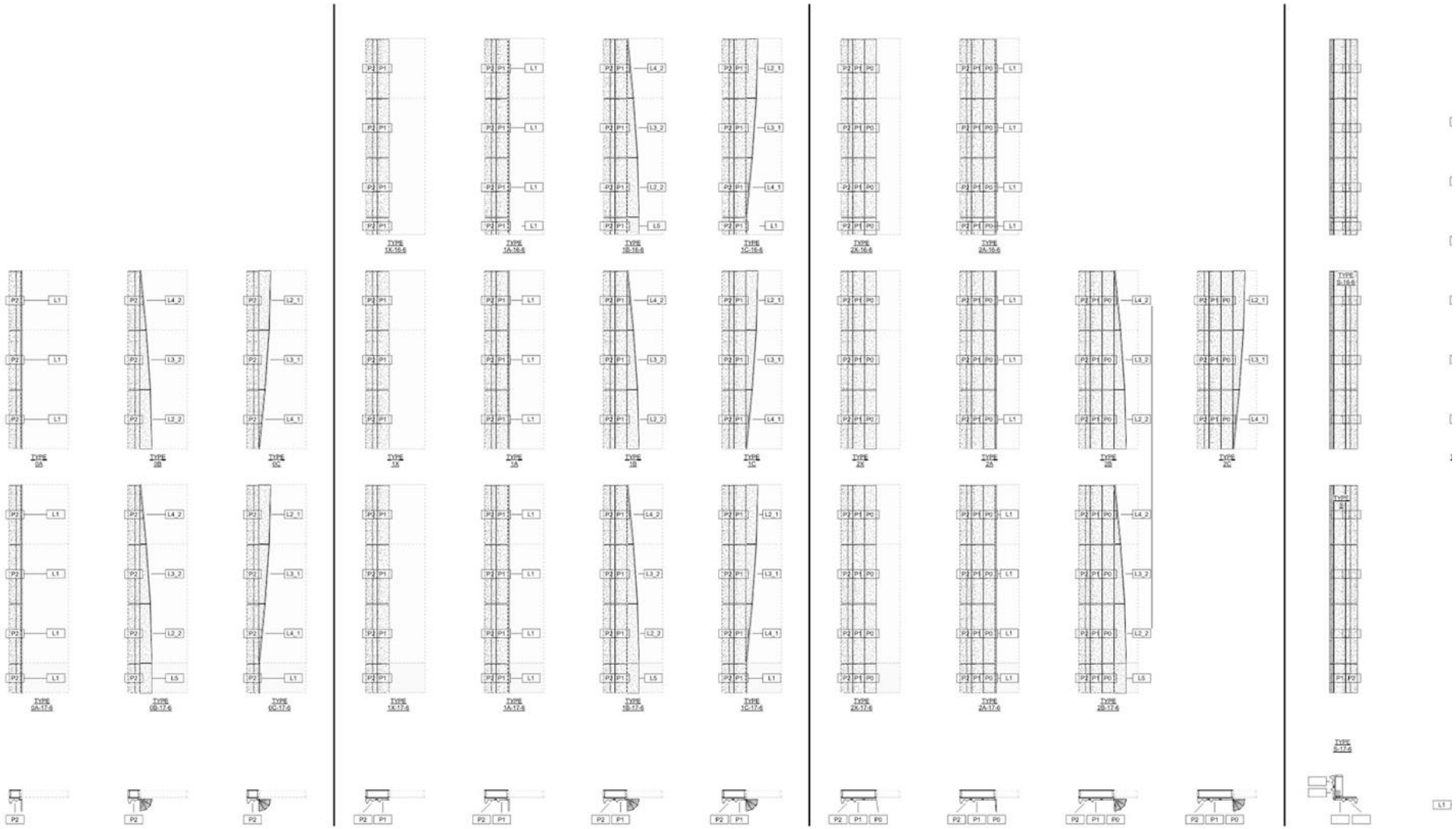
Terracota Façade – Attractor to generate the global pattern of openess





Health Sciences Innovation Building / University of Arizona, Tucson

Terracota Façade

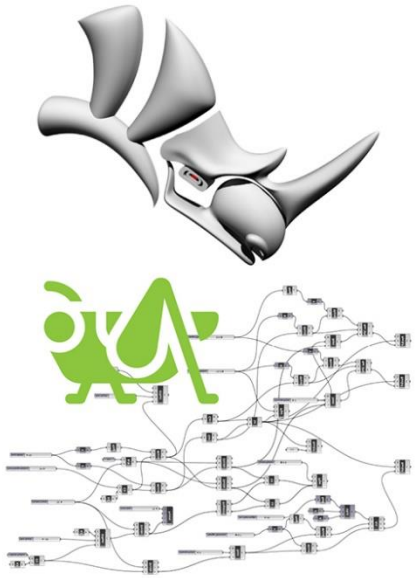


Design Interoperability

DESIGN

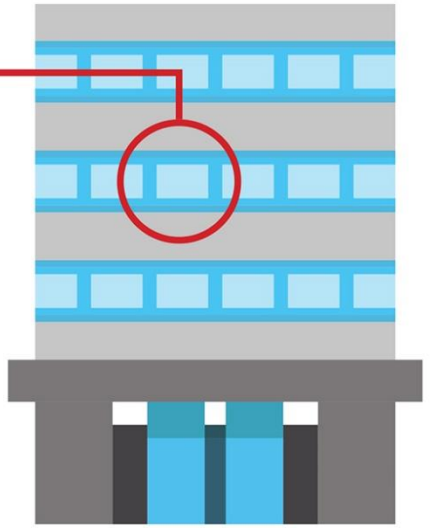
TRANSFERS

DOCUMENTATION

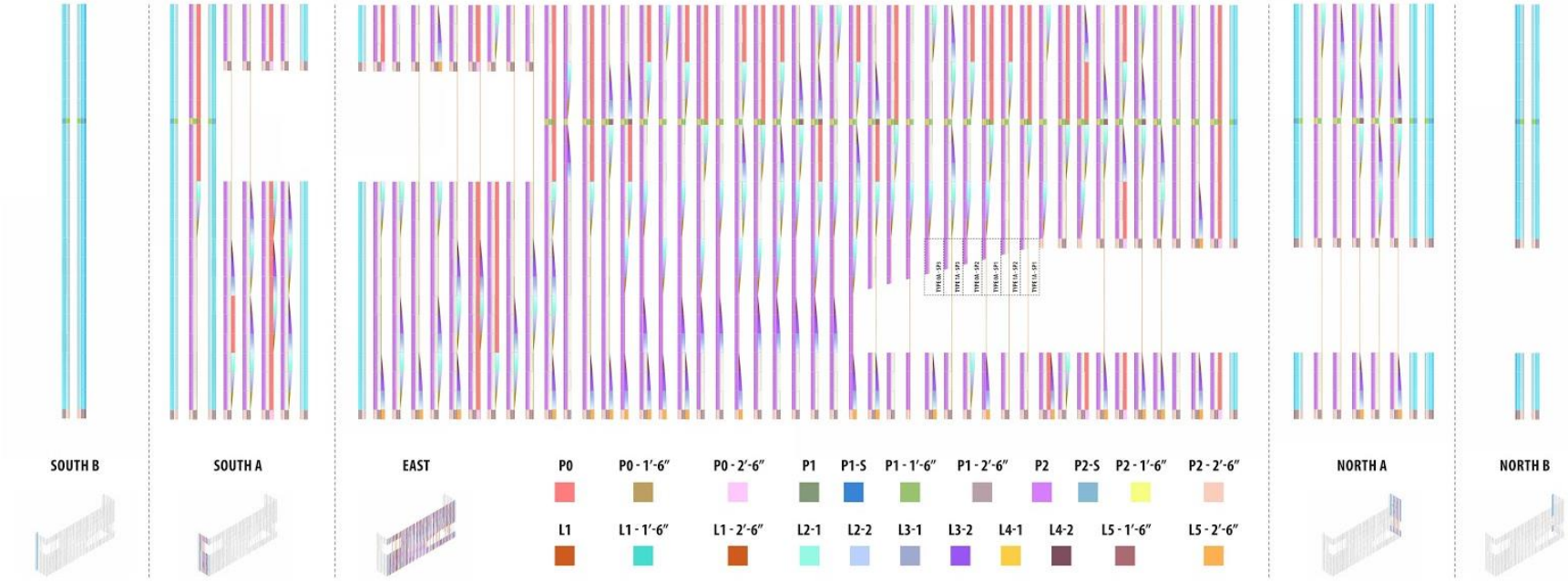


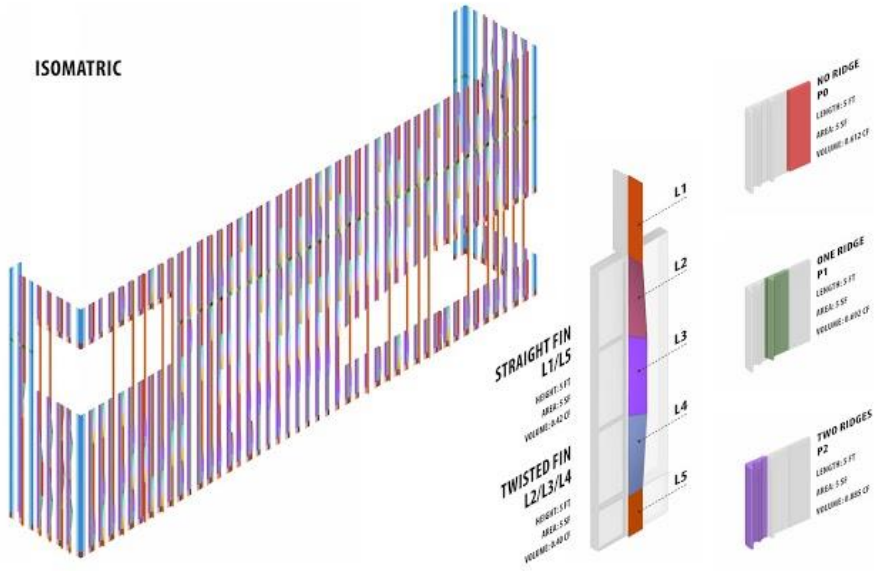
Rationalized Design Output

Panel Types List



Curtain Wall Panels


SOUTH B
SOUTH A
EAST
NORTH A
NORTH B
P0
P0 - 1'-6"
P0 - 2'-6"
P1
P1-S
P1 - 1'-6"
P1 - 2'-6"
P2
P2-S
P2 - 1'-6"
P2 - 2'-6"
L1
L1 - 1'-6"
L1 - 2'-6"
L2-1
L2-2
L3-1
L3-2
L4-1
L4-2
L5 - 1'-6"
L5 - 2'-6"


ISOMATRIC
STRAIGHT FIN
L1/L5
TWISTED FIN
L2/L3/L4
L1
L2
L3
L4
L5
NO RIDGE
P0
ONE RIDGE
P1
TWO RIDGES
P2

U of A - HSIB - Terra Cotta Matrix

Revised Date: 2016.11.28

Model Version - GMP 3 - 2016.11.22

Design Option - Primary

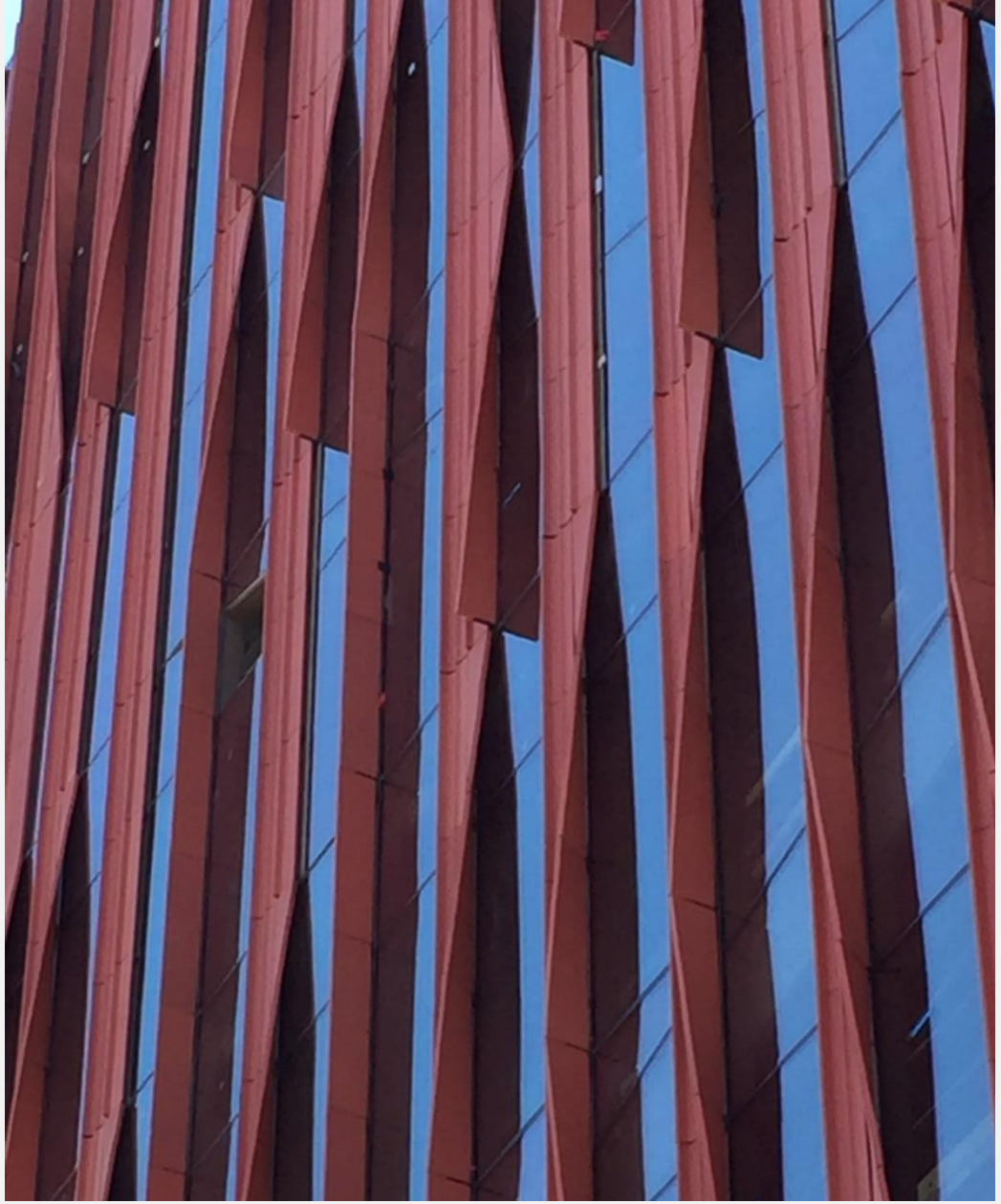
Window Module (ALL-IN-ONE) - Type Composition

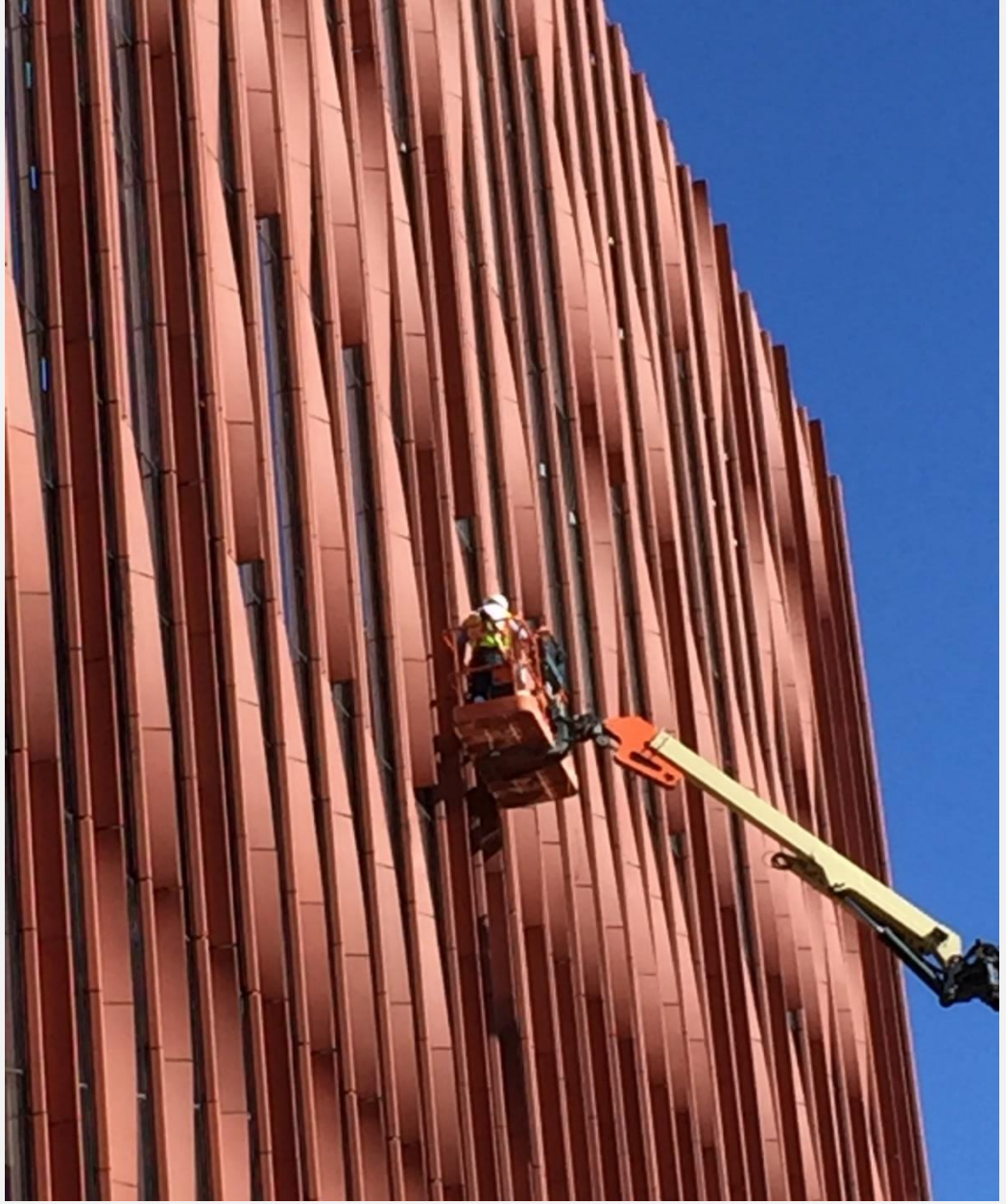
Type Name	Count	Straight Extrusion									Louvers												
		No Ridge			One Ridge			Two Ridges			Straight			Twisted						Straight		
		P0 - Full	P0 - 1'-6"	P0 - 2'-6"	P1 - Full	P1 - 1'-6"	P1 - 2'-6"	P2 - Full	P2 - 1'-6"	P2 - 2'-6"	L1 - Full	L1 - 1'-6"	L1 - 2'-6"	L2-1	L2-2	L3-1	L3-2	L4-1	L4-2	L1 - Full	L1 - 1'-6"	L1 - 2'-6"
Type 0A	31							3			3												
Type 0A - 17-6	1							0		1	0		1										
Type 0A - SP1	1							1			2												
Type 0A - SP2	1							1			2												
Type 0A - SP3	1							1			2												
Type 0B	10							3						1		1		1					
Type 0B - 17-6	5							1		1				1		1		1					1
Type 0C	18							3						1		1		1					
Type 0C - 16-6	1							0	1			1		1		1		1					
Type 0C - 17-6	3							0		1			1	1		1		1					
Type 1A	35				3			3			3												
Type 1A - 16-6	4				3	1		0	1		0	1											
Type 1A - 17-6	22				3		1	3		1	3		1										
Type 1A - SP1	1			1			1			1		1											
Type 1A - SP2	1				1			1			1												
Type 1A - SP3	1				2			2			2												
Type 1B	22				3			3						1		1		1					
Type 1B - 16-6	9				3	1		3	1					1		1		1			1		
Type 1B - 17-6	18				3		1	3		1				1		1		1					1
Type 1C	40				3			3							1		1		1				
Type 1C - 16-6	11				3	1		3	1			1			1		1						
Type 1C - 17-6	11				3		1	3		1			1		1		1						
Type 1D	31				3			3															
Type 1D - 16-6	10				3	1		3	1														
Type 1D - 17-6	10				3		1	3		1													
Type 2A	1	1			3			3			3												
Type 2A - 17-6	5	1		1	3		1	3		1	3		1										
Type 2B	2	1			3			3						1		1		1					
Type 2B - 17-6	1	1		1	3		1	3		1				1		1		1					1
Type 2C	5	1			3			3						1		1		1					
Type 2D	20	1			3			3															
Type 2D - 16-6	11	1	1		3	1		3	1														
Type 2D - 17-6	7	1		1	3		1	3		1													
Type L	7										6												
Type L - 15	1										1												
Type L - 20	1										1												
Type L - 21-6	1										0		1										
Type L - 27-6	10										5		1										
Type S	12				6			6															
Type S - 16-6	4				0	2		0	1														
Type S - 17-6	2				0		2	0		2													
Sub Total	347	171	11	13	1005	51	96	1155	53	194	347	17	51	67	67	67	67	67	67		9	26	
Grand Total	3567																						

Terra Cotta Needed

Type Name	Straight Extrusion									Louvers												
	No Ridge			One Ridge			Two Ridges			Straight			Twisted						Straight		
	P0 - Full	P0 - 1'-6"	P0 - 2'-6"	P1 - Full	P1 - 1'-6"	P1 - 2'-6"	P2 - Full	P2 - 1'-6"	P2 - 2'-6"	L1 - Full	L1 - 1'-6"	L1 - 2'-6"	L2-1	L2-2	L3-1	L3-2	L4-1	L4-2	L1 - Full	L1 - 1'-6"	L1 - 2'-6"
Type 0A							33			33												
Type 0A - 17-6							3		1	3		1										
Type 0A - SP1							2			2												
Type 0A - SP2							2			2												
Type 0A - SP3							2			2												
Type 0B							80						13		13		13					
Type 0B - 17-6							33		5				5		5		5					5
Type 0C							54						18		18		18					
Type 0C - 16-6							8	1			1		1		1		1					
Type 0C - 17-6							6		2			2	2		2		2					
Type 1A							105			105												
Type 1A - 16-6							12	4		12	4											
Type 1A - 17-6							66		22	66		22	22									
Type 1A - SP1							1			1												
Type 1A - SP2							1			1												
Type 1A - SP3							2			2												
Type 1B							66			66			22		22		22					
Type 1B - 16-6							27	9		27	9		9		9		9			9		
Type 1B - 17-6							54		18	54		18	18		18		18					18
Type 1C							120			120			60		60		60					
Type 1C - 16-6							33	11		33	11		11		11		11					
Type 1C - 17-6							36		12	36		12	12		12		12					
Type 1D							96			96												
Type 1D - 16-6							30	10		30	10											
Type 1D - 17-6							54		18	54		18										
Type 2A	3						3			3												
Type 2A - 17-6	9		3				9		3	9		3										
Type 2B	6						6			6			2		2		2					
Type 2B - 17-6	3		1				3		1	3		1	1		1		1					1
Type 2C	9						9			9			3		3		3					
Type 2D	87						87			87												
Type 2D - 16-6	33	11					33	11		33	11											
Type 2D - 17-6	21		7				21		7	21		7										
Type L													42									
Type L - 15													1									
Type L - 20													8									
Type L - 21-6													0		1							
Type L - 27-6													10		10							
Type S							72			71												
Type S - 16-6							18	6		18	6											
Type S - 17-6							12		14	12		14										
Elevation Area (sq.ft)	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1.5	1	1.5	1	1.5	1	1.5	2.5	
Sub Total	855	16.5	30	5025	76.5	240	5715	78	480	5195	25.5	127.5	435	335	435	335	435	335		13.5	65	
Grand Total	16628																					
Length (ft)	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1	1	1	1	1		2.5	2.5	
Sub Total	855	16.5	30	5025	76.5	240	5715	78	480	5195	25.5	127.5	435	335	435	335	435	335		13.5	65	
Grand Total	16628																					
Volume (cu.ft)	0.613	0.176	0.321	0.692	0.199	0.33	0.685	0.255	0.435	0.473	0.122	0.288	0.4	0.395	0.395	0.395	0.395	0.395		0.122	0.208	
Sub Total	304.452	1.936	3.913	695.86	10.149	32.64	1832.18	13.26	95.24	183.911	2.074	10.608	34.87	26.47	34.87	26.47	34.87	26.47		1.098	8.992	
Grand Total	2273.7																					

JLG ULTRA BOOM





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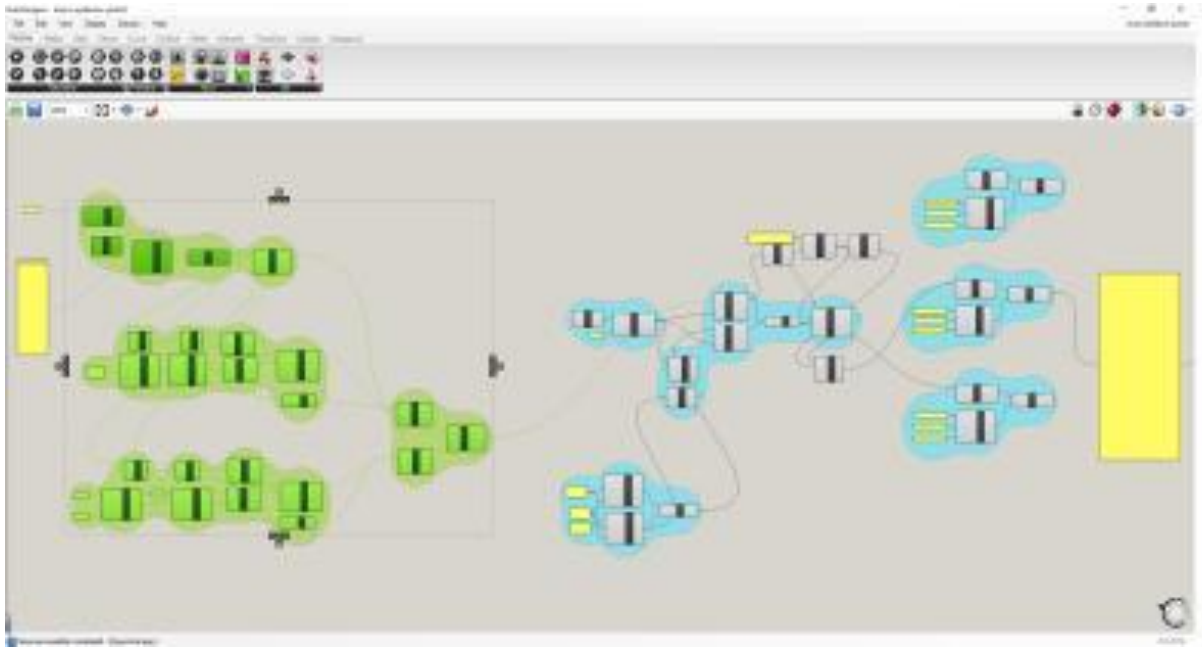
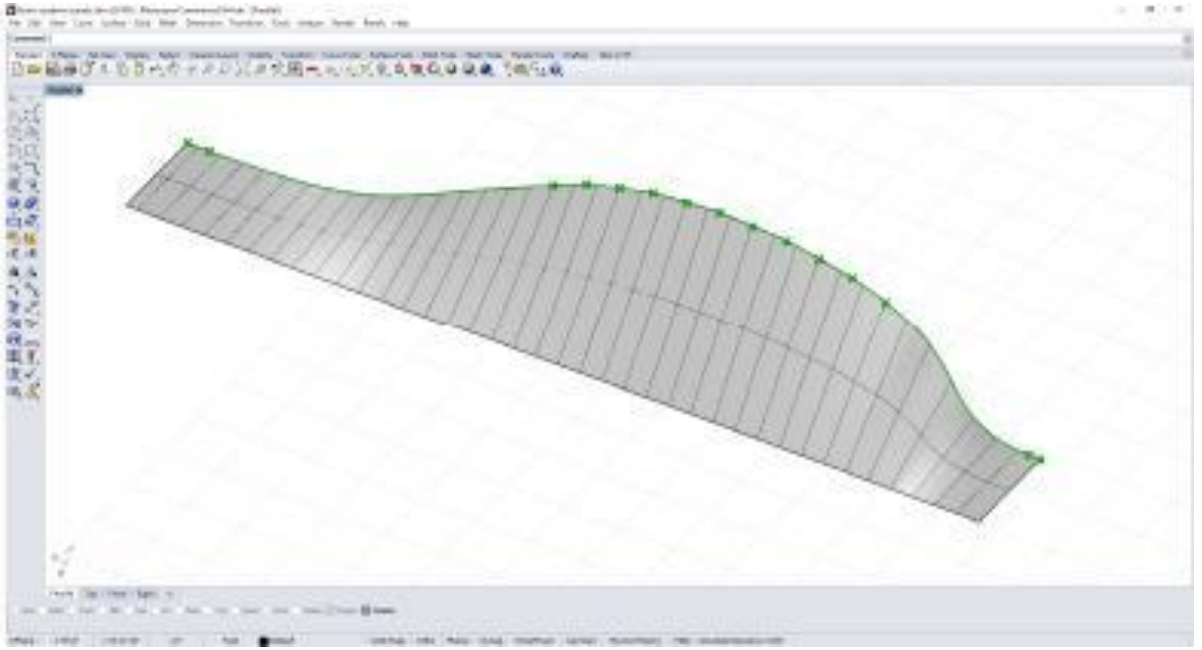
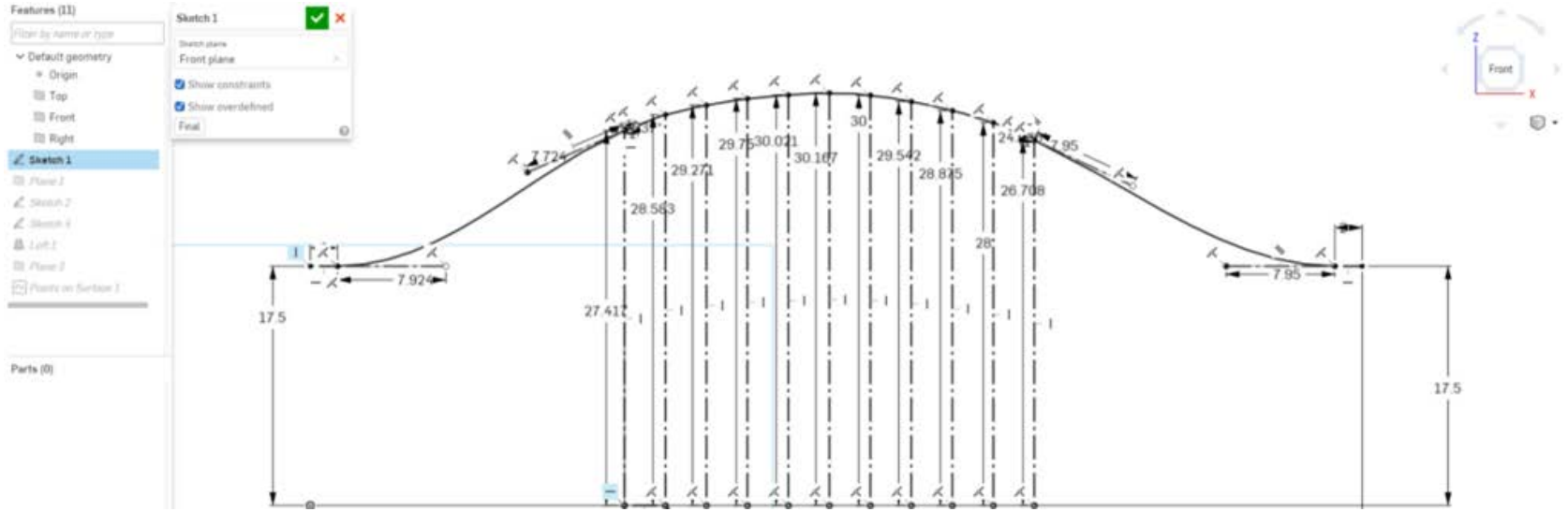
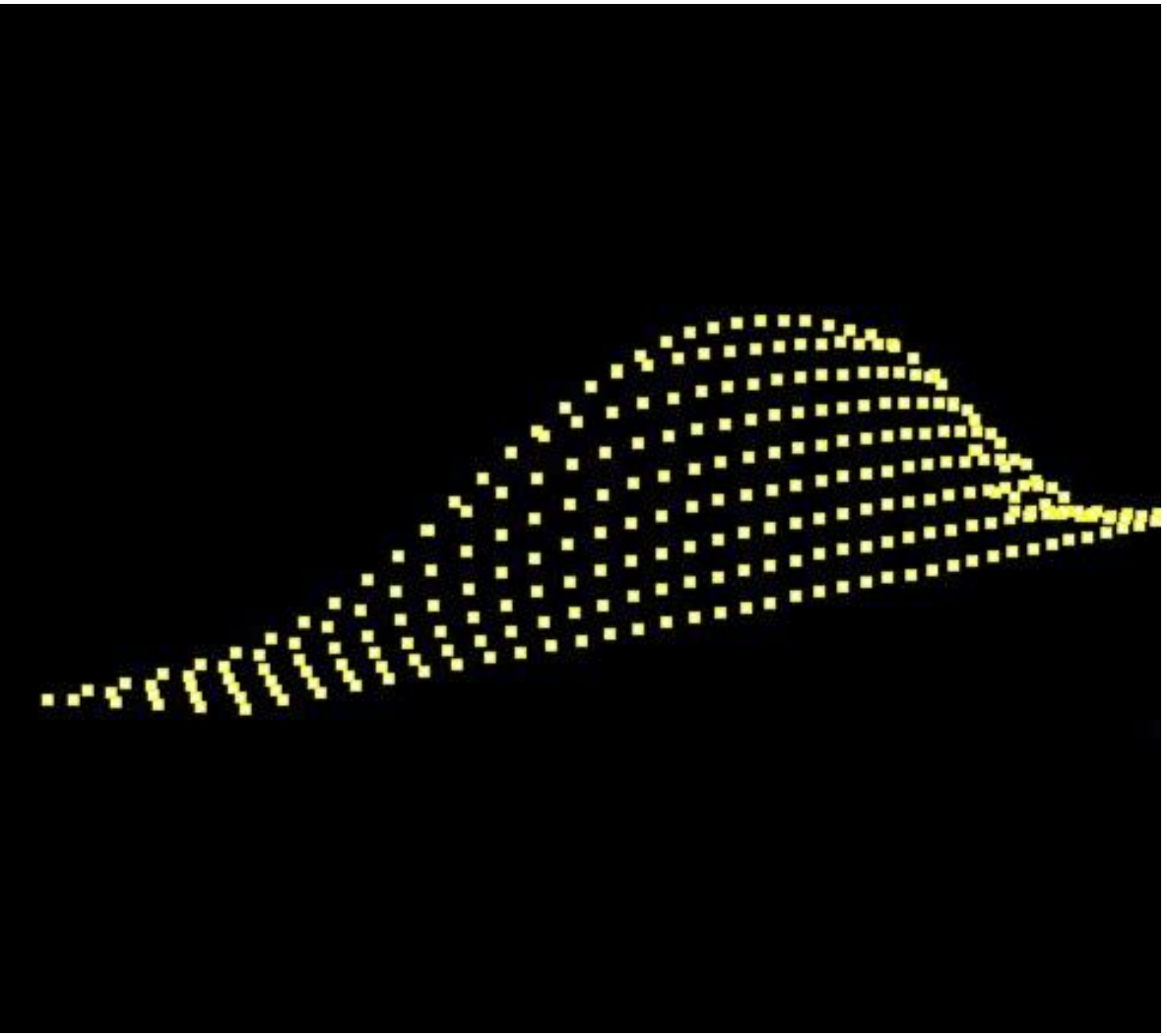





Features (11)
Default geometry
Origin
Top
Front
Right
Sketch 1
Sketch 1
Front plane
Show constraints
Show overdefined
Final
Parts (0)
Front
7.724
29.271
28.563
29.75
30.021
30.167
30
29.542
28.835
26.708
7.95
7.924
17.5
27.412
17.5



=

kumc-eyebrow-points.xls...

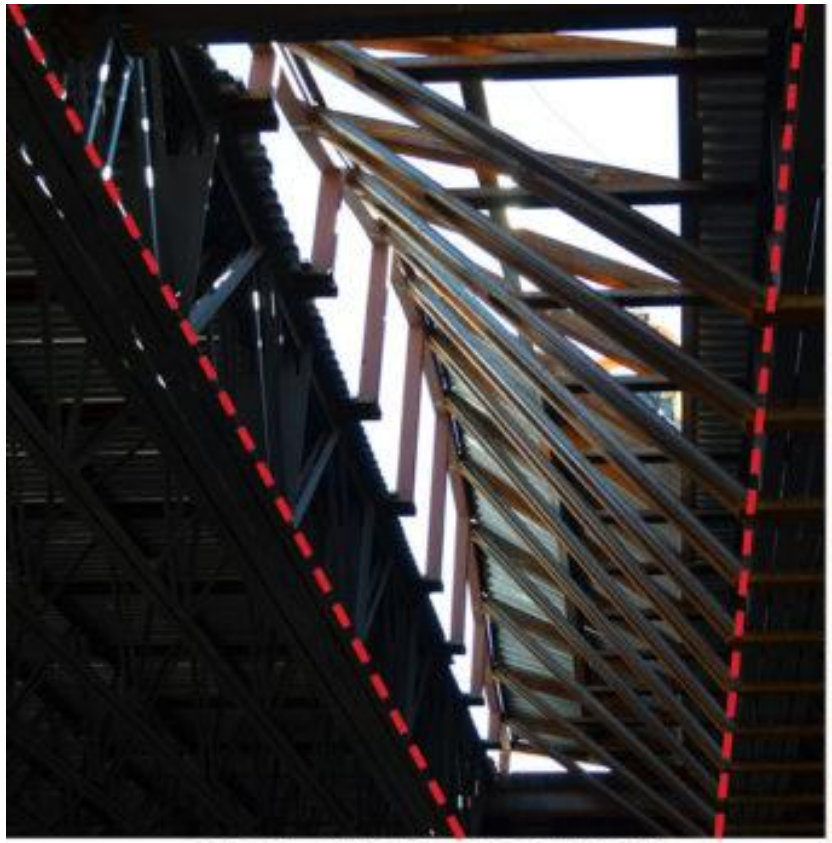
FILE | HOME | INSERT | PAGE L | FORMU | DATA | REVIEW | VIEW | Nuri Miller

A2 | 0

	A	B	C	D	E	F
1	X	Y	Z			
2	0	0	0.177083			
3	0	2	0.177083			
4	0	4	0.177083			
5	0	6	0.177083			
6	0	8	0.177083			
7	0	9.15625	0.177083			
8	-2	-0.00073	0.177082			
9	-2	1.999252	0.185332			
10	-2	3.999235	0.193582			
11	-2	5.999218	0.201833			
12	-2	7.999201	0.210083			
13	-2	9.15552	0.214853			
14	-4	-0.008229	0.176892			
15	-4	1.989611	0.269826			

eyebrow-north

READY 100%



Steel Super Structure

2’ T-Grid System

Gypsum Board to Receive Acoustic Foam and (3) Layers of Plaster

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What We Have Learned

01

Financial Investments are necessary, but Scalable.

02

Focus on People and problems, not tools.

03

Set tone, empower others and change will be organic.

What To Consider

- Consider your data expertise
- Define research for your practice
- Try a “low-risk” digital expert (intern)
- Leverage open source tools

Thank you!