

The UW Capital Projects Office and NW Construction Consumer Council

Present:

*“Changing Project Delivery at the UW through
Innovation, Integration, and Adoption of MC/CM and EC/CM”*

PACCAR Hall, the Gordon Kloft Classroom

June 22, 2011

UW Bothell, Phase 3

BRINGING IT ALL TOGETHER!

Integration of the Project Team – Part 2

- Will Dann – THA Architecture
- Troy Bloedel – Lease Crutcher Lewis
- Steve Tatge – University of Washington

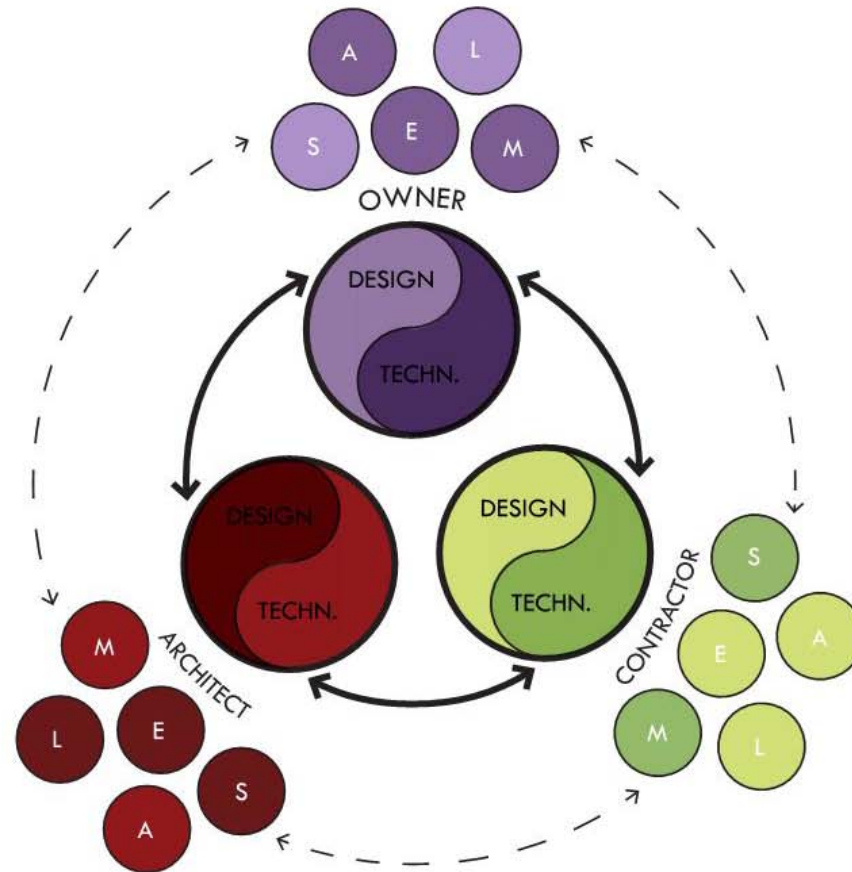
Presentation outline

- Integrated Project Delivery (like) Process
 - Contract
 - Three-leg Stool
 - Project Principles
- Project Scope
- Case Study
- Lessons Learned

Contract Considerations

- Adapt Standard UW Contract to Collaborative Process
- Defined “Project Partners”
 - “collaborative and cooperative”
- Mandated Building Information Modeling
- Participation in GCCM, MCCM & ECCM selection
- Simplified Attachment B- Design Document Requirements
- Reduced Attachment C – Document Review Process to single page!

Three Leg Stool



UW Technical Lead

Architect

Project Manager
|
Project Architect
|
Consultants

GCCM

Project Manager
|
Superintendent
|
Sub Contractor

Client

Project Manager
|
Technical Lead
|
Facilities Resources

Project Principles

- Objective:
 - Increase project quality and decrease project costs through collaboration, innovative thinking and use of technology

- Tenants:
 - Promote Partnership
 - Streamline Processes
 - Embrace Innovation

- Principles:
 - Trust your partners
 - Promote collaboration without duplication
 - Allow the process to serve the project, not constrain it
 - Embrace and reward innovation

Project Overview

Program:

- Science Technology Engineering and Math Focus
- Laboratories, Classrooms and Faculty Offices
- 75,000 GSF, \$41M construction cost, \$68M TPC

Schematic Design Goals

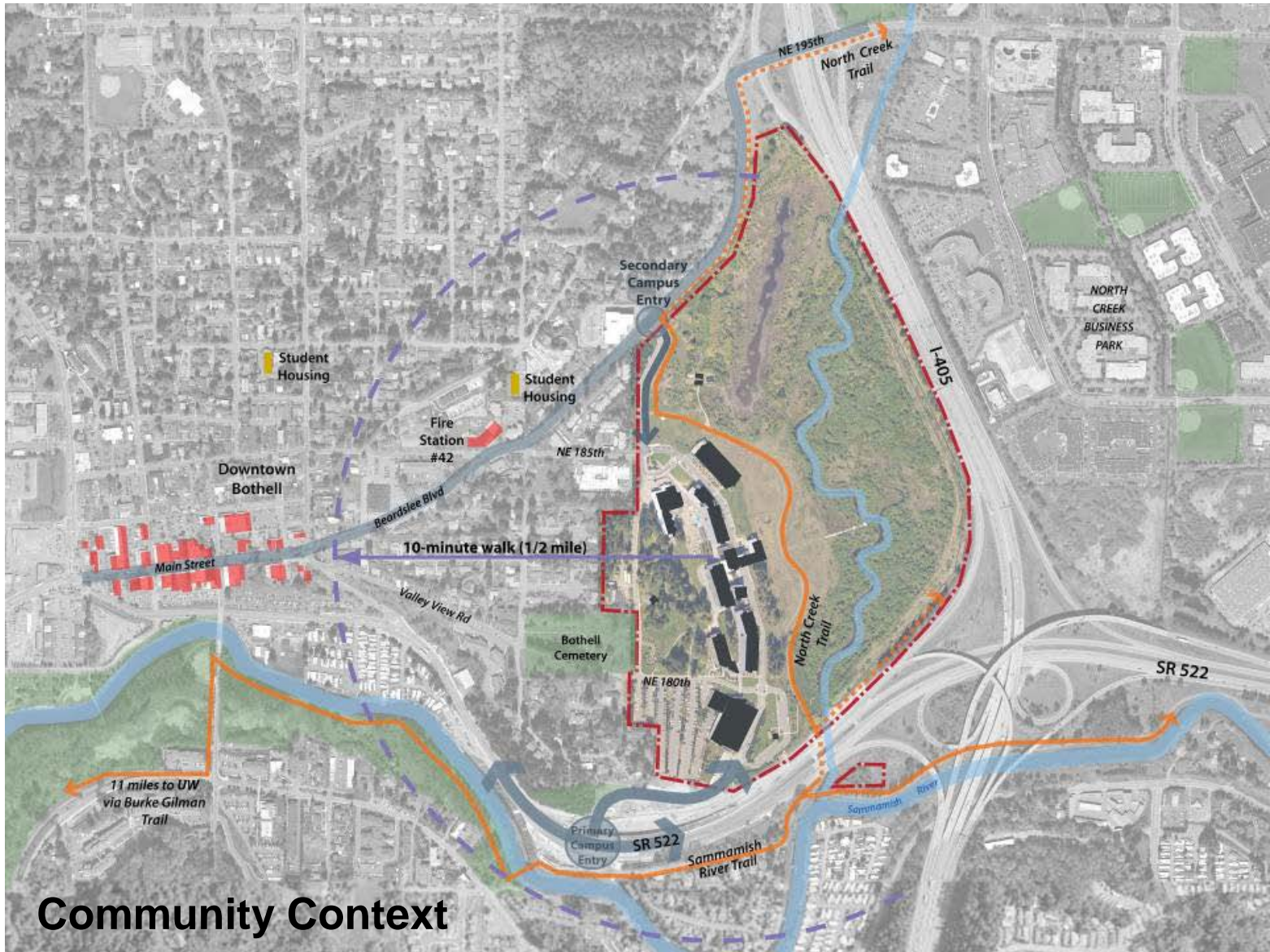
Dynamic, **Collaborative**, Student Centered and Community Oriented

Highly **Visible** and **Approachable** Science

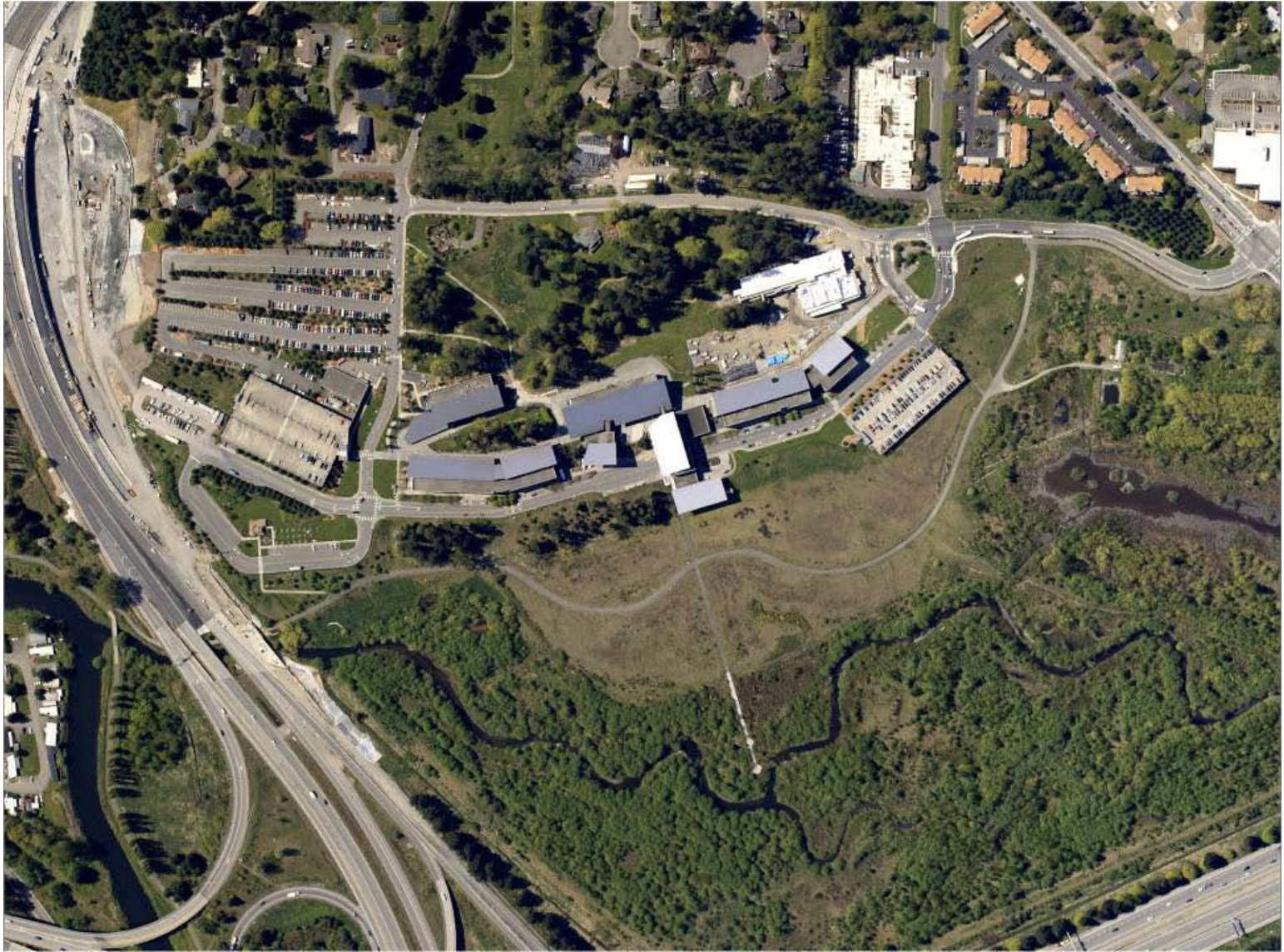
Building and Site as **Demonstration** of Science and Technology

Model **Sustainable** and **Healthful** Environment

Expression of **Architectural Diversity** on Campus



Community Context



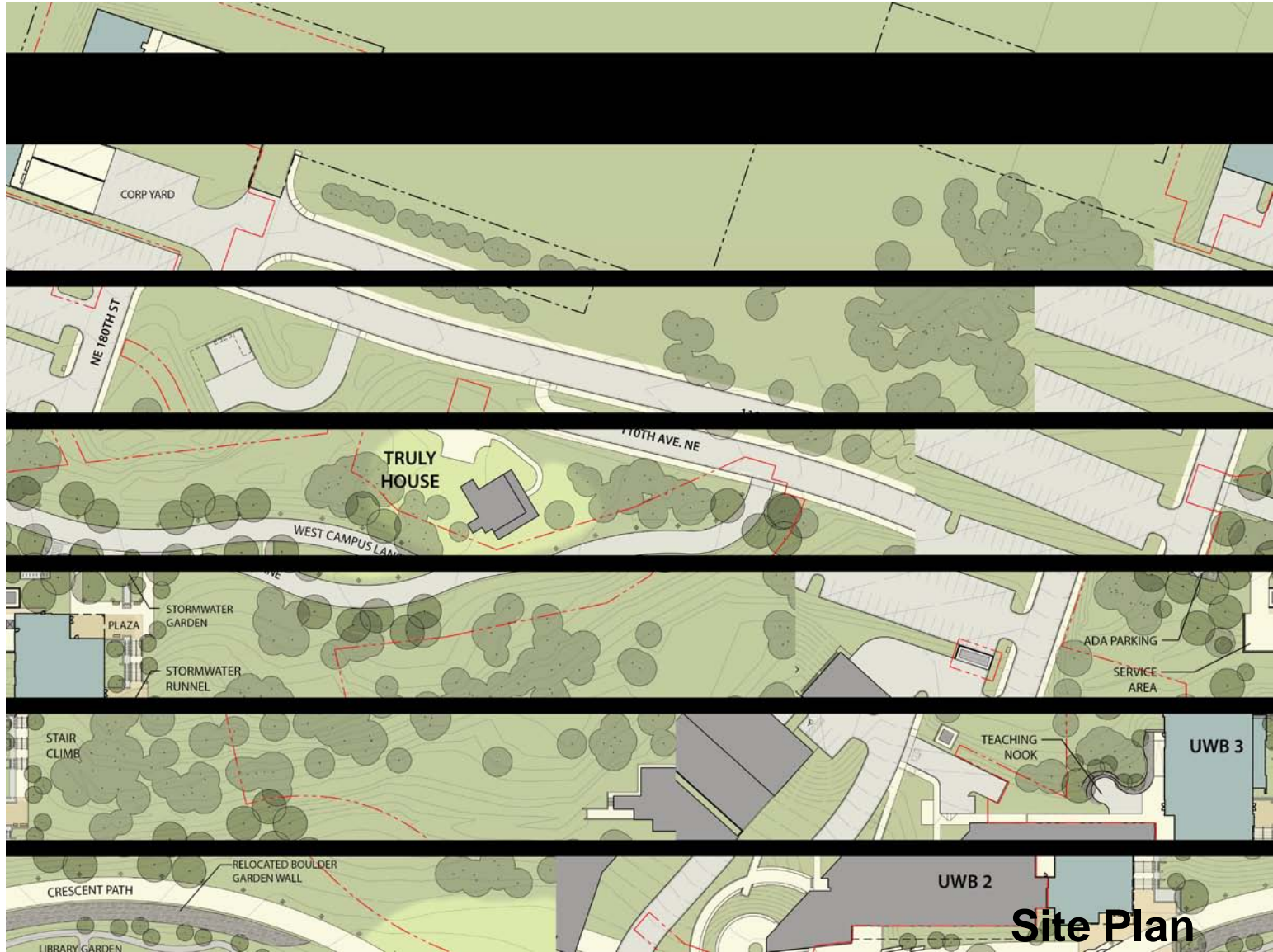
Slide 11







UWB Phase 3 Site Photos

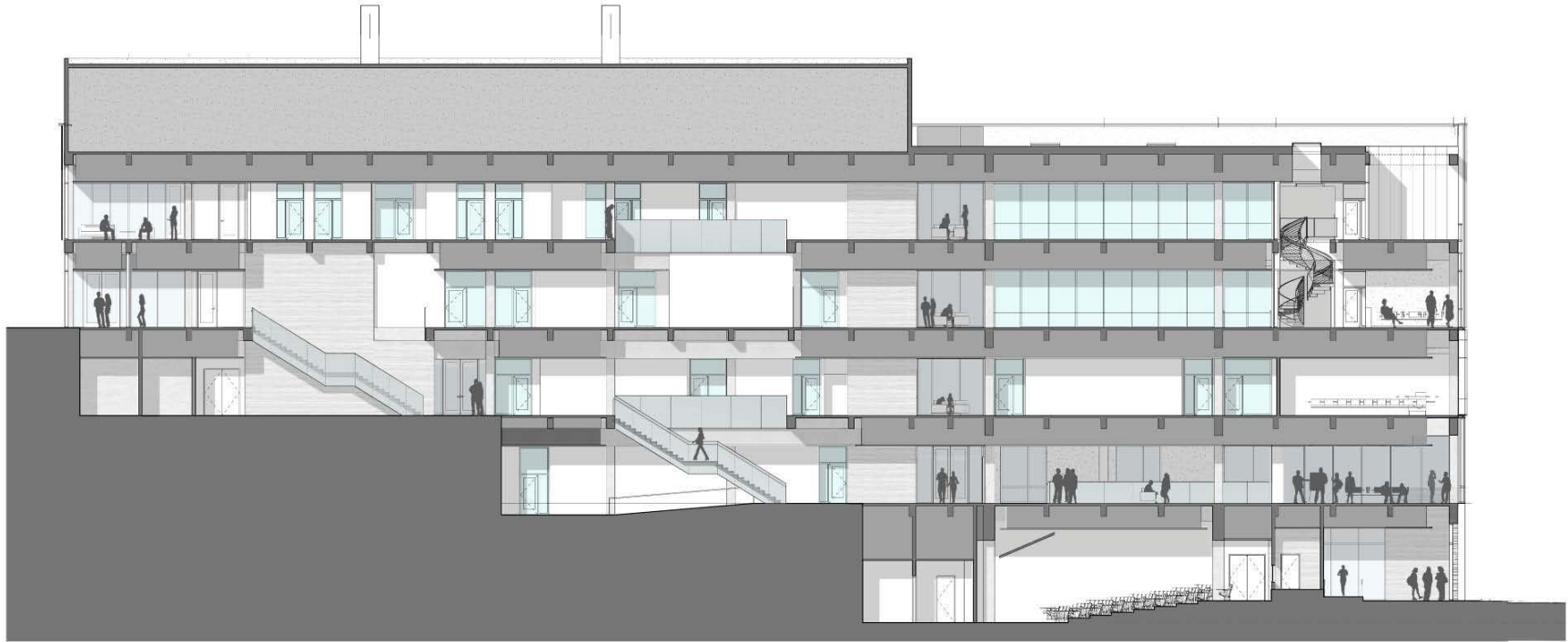


Site Plan

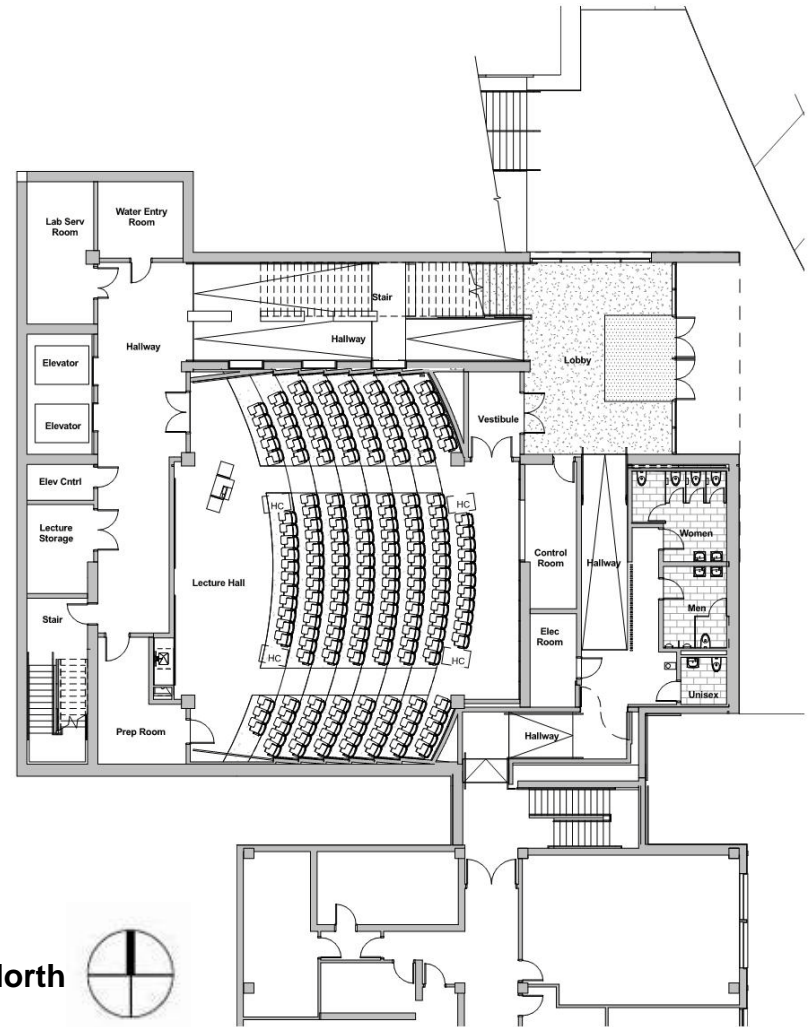








Building Section Looking North

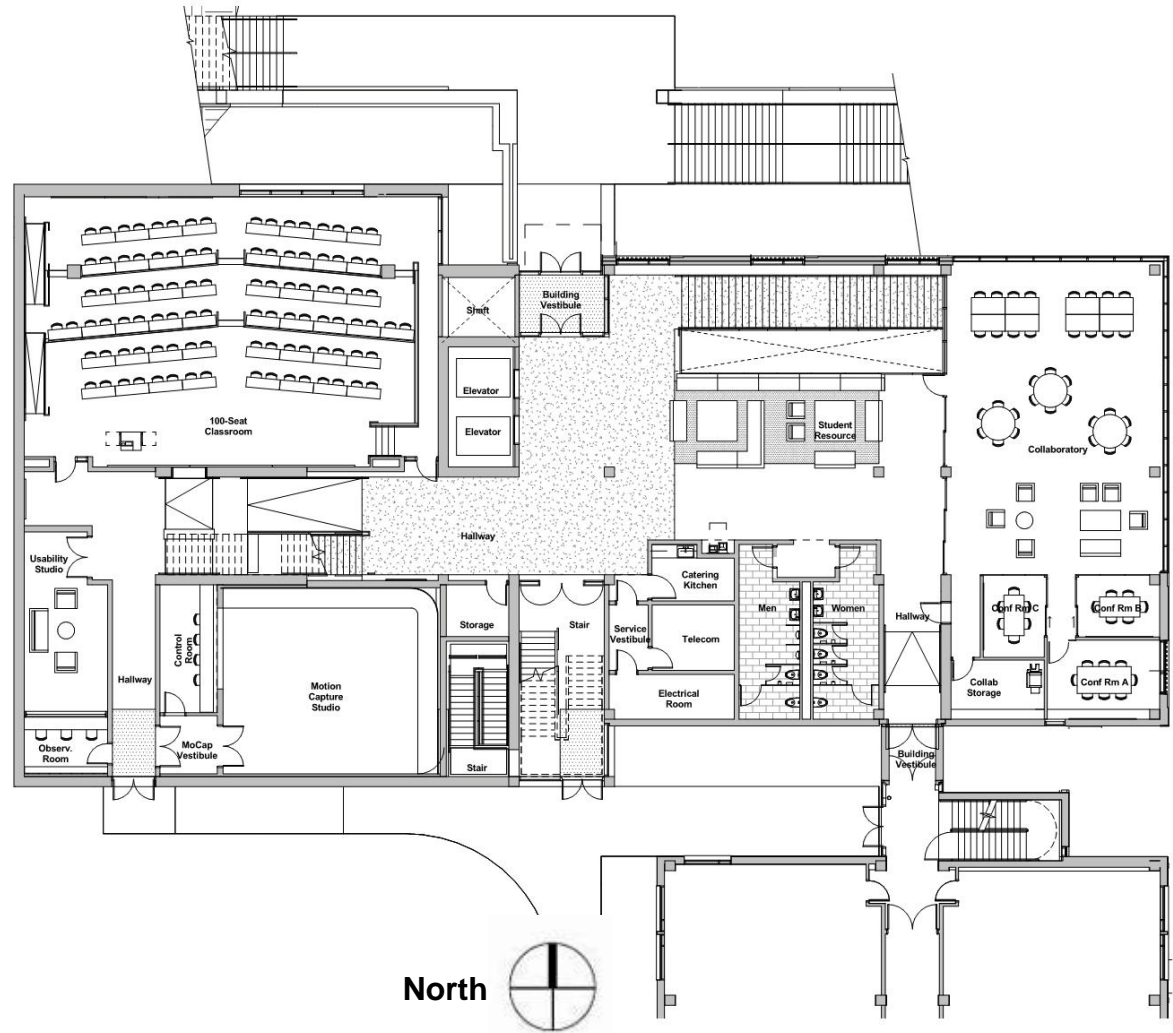


Lower Level





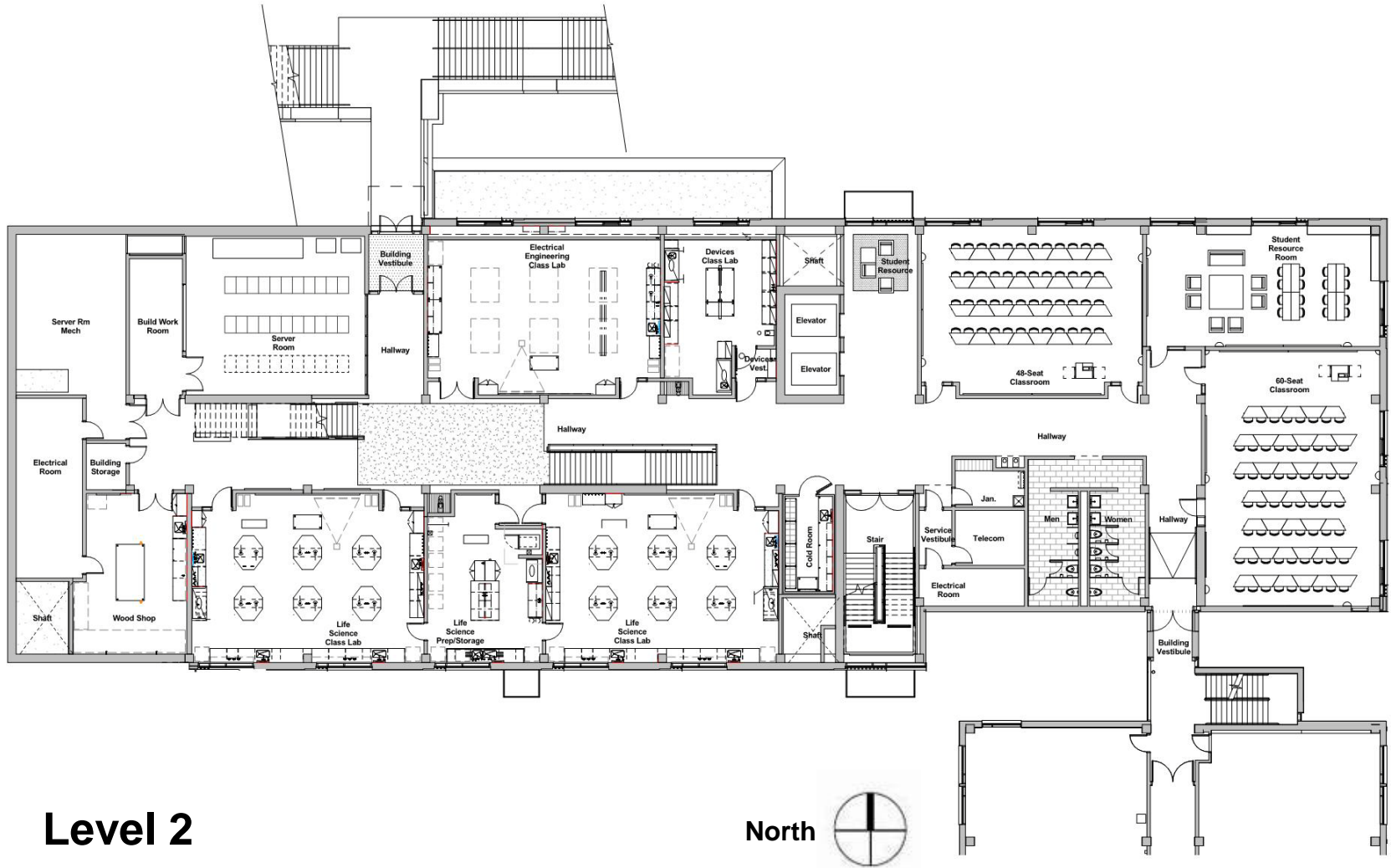
Lower Level Lobby



Level 1

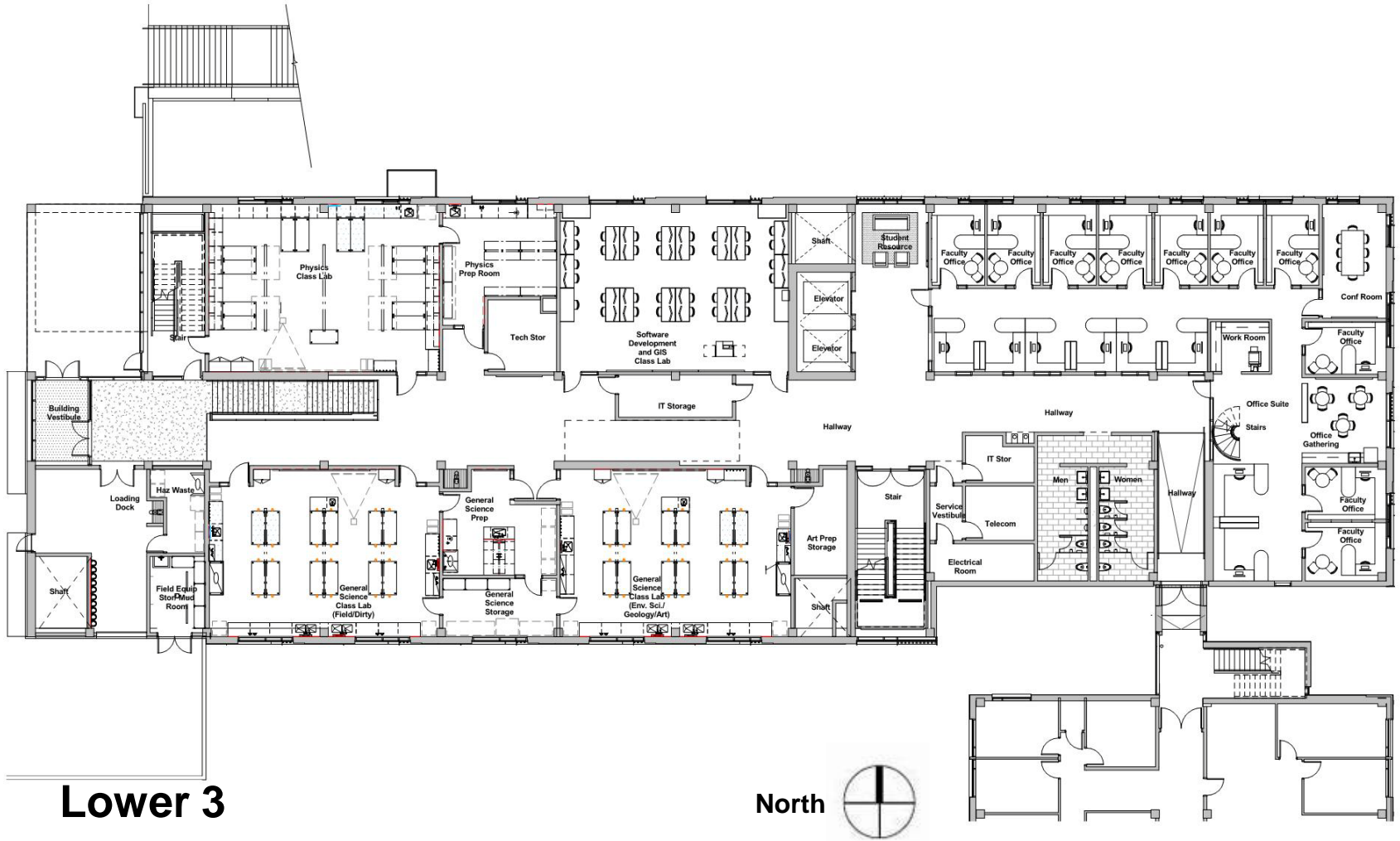


Level 1 Student Resource



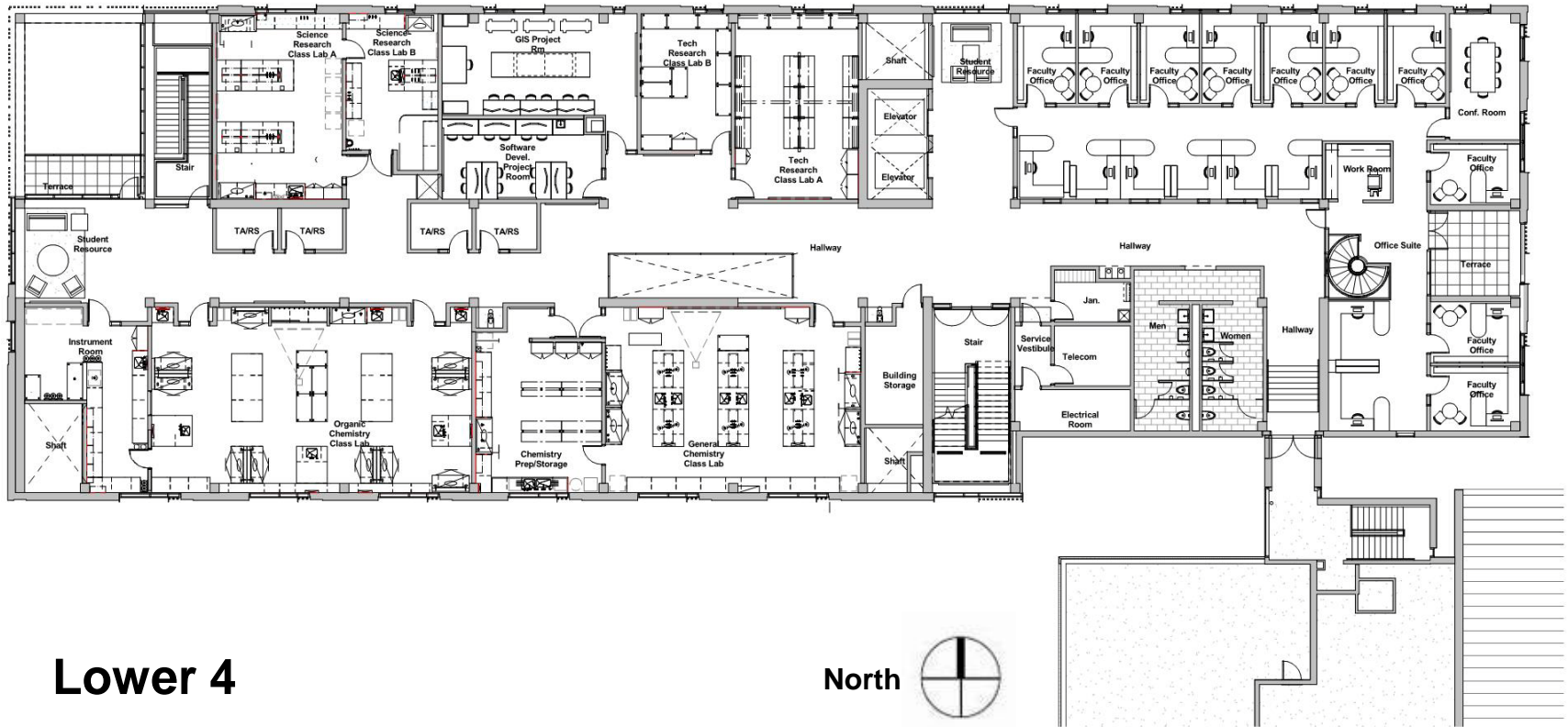
Level 2





Lower 3

North



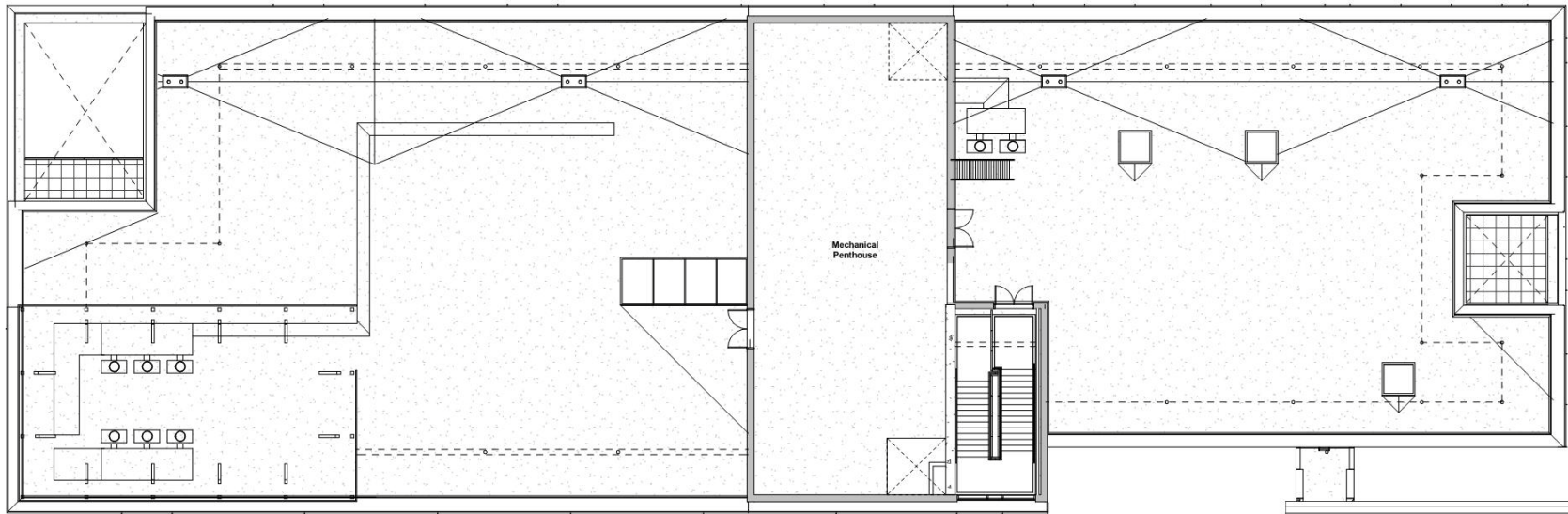
Lower 4

North

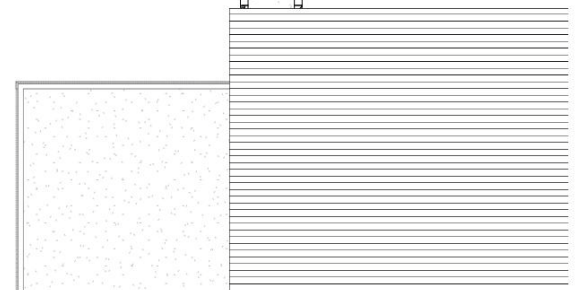




Level 4 – Color



Mechanical Penthouse Level



Team Integration Schedule

- GCCM – selected mid-Schematic Design
- MCCM-ECCM – selected mid-Design Development

Integration Venues

- Building Committee Meetings
- User meetings
- Technical review meetings
- Integrated Design Workshops
 - Approximately every other week DD and CD
- Systems workshops (Skin, Penthouse, Server Room)
- Site tours
- Budget reconciliation workshops
- Impromptu phone calls, and Go-To Meetings

Case Study

Design Concept

Ground Plane
Structural Frame
Skin System

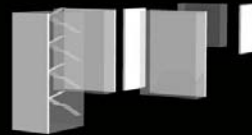
Building Anatomy



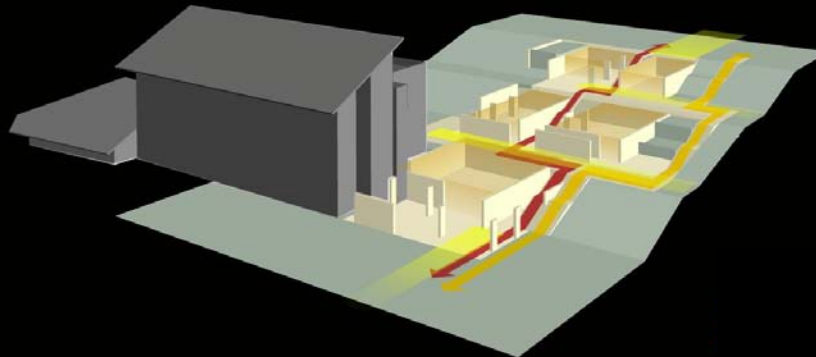
Skin



Frame



Vertical Circulation



Site

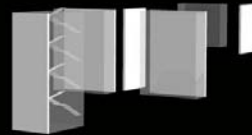
Building Anatomy



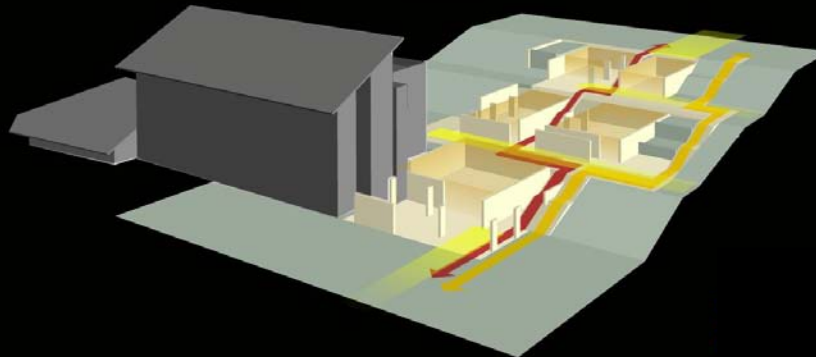
Skin



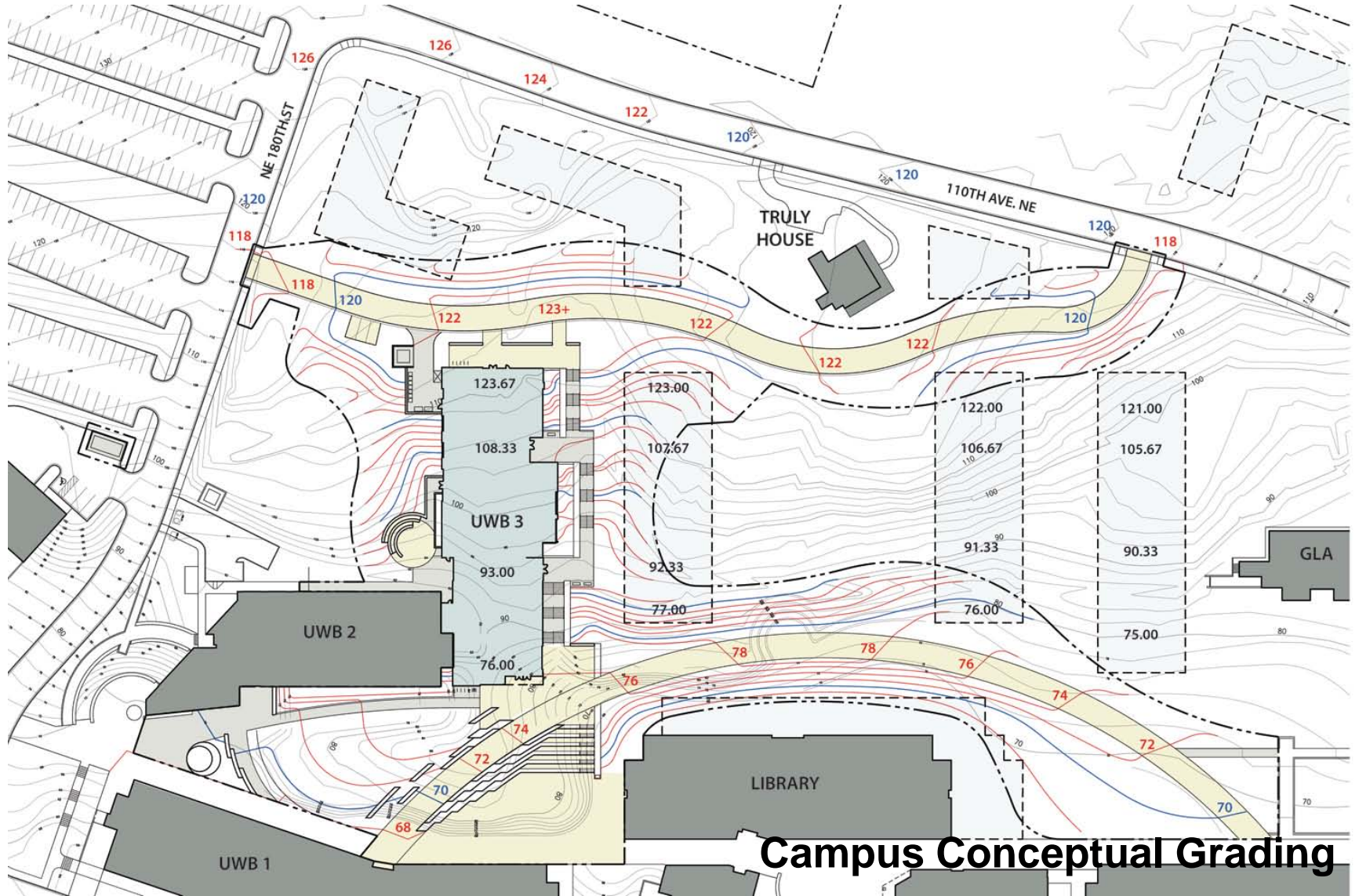
Frame



Vertical Circulation



Site



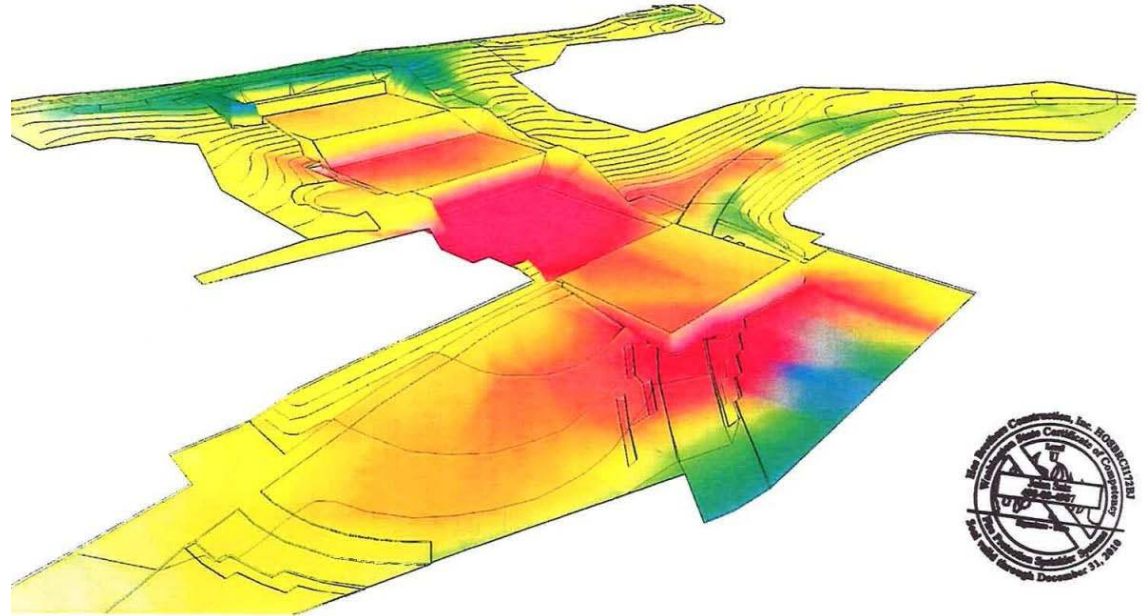
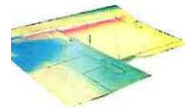
Campus Conceptual Grading

SD Balancing Cut and Fill

EARTHWORK SUMMARY BREAKDOWN

last layback

AREA	QUANTITY	UNIT
CORP YARD		
12" STRIPPING	765	TCY
CUT	1081	BCY
FILL	2741	BCY
NET SHORTFALL	1660	BCY
BUILDING PAD		
12" STRIPPING	2020	TCY
CUT	11,333	BCY
FILL	557	BCY
EXCESS MATERIAL	10,776	BCY
SITE		
12" STRIPPING	7280	TCY
CUT	8312	BCY
FILL	12056	BCY
NET SHORTFALL	3744	BCY
WEST CAMPUS LANE		
12" STRIPPING	1402	TCY
CUT	75	BCY
FILL	1427	BCY
NET SHORTFALL	1352	BCY
TOTALS		
12" STRIPPING	11467	TCY
CUT	20,801	BCY
FILL	16781	BCY
EXCESS MATERIAL	4,020	BCY



10-099 UWB Phase 3

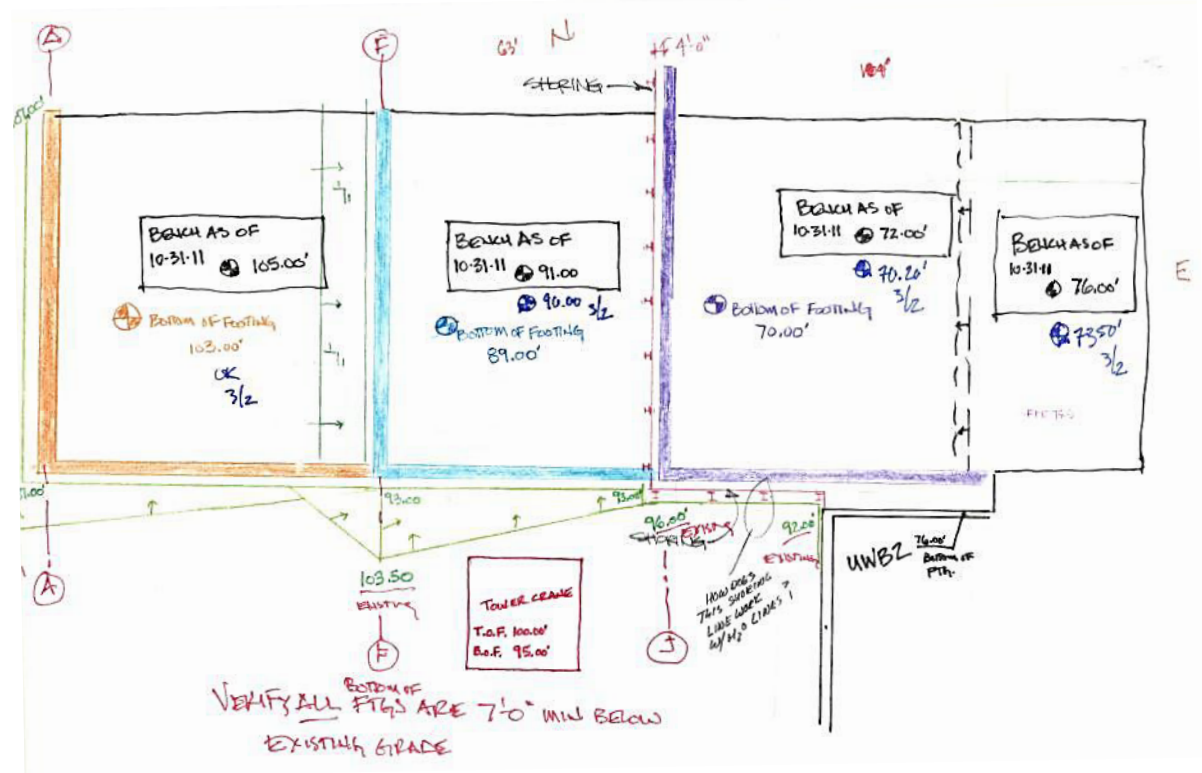
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Schematic Design Foundation Benching & Shoring

- Identified need to confirm (e) utilities at UWB2, UWB3 corridor.
- Identified potential conflict with UWB2 footing.

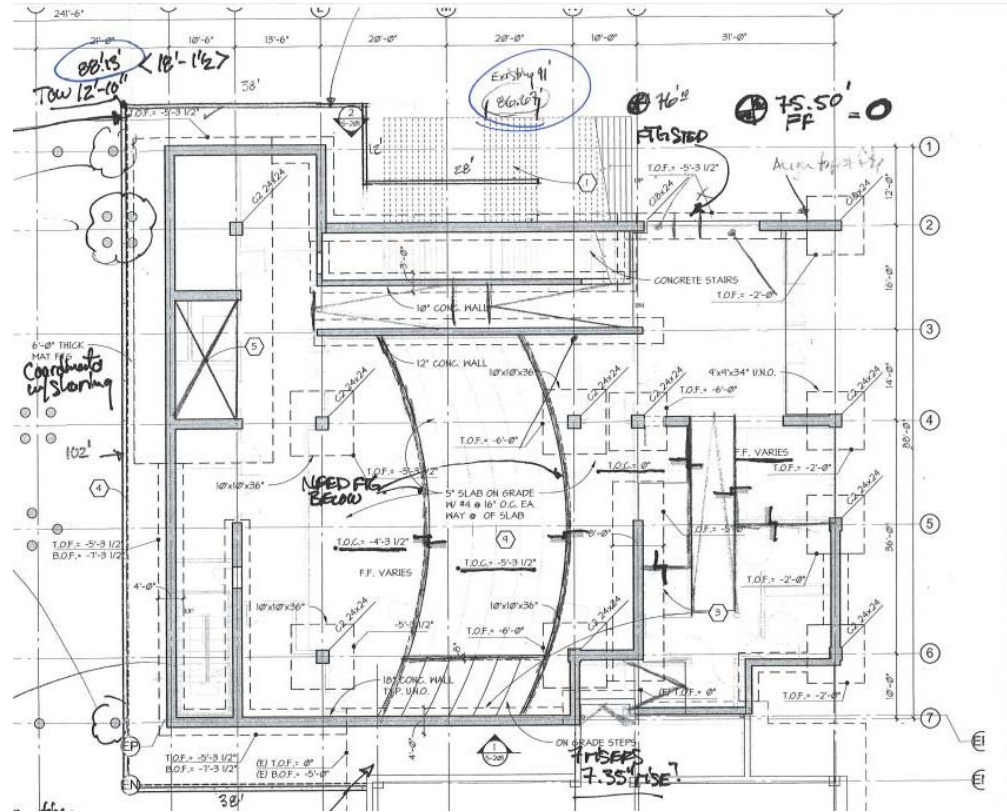
As-Built drawing was incorrect. Field investigation led to moving UWB3 two feet North.



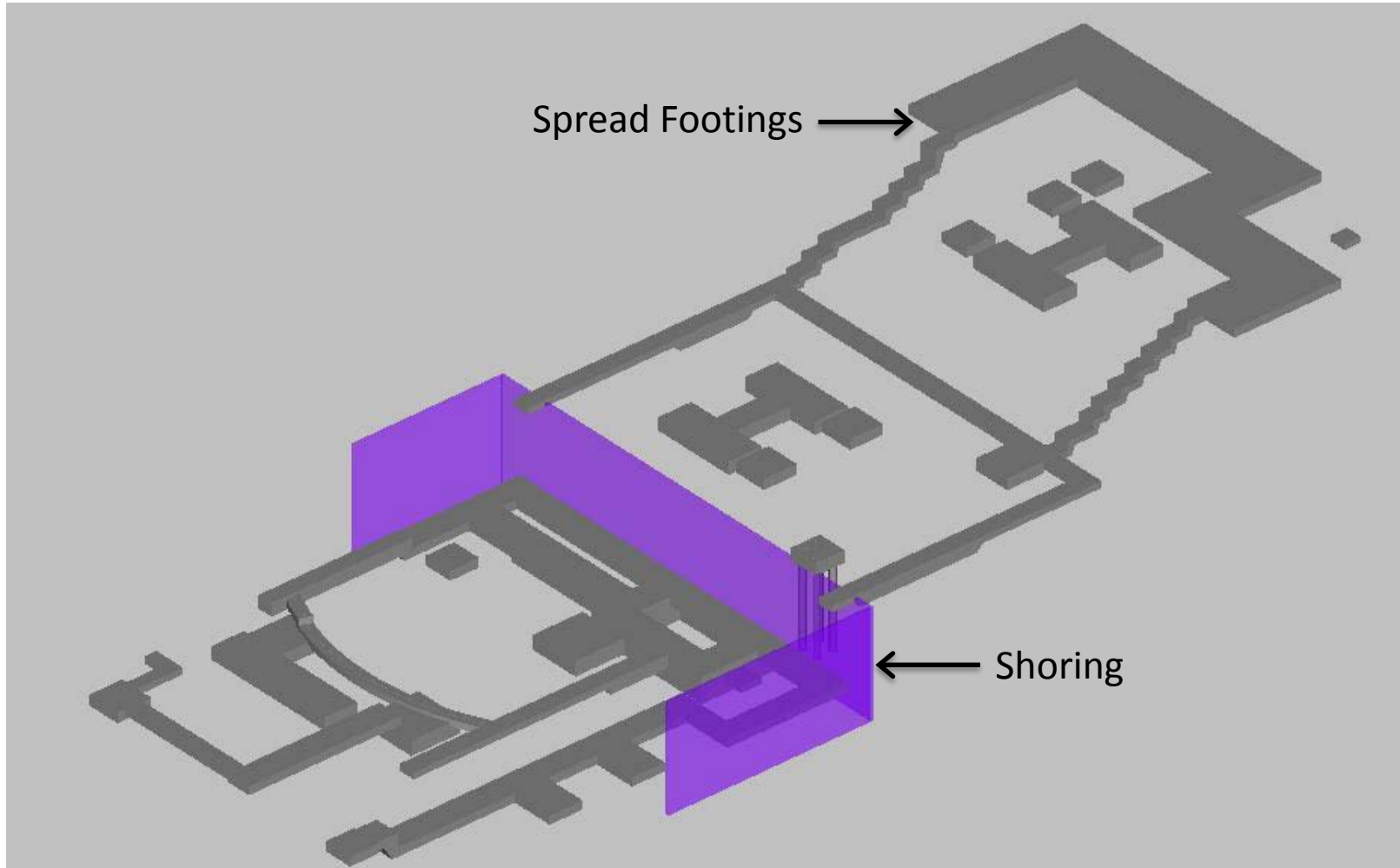
50% DD Foundation Plan

- Initial design incorporated pile foundations and spread footings.

- Result – Revised benching elevations to eliminate pile foundations.
- Coordinated UWB2 & UWB3 foundation elevations.

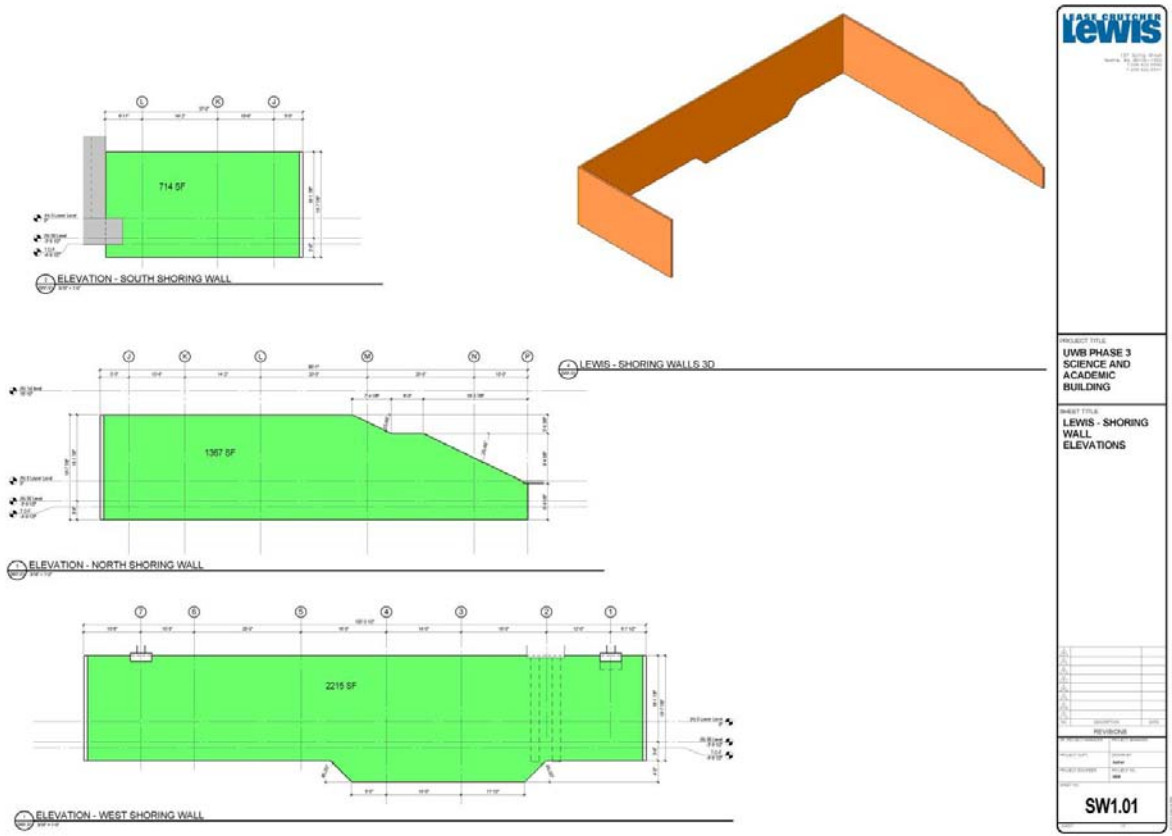


50% DD Foundation Plan



50% DD Foundation Plan

- Image – Revit model of coordinated shoring plan utilities for estimating and constructability.



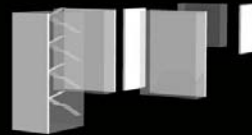
Building Anatomy



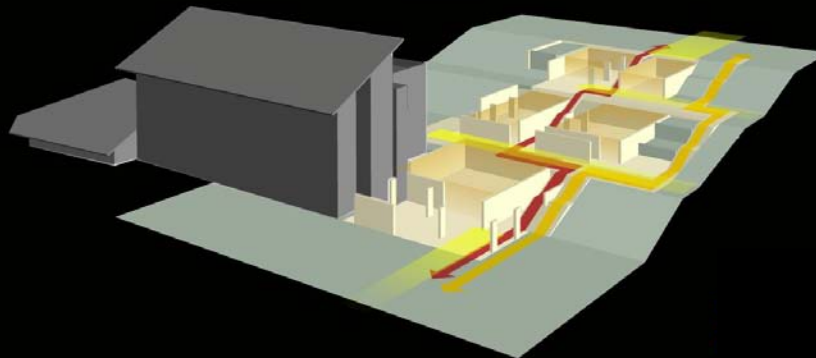
Skin



Frame

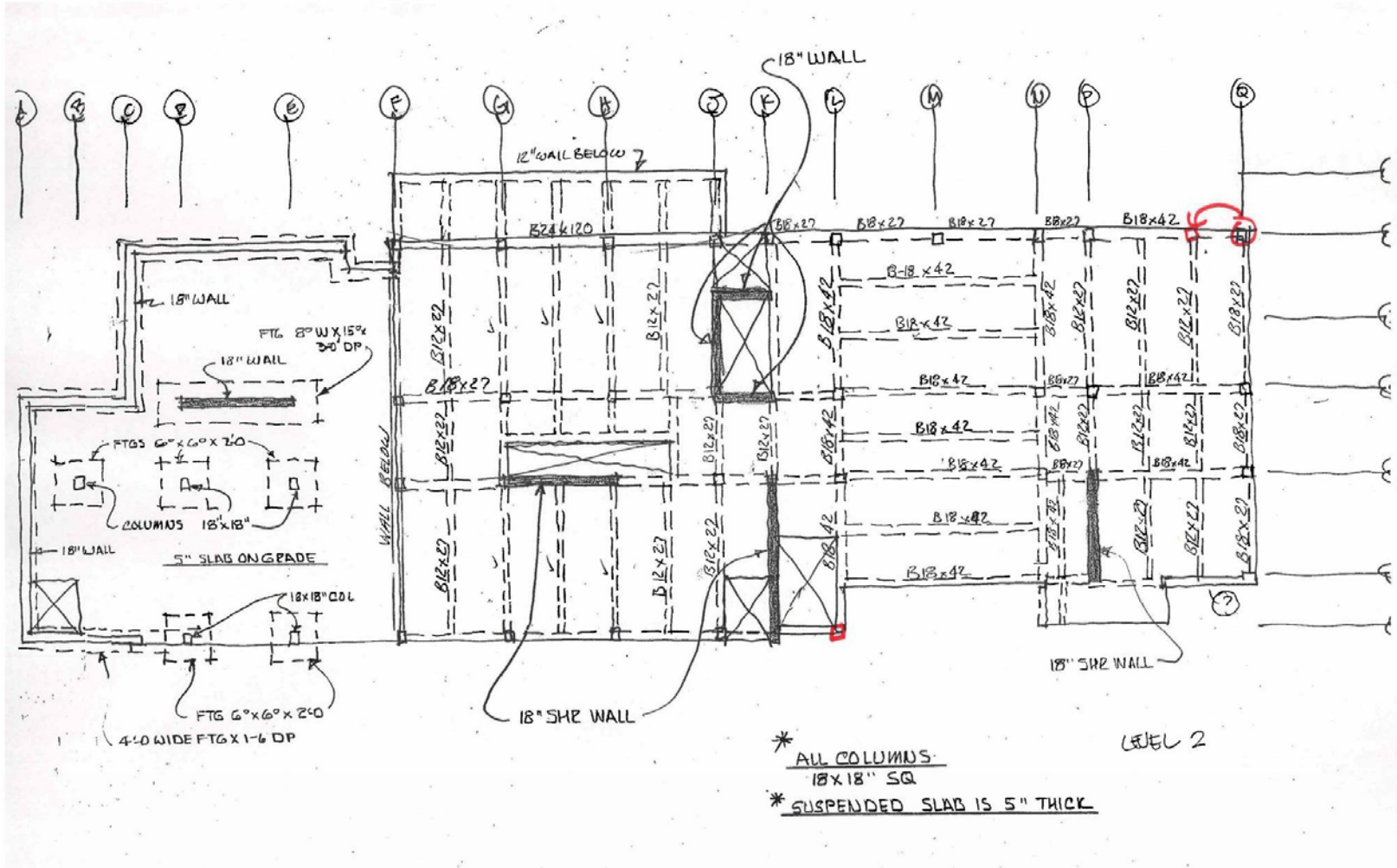


Vertical Circulation

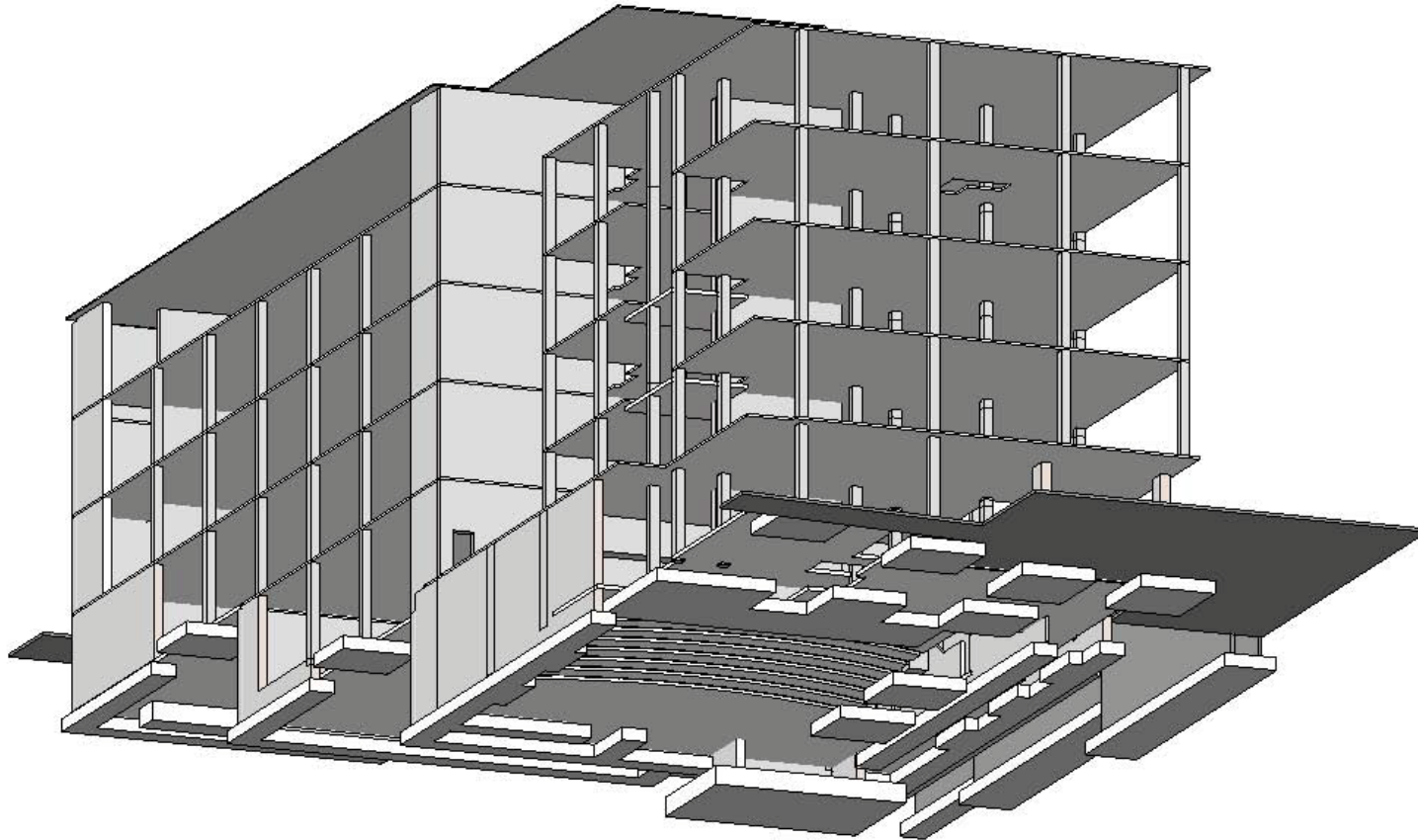


Site

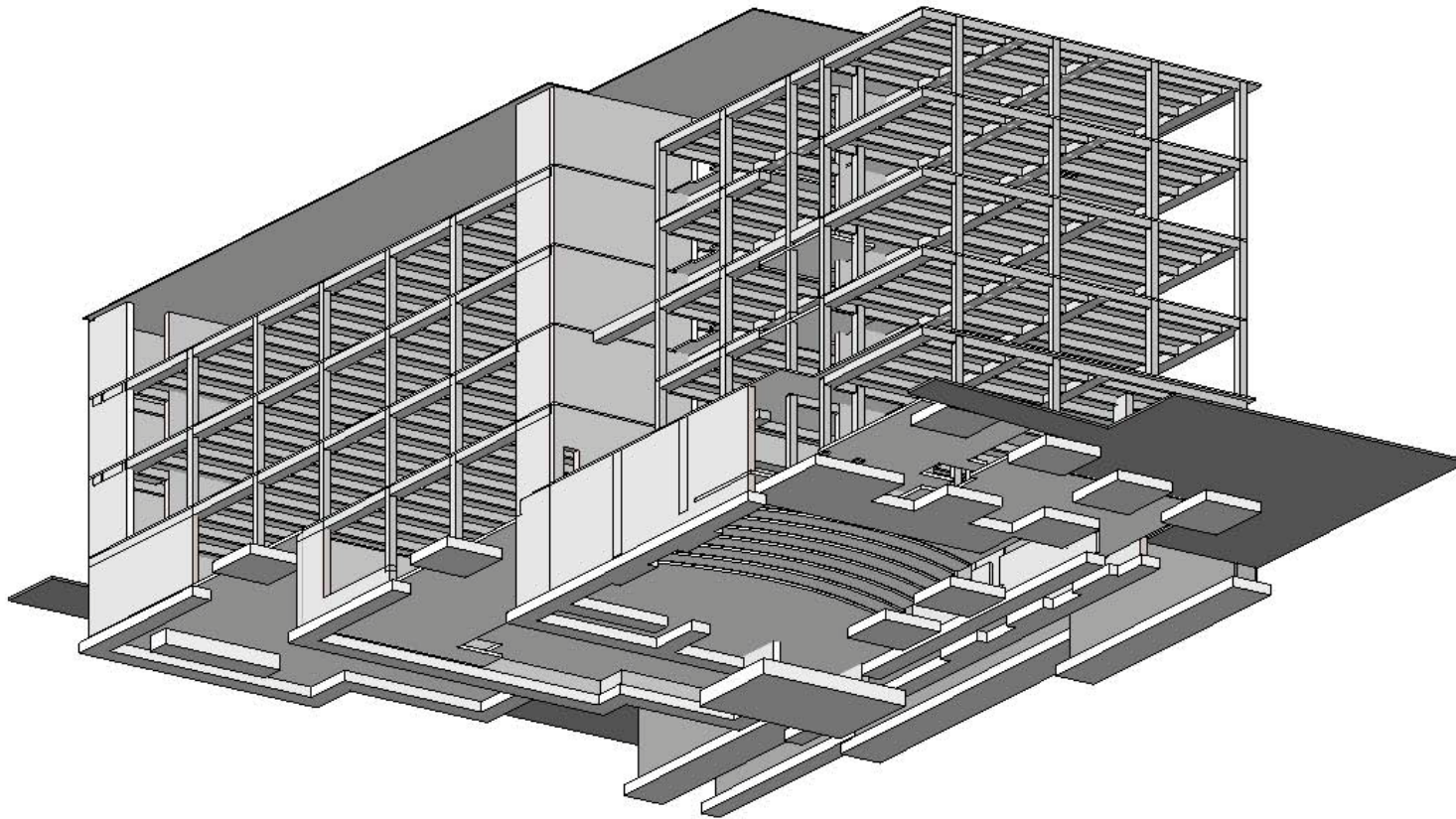
SD Foundation and Framing Plan



THA Schematic Design Model



THA Modified Model – Incorporated joists/girders



Innovaya's Outpoint Screen

Start >> Communication >> Quantities >> MC2-ICE >> Help >>

Building Sections

- Default (657)
 - Existing (0)
 - New Construction (657)
 - zzzUnassigned (0)

Component Types

- ARCHITECTURAL
 - Walls (51)
 - Wall Sweeps (0)
 - Curtain Walls (90)
 - Curtain Wall Mullions (0)
 - Doors (0)
 - Windows (0)
 - Window Door Assemblies (0)
 - Ceilings (0)
 - Floors (20)
 - Roofs (0)
 - Fascias (0)
 - Gutters (0)
 - Stairs (0)
 - Railing (0)
 - Architectural Columns (8)
- STRUCTURAL
 - Beams (376)
 - Braces (50)
 - Columns (62)
 - Slabs (0)
 - Slab Edges (0)
 - Foundations (0)
 - Wall Foundations (0)
- HVAC & MECHANICAL
 - Mechanical Equipment (0)
 - Plumbing Fixtures (0)
 - Straight Ducts (0)
 - Flexible Ducts (0)
 - Duct Fittings (0)
 - Straight Pipes (0)
 - Flexible Pipes (0)
 - Pipe Fittings (0)
- ELECTRICAL
 - Electrical Equipment (0)
 - Electrical Fixtures (0)
 - Cable Trays (0)
 - Cable Tray Fittings (0)
 - Conduits (0)

Managed Quantities

Sort by Building Sections

Sort by Component Types

TypeName	Unconnected-Height (ft)	Width (ft)	AssemblyCode	AssemblyDescription	Length (ft)	Area (sq ft)	Volume (cu yd)	GrossArea (sq ft)
Concrete - 18"	3	1.5			1.061	8.614	0.354	8.614
Concrete - 18"	18	1.5			88.000	1,581.750	87.125	1,581.750
Concrete - 18"	63.167	1.5			21.000	1,279.031	71.057	1,279.031
Concrete - 18"	76	1.5			29.443	2,171.222	120.623	2,213.222
Concrete - 18"	32.5	1.5			21.000	663.305	36.850	663.305
Concrete - 18"	45.333	1.5			0.750	68.000	3.532	68.000
Concrete - 18"	19.833	1.5			67.750	1,008.630	54.665	1,029.630
Concrete - 18"	81.167	1.5			21.896	1,826.250	98.076	1,826.250
Concrete - 18"	20.5	1.5			84.750	1,734.875	96.382	1,734.875
Concrete - 18"	16.833	1.5			63.000	940.375	52.243	961.375
Concrete - 18"	60.667	1.5			51.343	2,899.722	158.622	2,941.722

Quantities > Estimate >

Quantities Table Headers: TypeName, Unconnected-Height (ft), Width (ft), AssemblyCode, AssemblyDescription, Length (ft), Area (sq ft), Volume (cu yd), GrossArea (sq ft)

Quantities Table Data (Visible Rows):

TypeName	Unconnected-Height (ft)	Width (ft)	AssemblyCode	AssemblyDescription	Length (ft)	Area (sq ft)	Volume (cu yd)	GrossArea (sq ft)
Concrete - 18"	3	1.5			1.061	8.614	0.354	8.614
Concrete - 18"	18	1.5			88.000	1,581.750	87.125	1,581.750
Concrete - 18"	63.167	1.5			21.000	1,279.031	71.057	1,279.031
Concrete - 18"	76	1.5			29.443	2,171.222	120.623	2,213.222
Concrete - 18"	32.5	1.5			21.000	663.305	36.850	663.305
Concrete - 18"	45.333	1.5			0.750	68.000	3.532	68.000
Concrete - 18"	19.833	1.5			67.750	1,008.630	54.665	1,029.630
Concrete - 18"	81.167	1.5			21.896	1,826.250	98.076	1,826.250
Concrete - 18"	20.5	1.5			84.750	1,734.875	96.382	1,734.875
Concrete - 18"	16.833	1.5			63.000	940.375	52.243	961.375
Concrete - 18"	60.667	1.5			51.343	2,899.722	158.622	2,941.722

Managed Quantities

Sort by Building Sections

Sort by Component Types

- Concrete - 18" (1)
- Concrete - 18" (1)
- Concrete - 18" (2)
- Concrete - 18" (2)
- Concrete - 18" (3)
- Concrete - 18" (3)
- Concrete - 18" (3)
- Concrete - 18" (3)
- Concrete - 18" (3)
- Concrete - 18" (5)
- Concrete - 18" (6)
- Concrete - 18" (6)
- Exterior - Terra Cotta Screening (1)
- Generic - 12" (2)
- Site Concrete (1)

Quantities > Estimate >

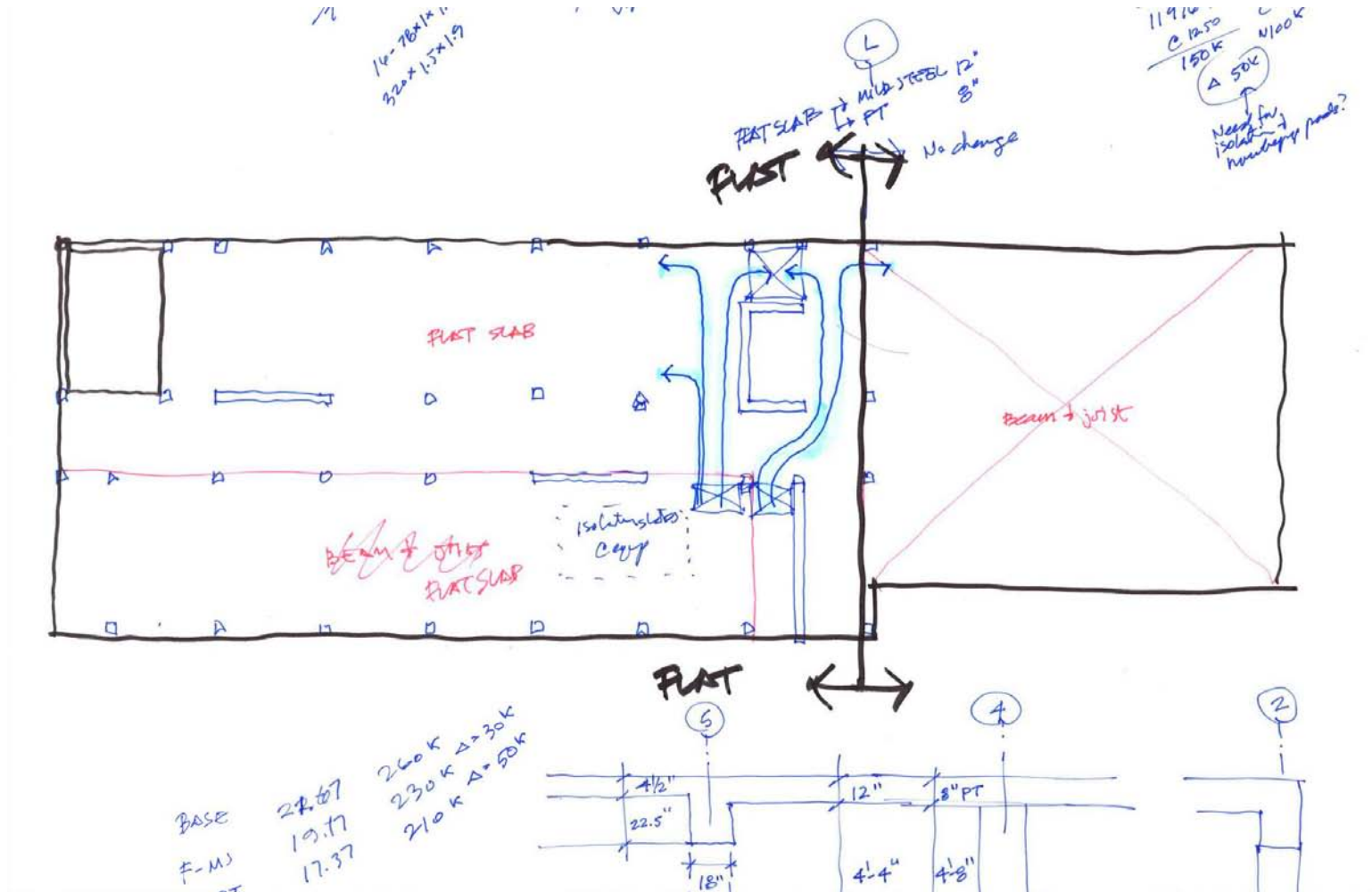
Use MQ Color Auto-Reset

Timberline Estimate for UWB3

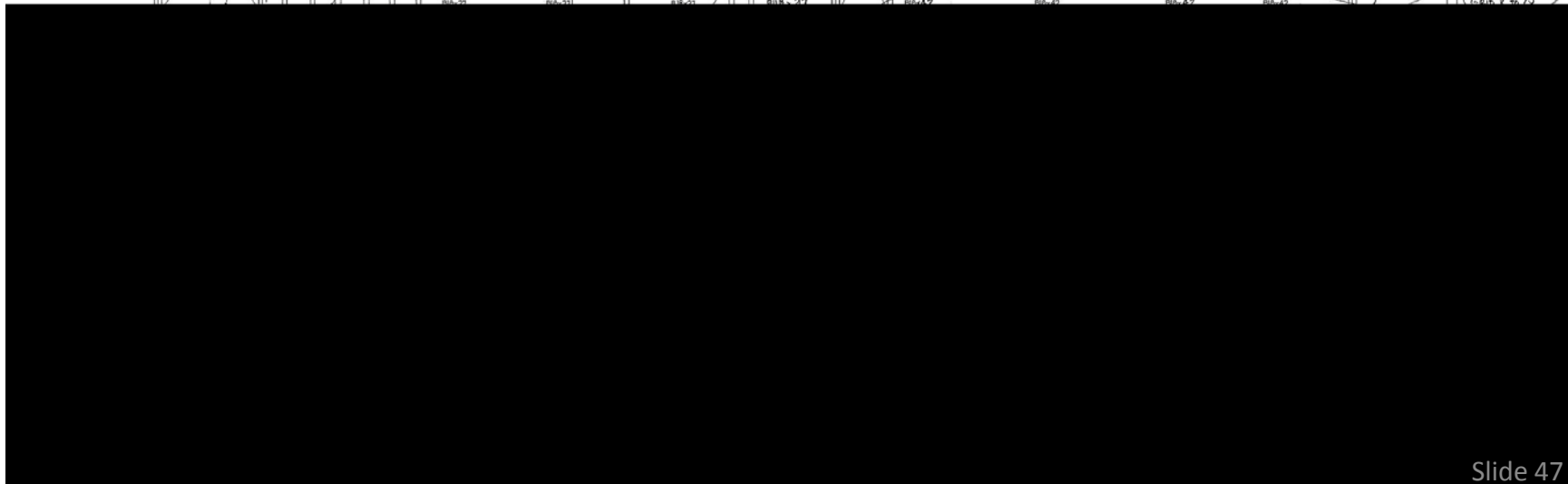
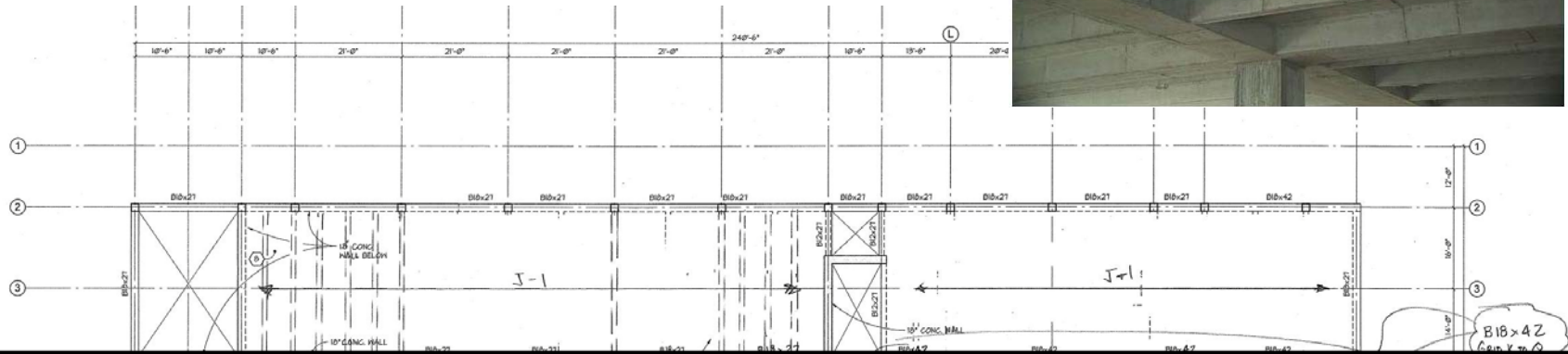
Group	Phase	Item	Description	Takeoff Quantity	Crew	Labor Product	Labor Quantity	Labor Price	Labor Cost/Unit	Labor Rate Table	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Total Cost/Unit
	04.205		Transfer Beams													
		15	Rebar 350#/cy	19 ton			19.00 ton					1,100.00	20,900	550.00	10,450	1,650
		25	Buy Concrete	116 cy			116.00 cy					100.00	11,600			100
		33	Concrete Access/Equipment	110 cy			110.00 cy					2.00	220	2.00	220	4
		35	Place Concrete	110 cy	Place Crew -Small	0.500	55.00 mh	33.61	16.80	CHSBID	1,848			13.50	1,485	30
		44	Form Oil/Nails/HW	2,568 sf			2,568.00 sf					0.12	308			0
		45	Form Ties	257 ea			257.00 ea					0.50	129			0
		50	Form/Strip - downturned	1,990 sf	Formwork - Gen	0.160	318.40 mh	36.73	5.88	CHSBID	11,693	2.50	4,975			8
		50	Form/Strip - upturned	578 sf	Formwork - Gen	0.160	92.48 mh	36.73	5.88	CHSBID	3,396	2.50	1,445			8
		53	Edge Forms	lf	Formwork-Small	0.250	mh	37.14		CHSBID						
		66	Chamfer Strips	lf	Formwork-Small		lf			CHSBID						
		74	Rub Finish	2,568 sf	Finish Conc-R/P/G	0.010	25.68 mh	36.56	0.37	CHSBID	939	2.00	5,136			2
		75	Patch Tie Holes	2,568 sf	Finish Conc-R/P/G	0.010	25.68 mh	36.56	0.37	CHSBID	939					0
		81	Finish Wall/Col. Tops	140 sf	Cement Mason	0.010	1.40 mh	35.81	0.36	CHSBID	50	0.03	4			0
		95	Protect Concrete	110 cy	Lab - Journeyman	0.040	4.40 mh	31.50	1.26	CHSBID	139	1.10	121			2
	04.220		Equipment Pads/Curbs													
		33	Equipment Pads/Curbs	74,700 bsf			74,700.00 bsf			UWB3-SD		0.00	0	0.25	18,675	0
	04.260		Structural Stairs													
		01	CIP Stairs/Risers	990 lf	Lab - Journeyman		mh	31.50		CHSBID				120.00	118,800	120
	04.300		Foundation Walls													
		15	Rebar - 5#/sf	20 ton			20.00 ton			UWB3-SD		1,100.00	22,000	550.00	11,000	1,650
		18	Set Anchor Bolts	ea	Formwork-Small	0.500	mh	36.27		UWB3-SD						
		19	Set Embed Plates	200 ea	Formwork-Small	0.500	100.00 mh	36.27	18.14	UWB3-SD	3,627	35.00	7,000			53
		25	Buy Concrete	476 cy			476.00 cy			UWB3-SD		100.00	47,600			100
		33	Concrete Access/Equipment	453 cy			453.00 cy			UWB3-SD		2.00	906	2.00	906	4
		35	Place Concrete	453 cy	Place Crew -Small	0.600	271.80 mh	32.65	19.59	UWB3-SD	8,873			13.50	6,116	33
		44	Form Oil/Nails/HW	11,919 sf			11,919.00 sf			UWB3-SD		0.12	1,430			0
		45	Form Ties	1,200 ea			1,200.00 ea			UWB3-SD		0.50	600			0
		50	Form/Strip - one sided	4,387 sf	Formwork - Gen	0.100	438.70 mh	35.84	3.58	UWB3-SD	15,722	0.50	2,194			4
		50	Form/Strip - two sided	7,532 sf	Formwork - Gen	0.100	753.20 mh	35.84	3.58	UWB3-SD	26,992	0.50	3,766			4
		52	Edge Form	lf	Formwork - Gen	0.200	mh	35.84		UWB3-SD						
		55	Construction Joint	lf	Formwork - Gen	0.200	mh	35.84		UWB3-SD						
		74	Rub Finish	11,919 sf	Finish Conc-R/P/G	0.010	119.19 mh	37.05	0.37	UWB3-SD	4,416					0
		75	Patch Tie Holes	11,919 sf	Finish Conc-R/P/G	0.005	59.60 mh	37.05	0.19	UWB3-SD	2,208	0.08	954			0
		84	Pole Braces	ea	Formwork - Gen	2.000	mh	35.84		UWB3-SD						
		85	Deadman for Braces	ea	Formwork - Gen	2.000	mh	35.84		UWB3-SD						
		95	Protect Concrete	453 cy	Lab - Journeyman	0.040	18.12 mh	31.39	1.26	UWB3-SD	569	1.10	498			2
	04.360		Shear Walls													
		15	Rebar - 8#/sf	73 ton			73.00 ton			UWB3-SD		1,100.00	80,300	550.00	40,150	1,650
		19	Set Embed Plates	100 ea	Formwork-Small	0.500	50.00 mh	36.27	18.14	UWB3-SD	1,813	35.00	3,500			53

Phase/Item Takeoff Order Assembly Location/Phase Bid Item/Phase

Flat Slab Option



Pan Joist Option



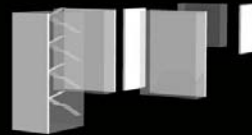
Building Anatomy



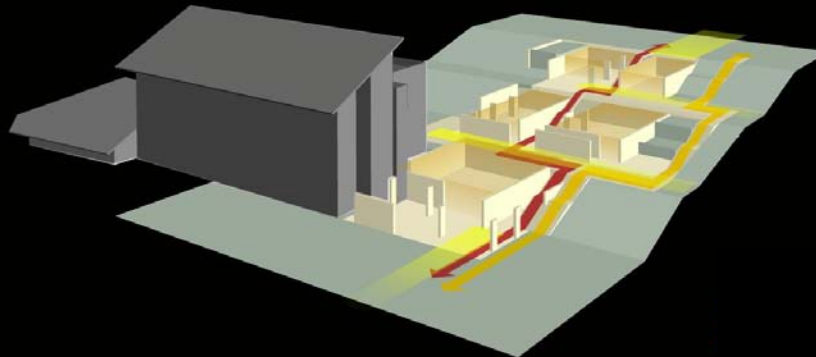
Skin



Frame

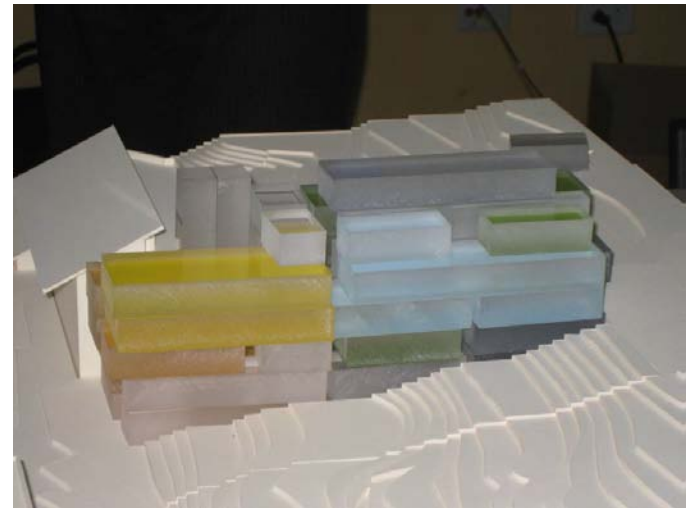
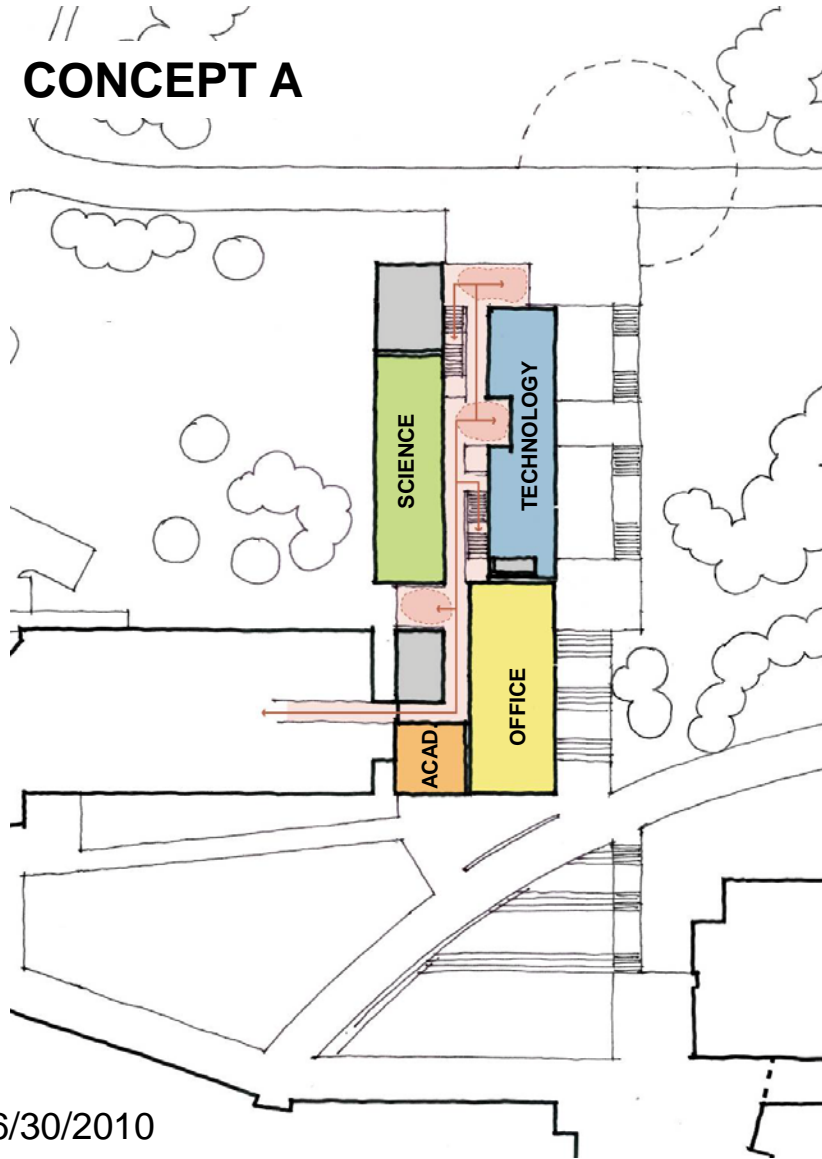


Vertical Circulation

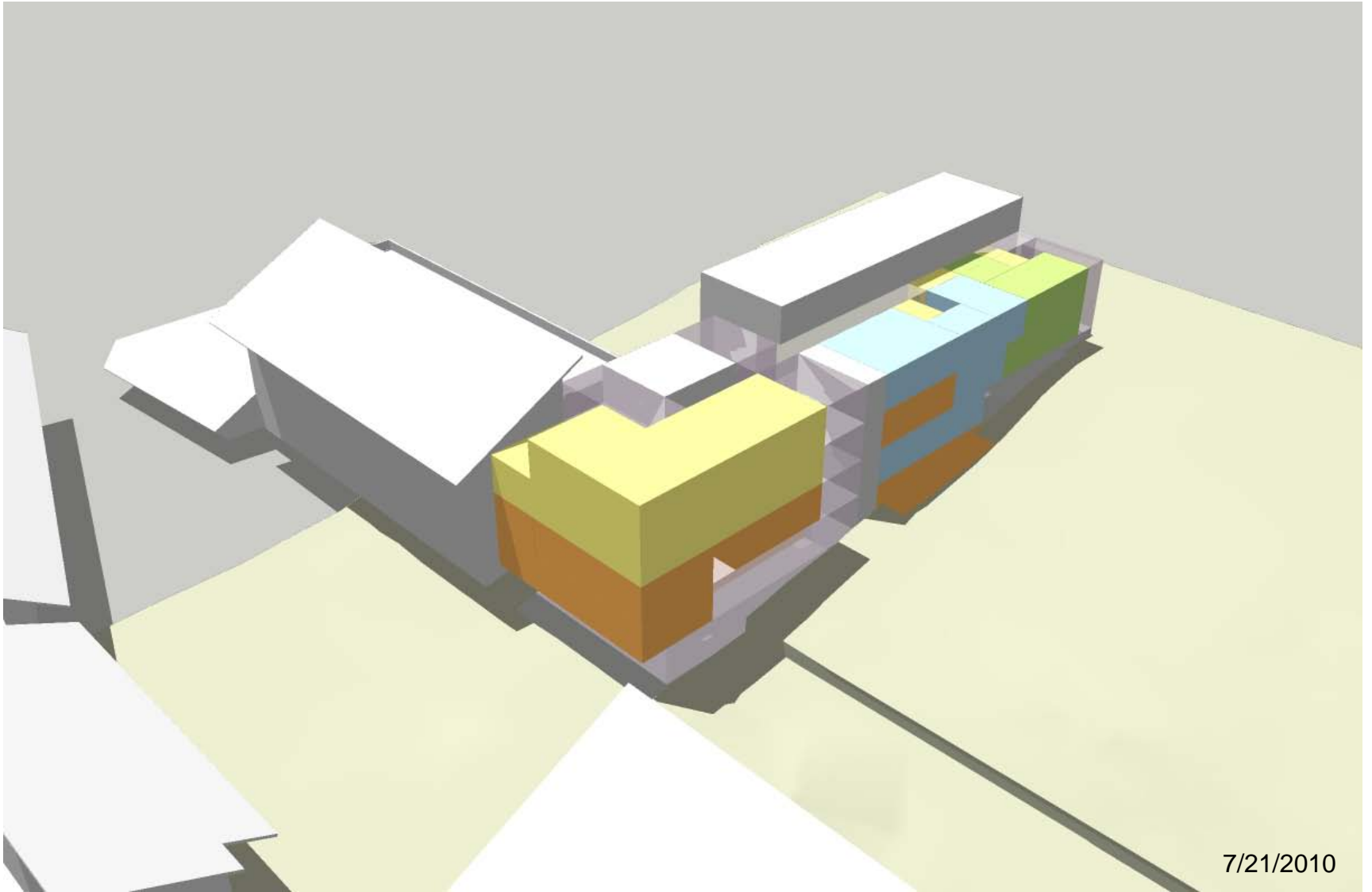


Site

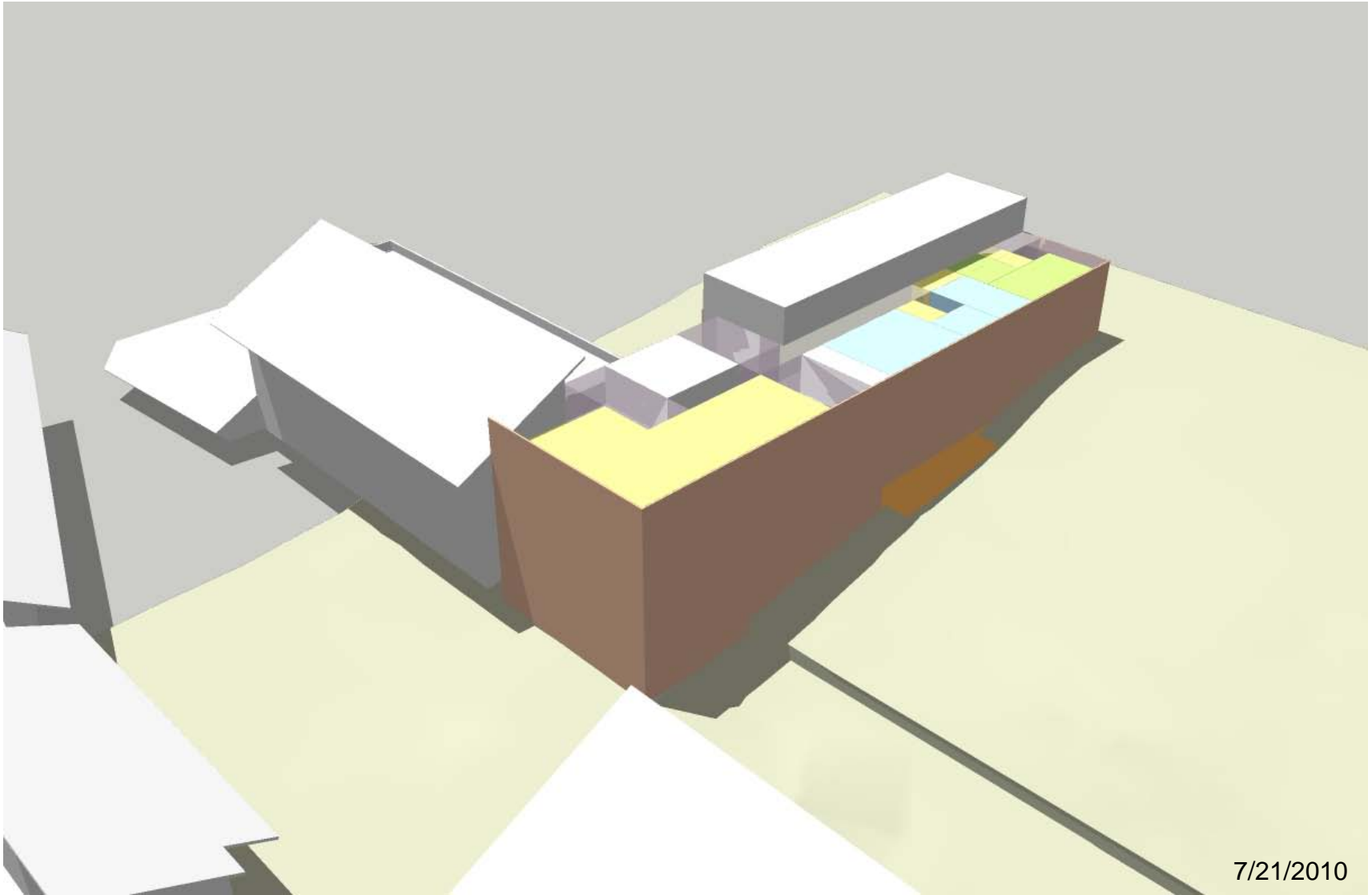
CONCEPT A



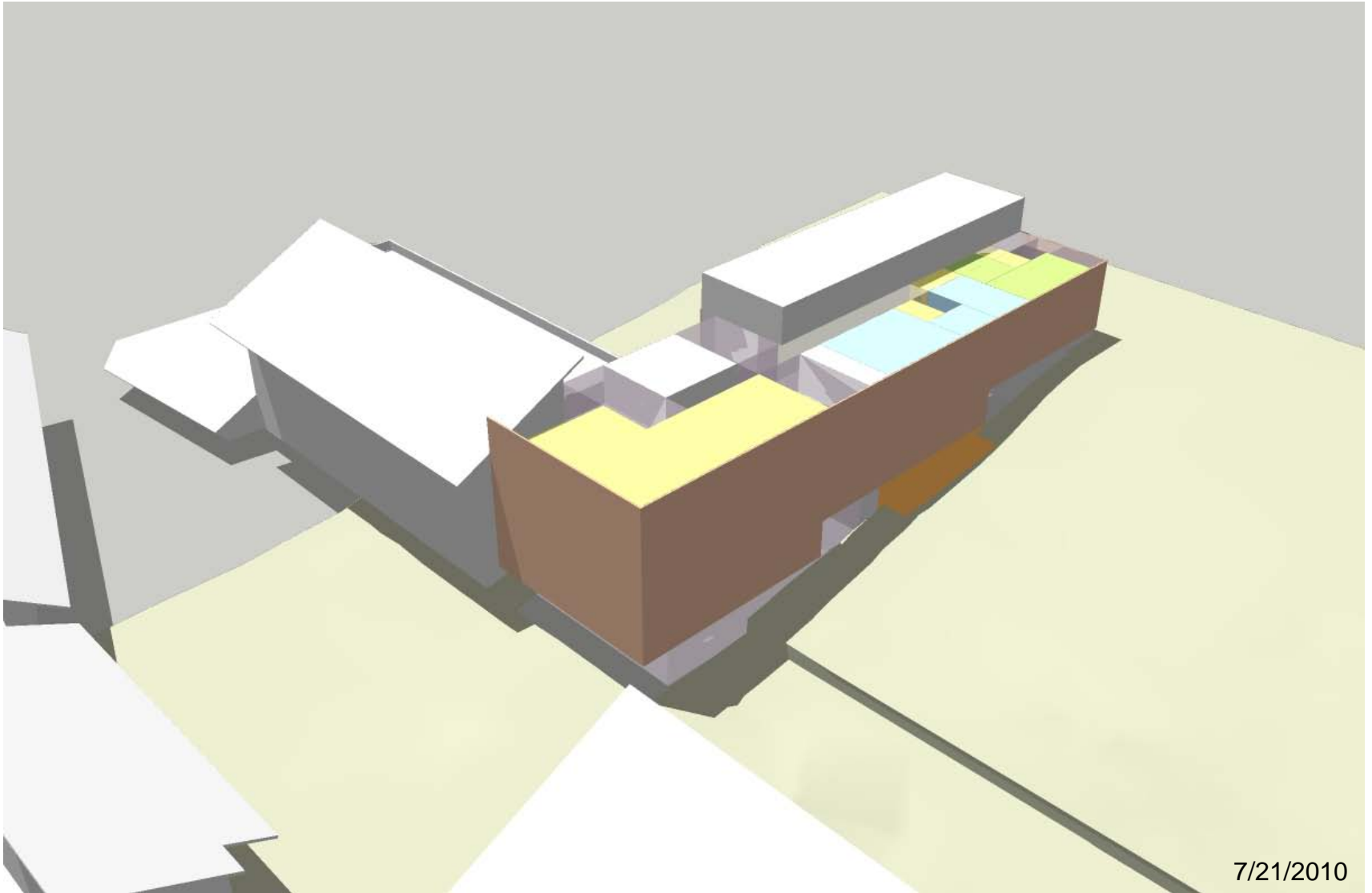
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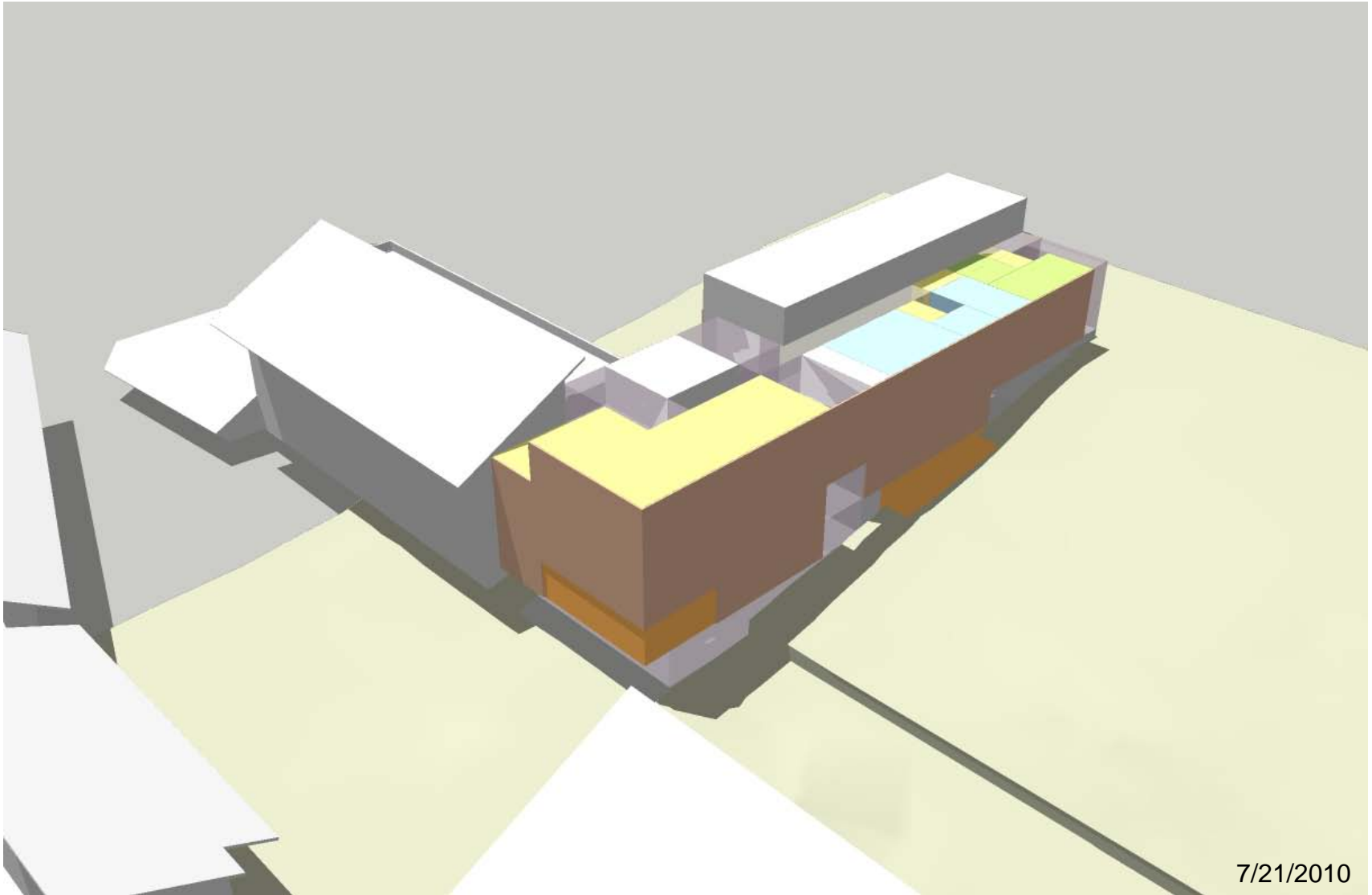
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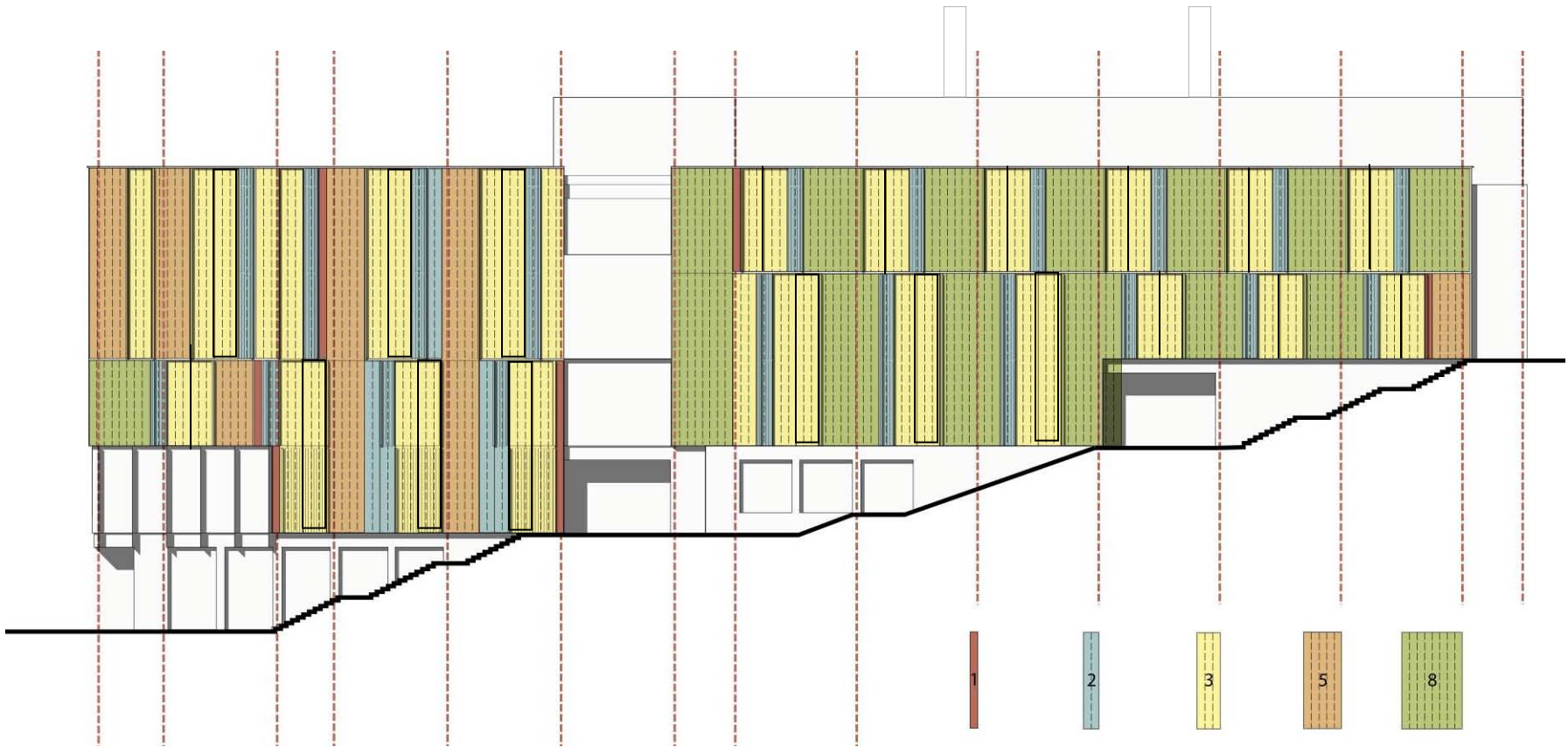
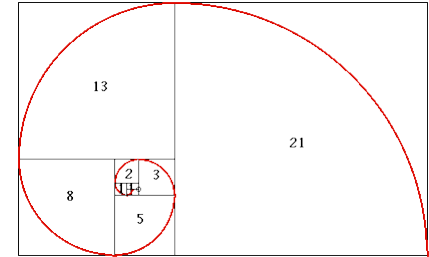
7/21/2010



7/21/2010

Fibonacci Sequence

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, ...



View from the Crescent Path

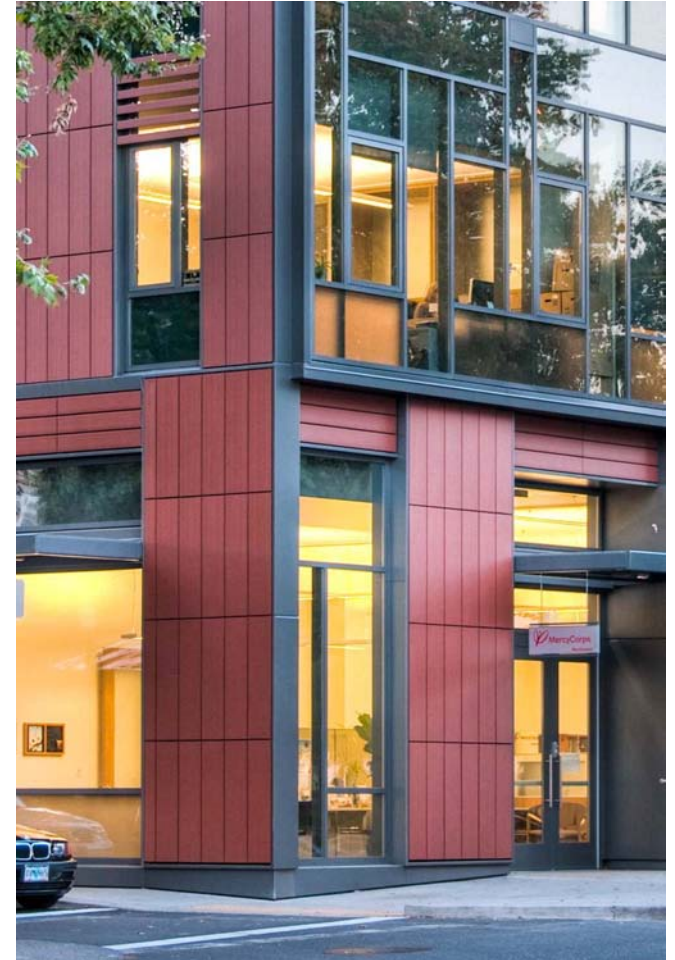




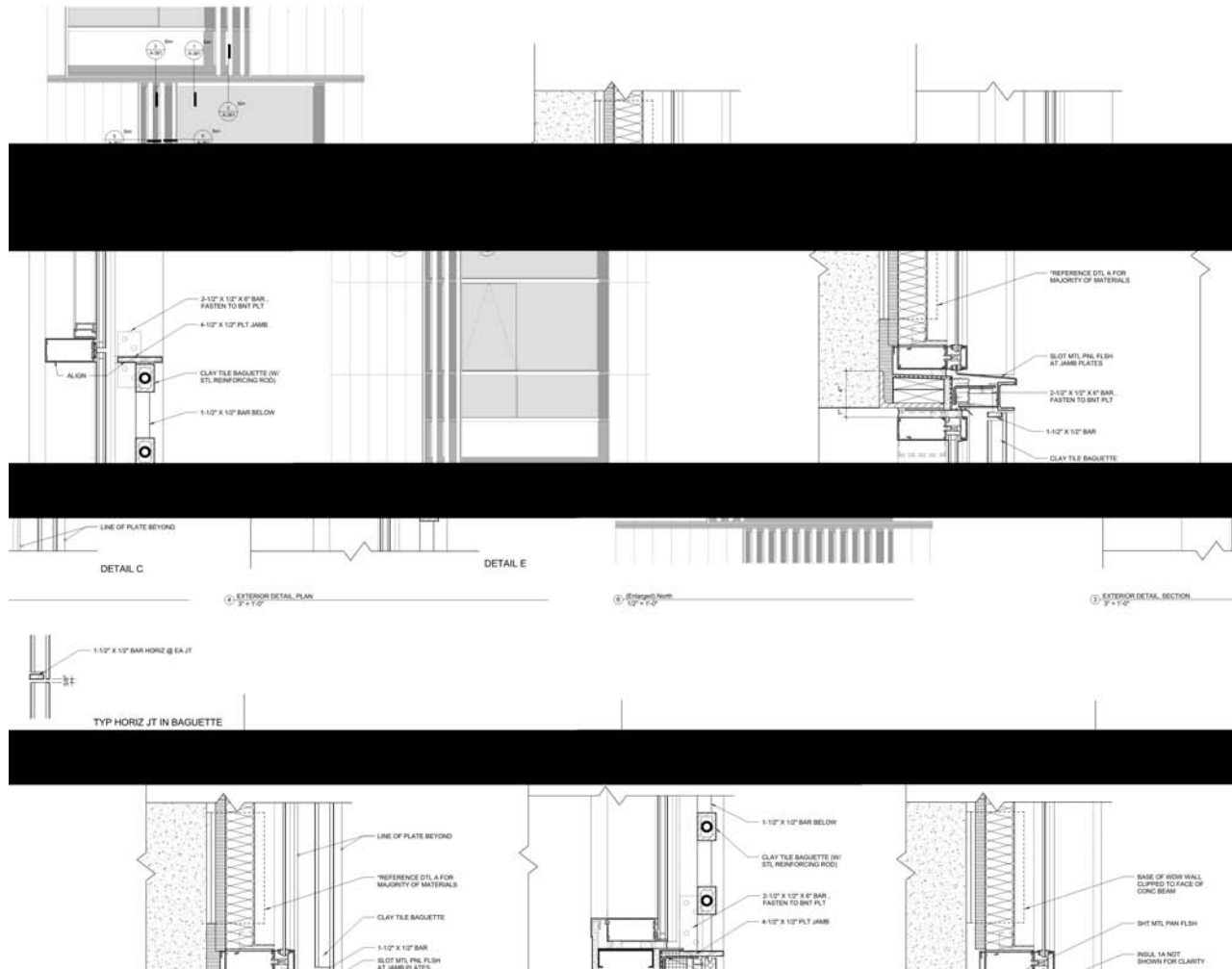
View from the West



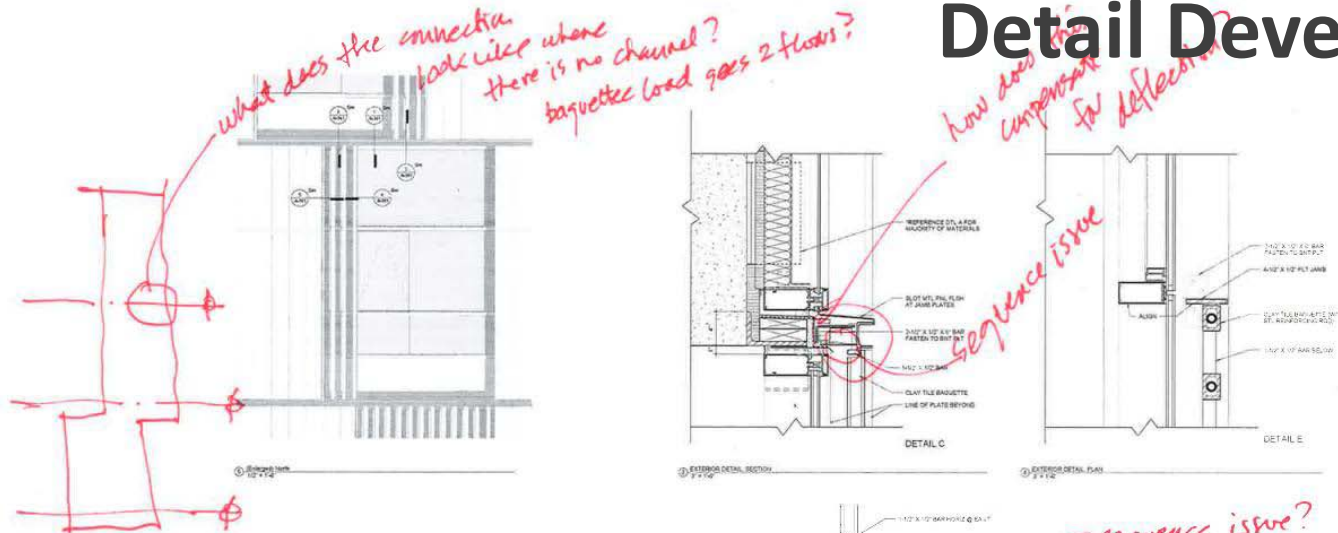
Previous Work



Detail Development



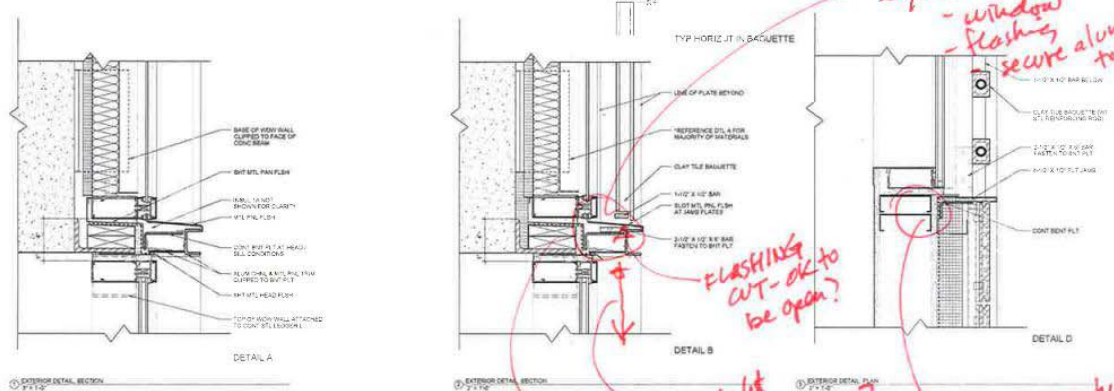
Detail Development



what does the connection look like where baguette load goes 2 floors?

how does this compensate for deflection?

sequence issue



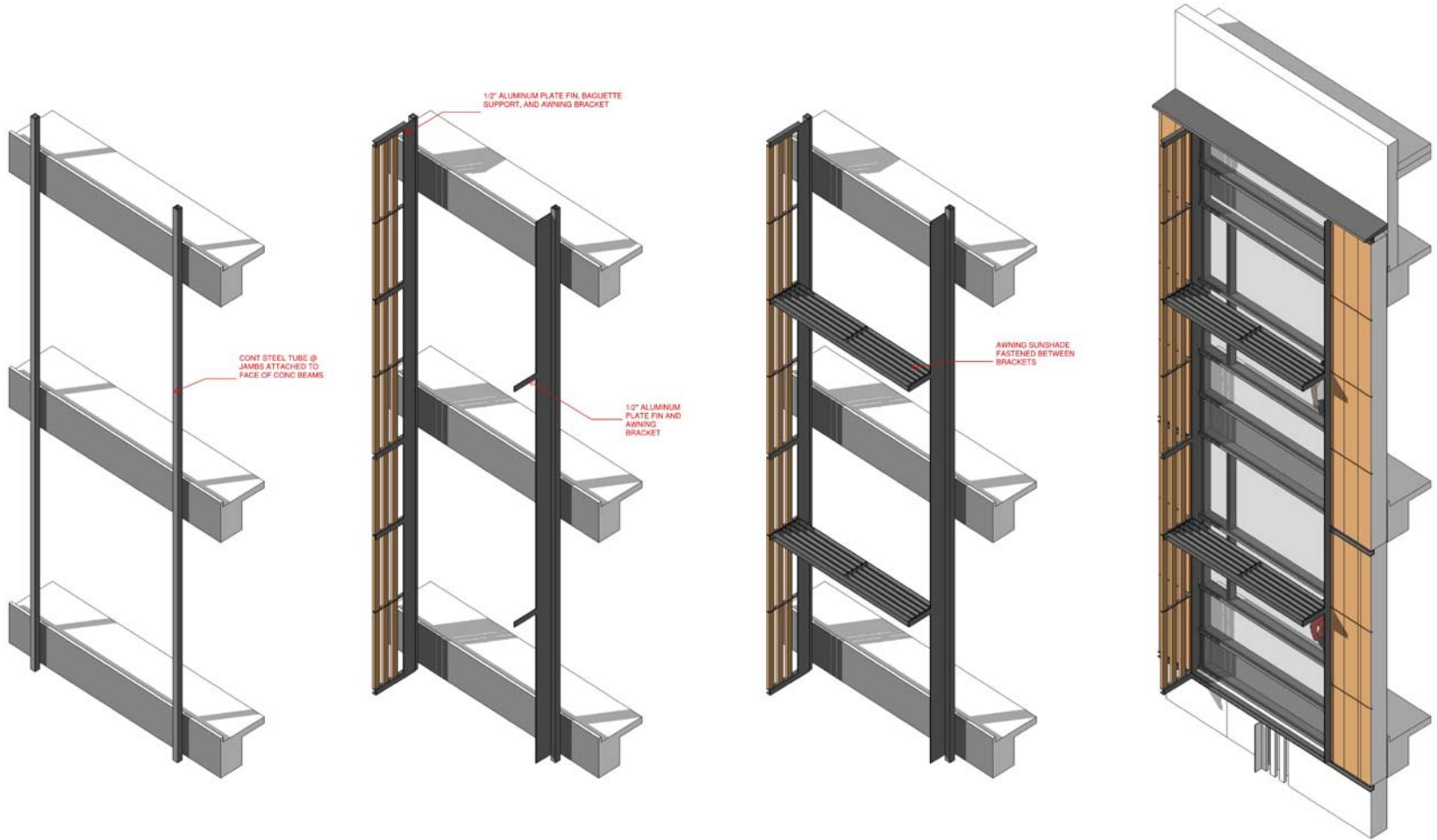
*sequence issue?
- window
- flashing
- secure aluminum frame to bent plate*

FLASHING CUT - ok to be open?

Need structural steel support? - carry load on studs?

*Wood?
weight issue on bent plate?
attached to wood*

Detail Development



Brick and Terracotta

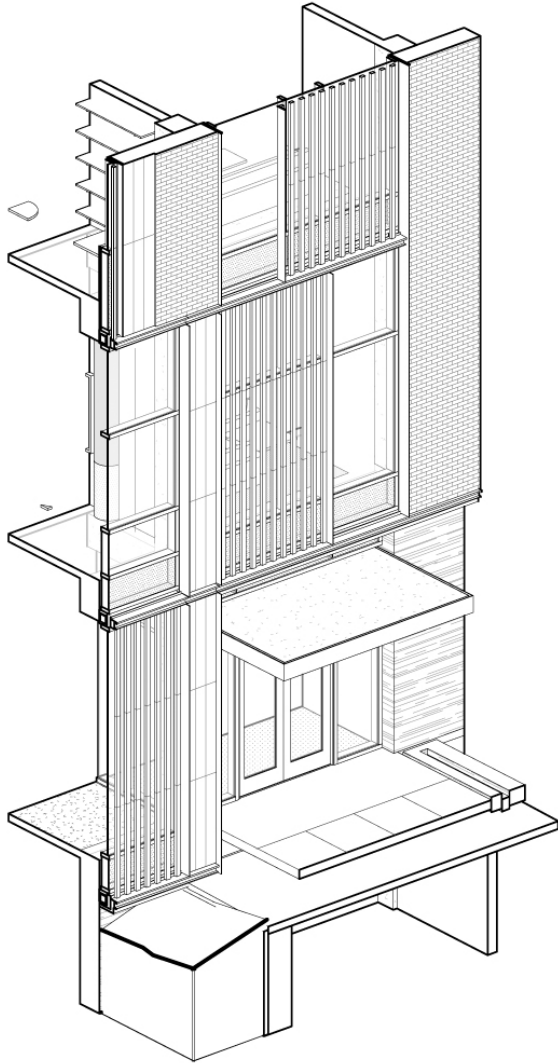


Brick and Terracotta

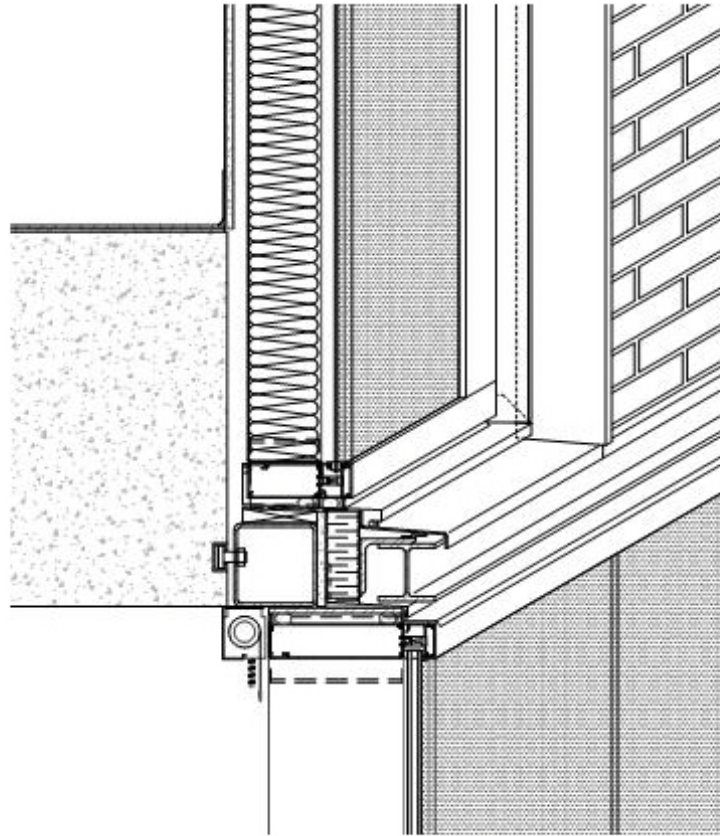


Sketch Up Model

Detail Development

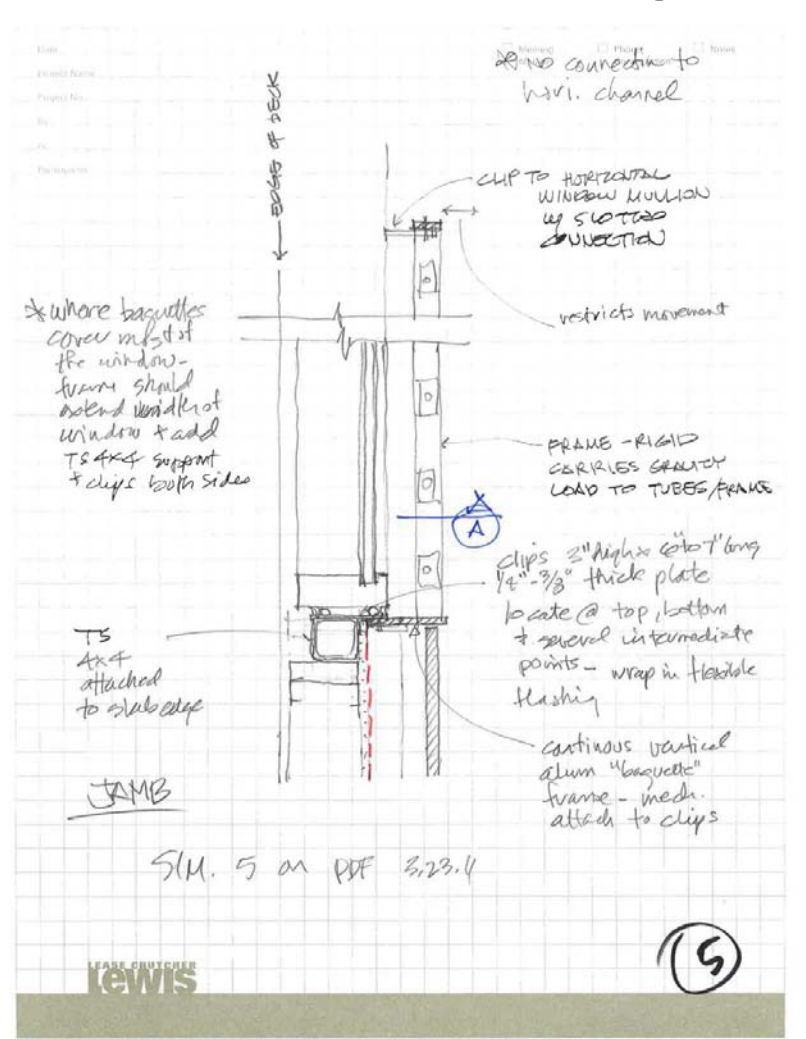
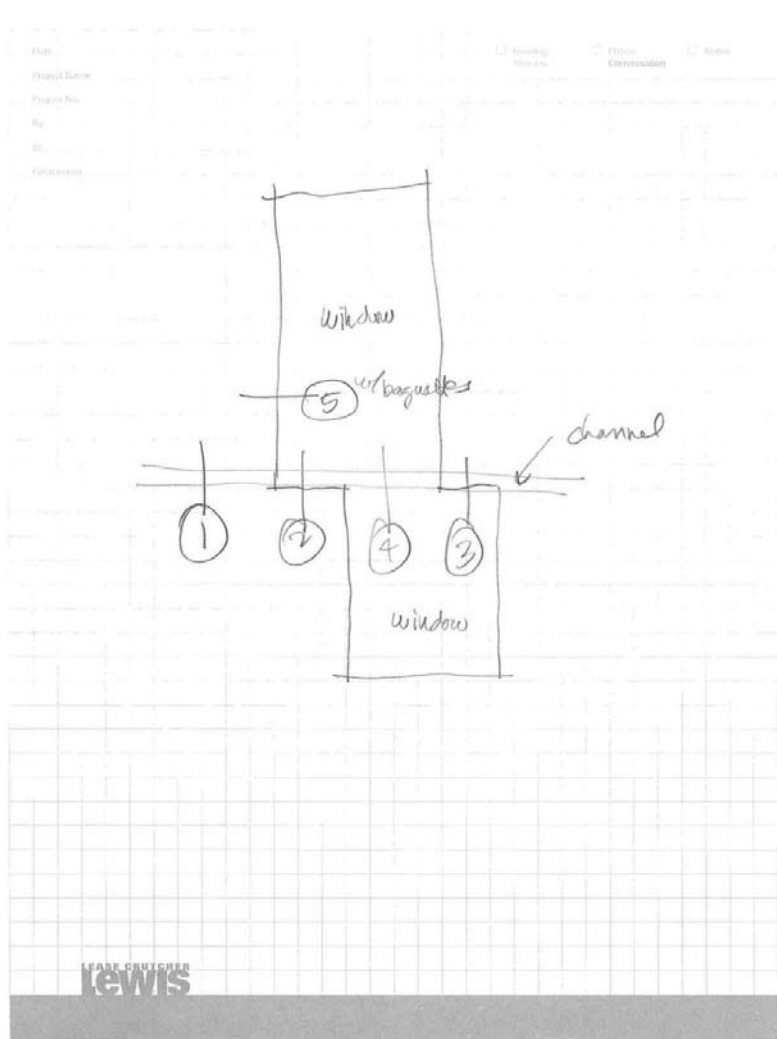


Axon from Revit Model

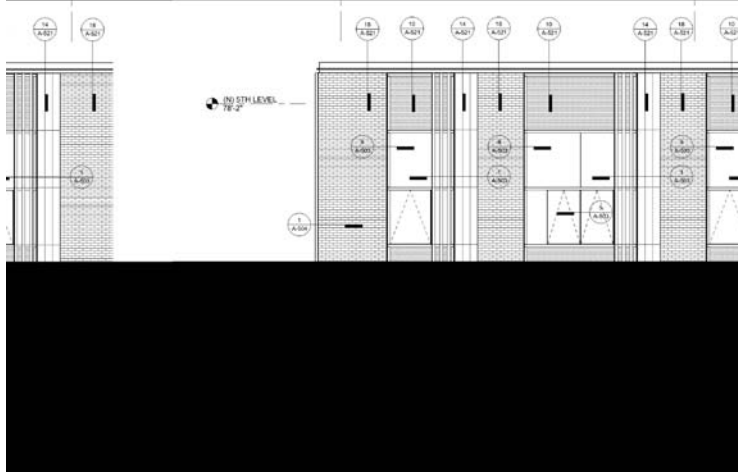
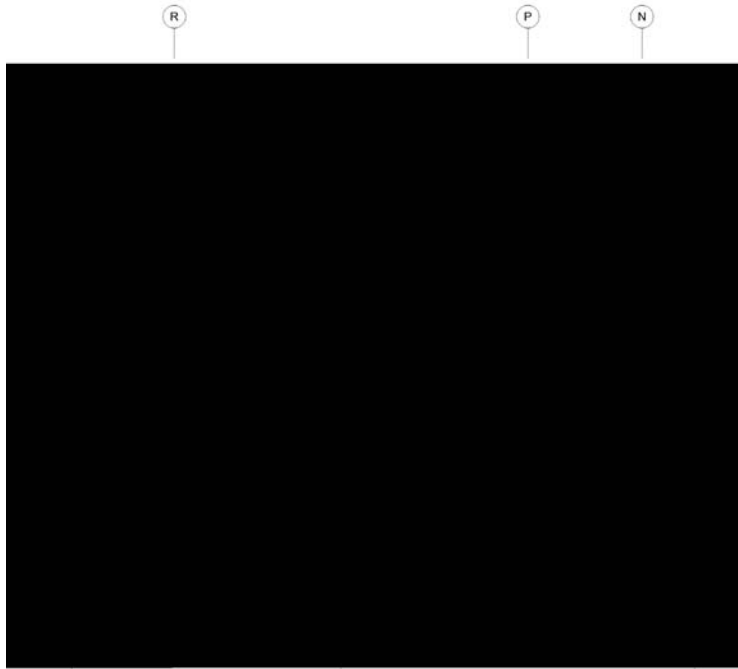


Window Detail from Revit Model

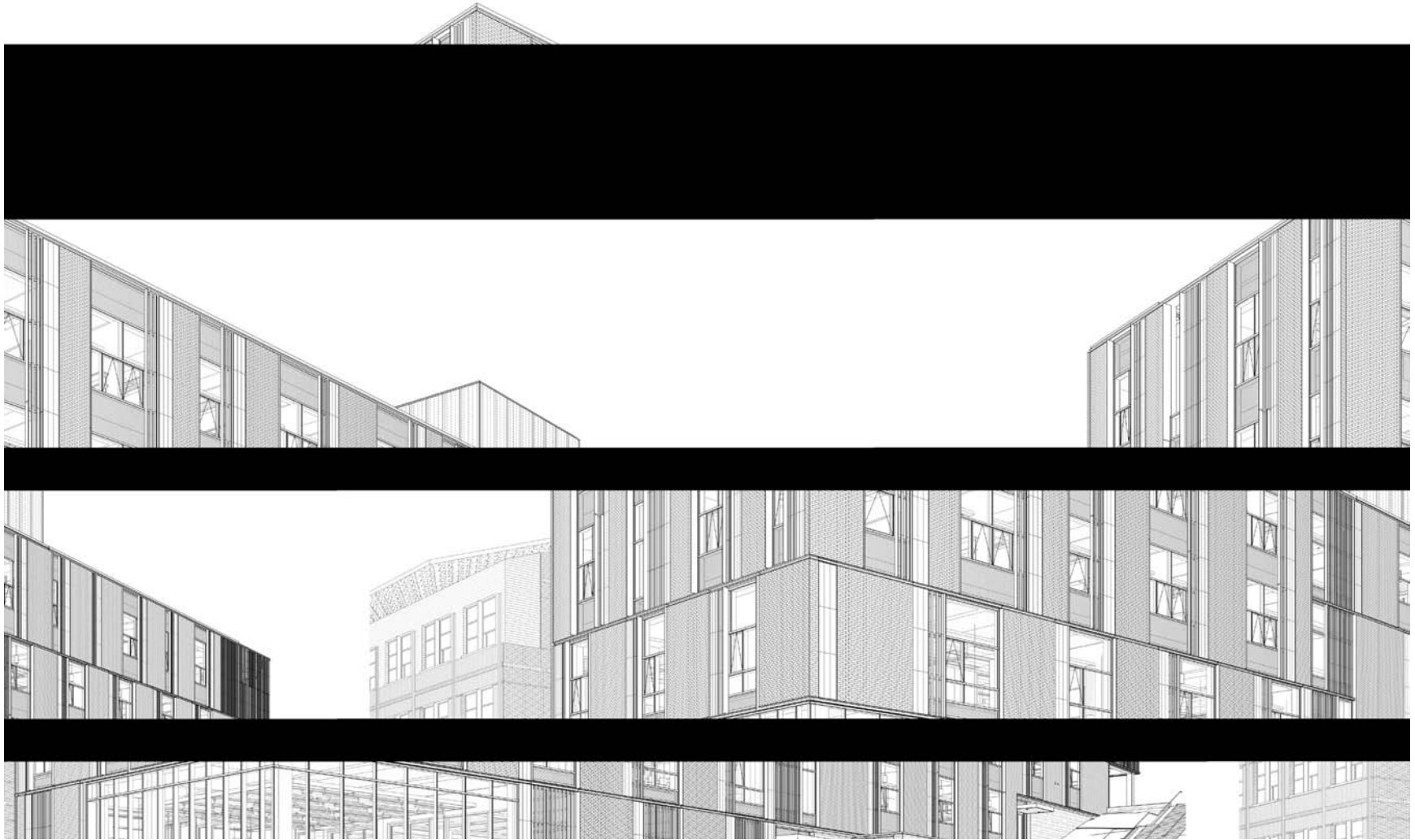
Detail Development



Detail



Current Revit Model



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Lessons Learned

- Early Integration works!
 - Team-work atmosphere
 - Constructability Issues discussed as design evolved
 - Cost (VE) ideas put forth as design evolved
 - Client/users better informed of issues and decisions – fewer surprises
 - Projected decrease in substitutions requests, and RFI's

Lessons Learned

- Maximize Team Integration
 - Go-To Meetings are not enough
 - Documentation still got ahead of Estimating
 - Consider Co-Location
- Get Constituents Buy-In
 - Better balance between progressing design and review and response to comments
 - Accelerated Schedule Challenging
 - Vest “Technical Lead” with more authority
- BIM Limitations
 - Two-way transfer of model difficult
 - MEP Modeling still evolving

North Elevation

