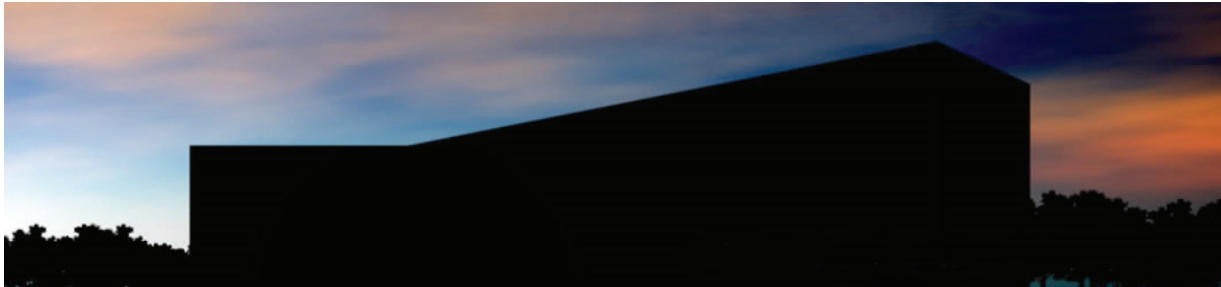


Elements of a Successful State Construction Project



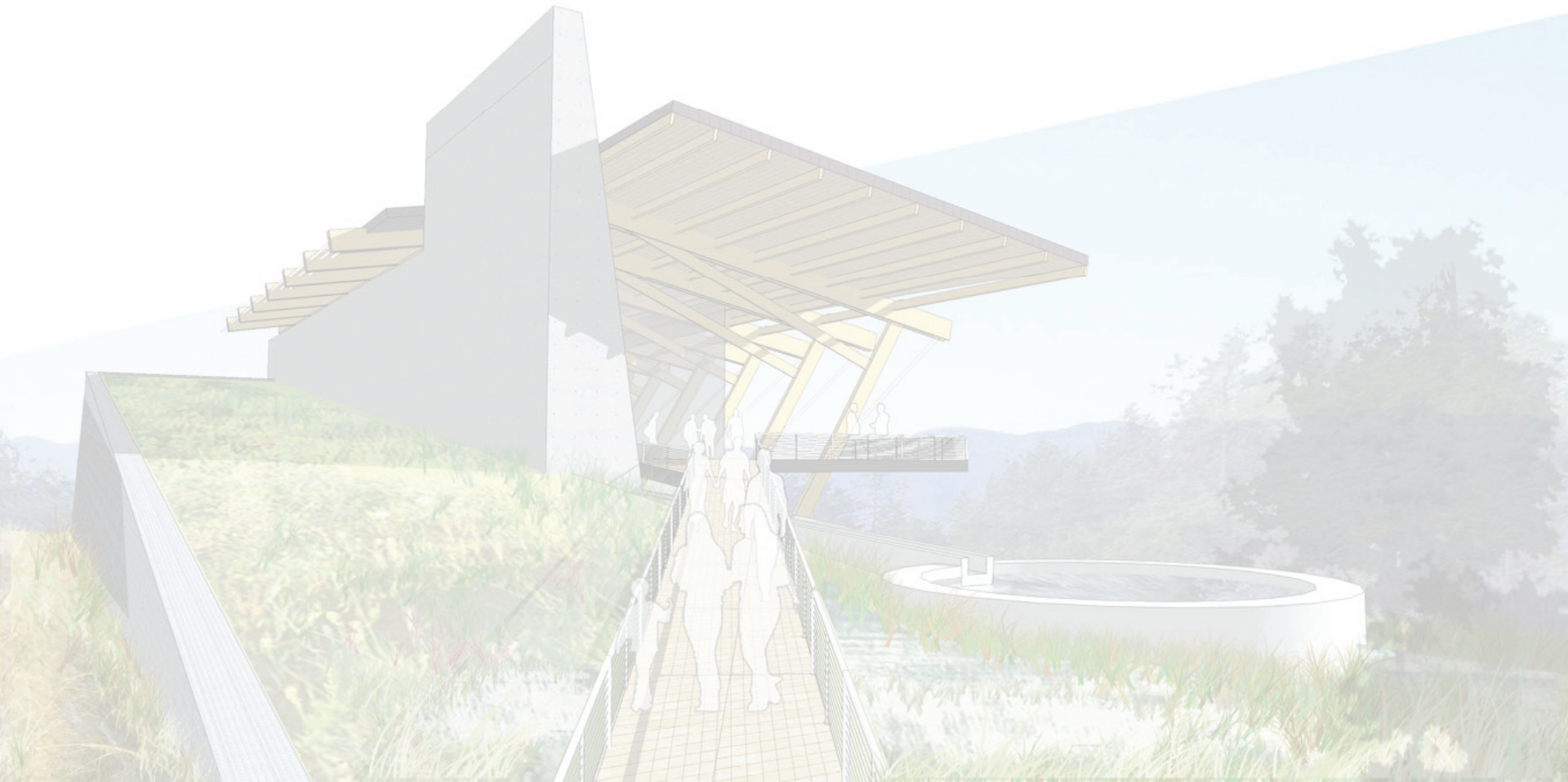
“It’s not what people don’t know that worries me
... it’s what they know for sure that just ain’t so.”

– Mark Twain

Several Perspectives:
Owners / Agencies / Designers

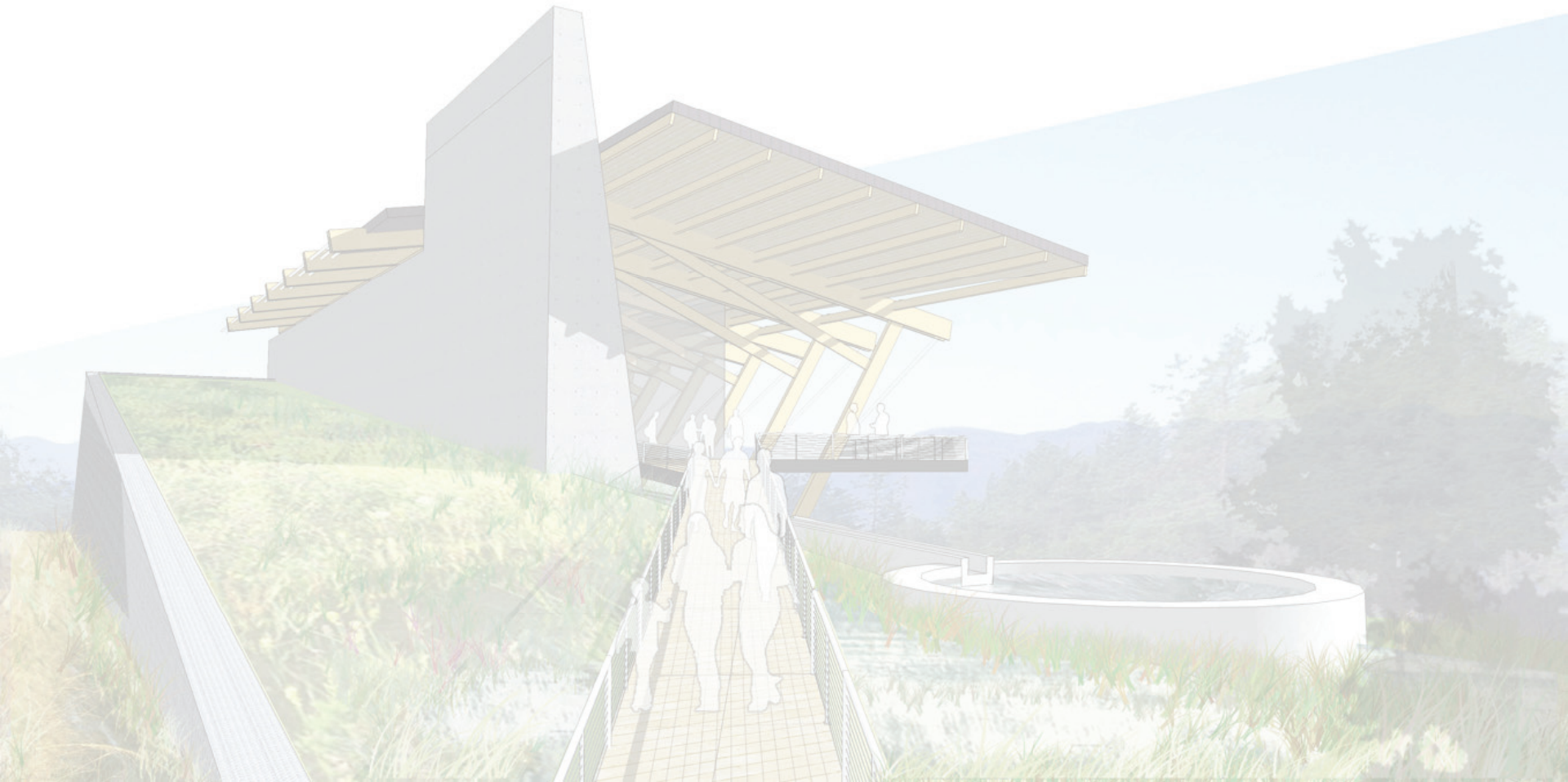
THINGS THAT MAKE **OWNERS** CRAZY

- **Unfamiliarity with contract requirements and procedures**



THINGS THAT MAKE **OWNERS** CRAZY

- Unfamiliarity with contract requirements and procedures
- **Poor communication among design and construction team members**



THINGS THAT MAKE **OWNERS** CRAZY

- Unfamiliarity with contract requirements and procedures
- Poor communication among design and construction team members
- **Inadequate existing conditions and field investigation**



THINGS THAT MAKE **OWNERS** CRAZY

- Unfamiliarity with contract requirements and procedures
- Poor communication among design and construction team members
- Inadequate existing conditions and field investigation
- **Incomplete submittals, lack of document coordination**



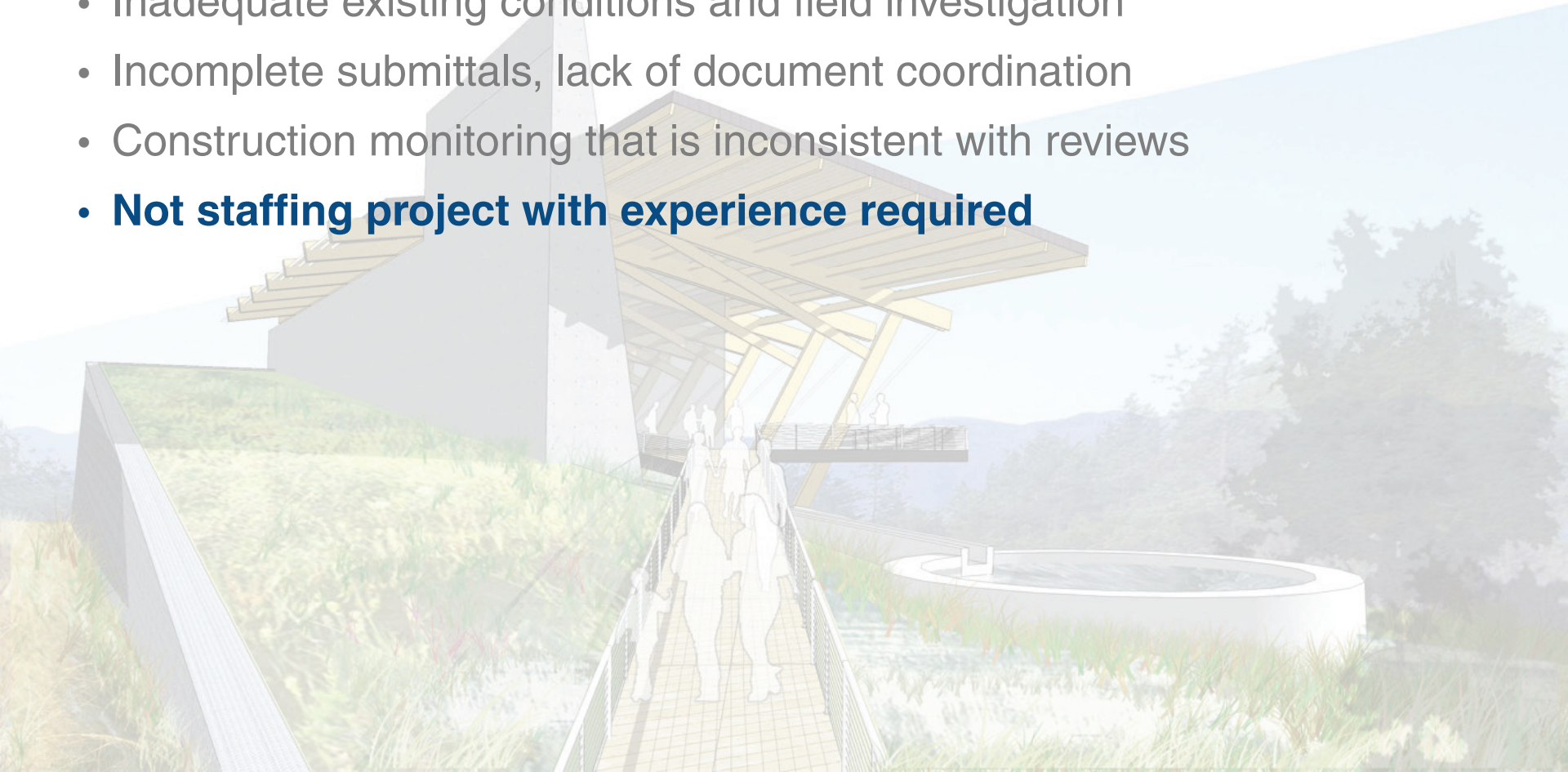
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- Unfamiliarity with contract requirements and procedures
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- Inadequate existing conditions and field investigation
- Incomplete submittals, lack of document coordination
- **Construction monitoring that is inconsistent with reviews**



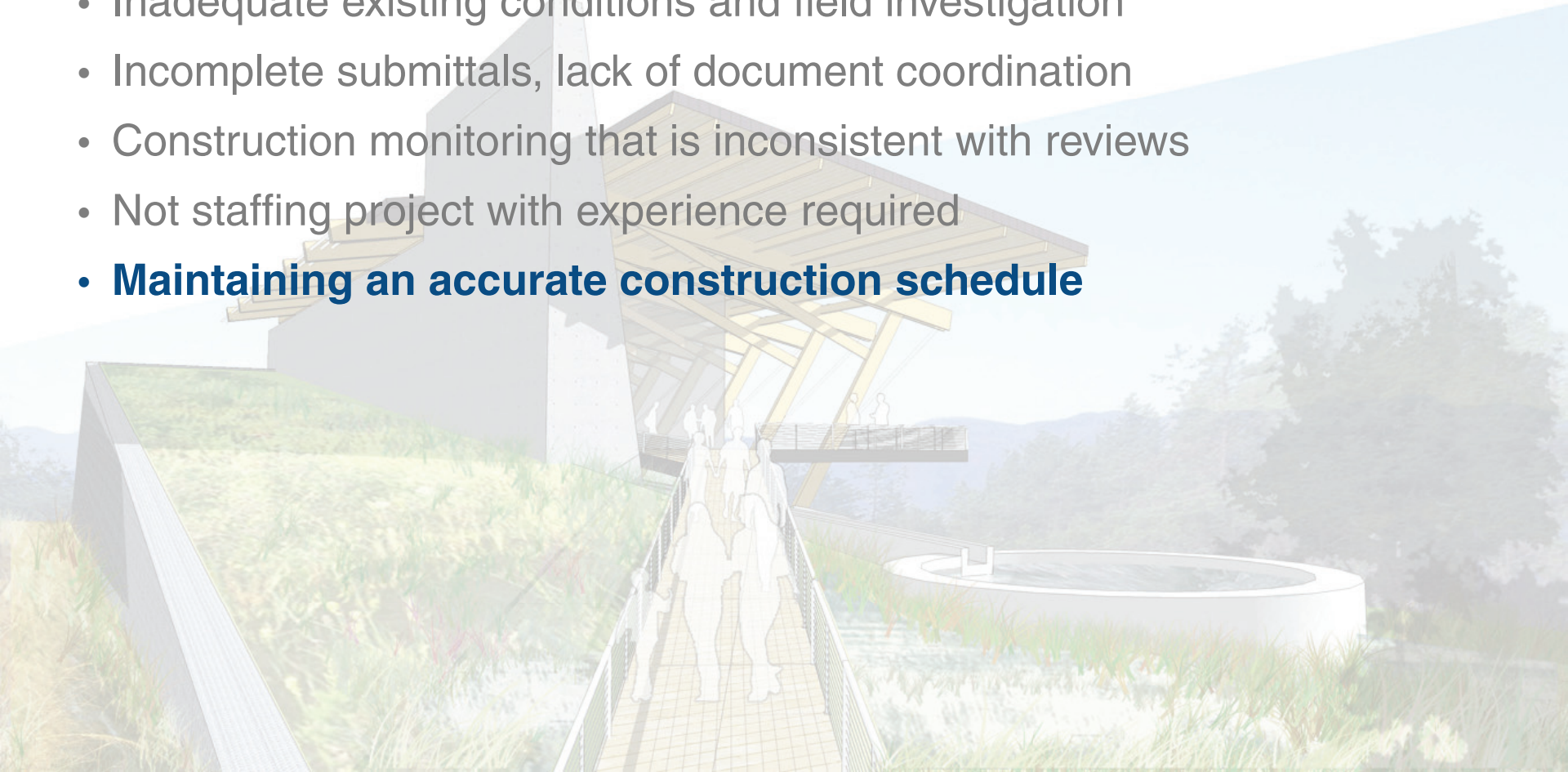
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- Construction monitoring that is inconsistent with reviews
- **Not staffing project with experience required**



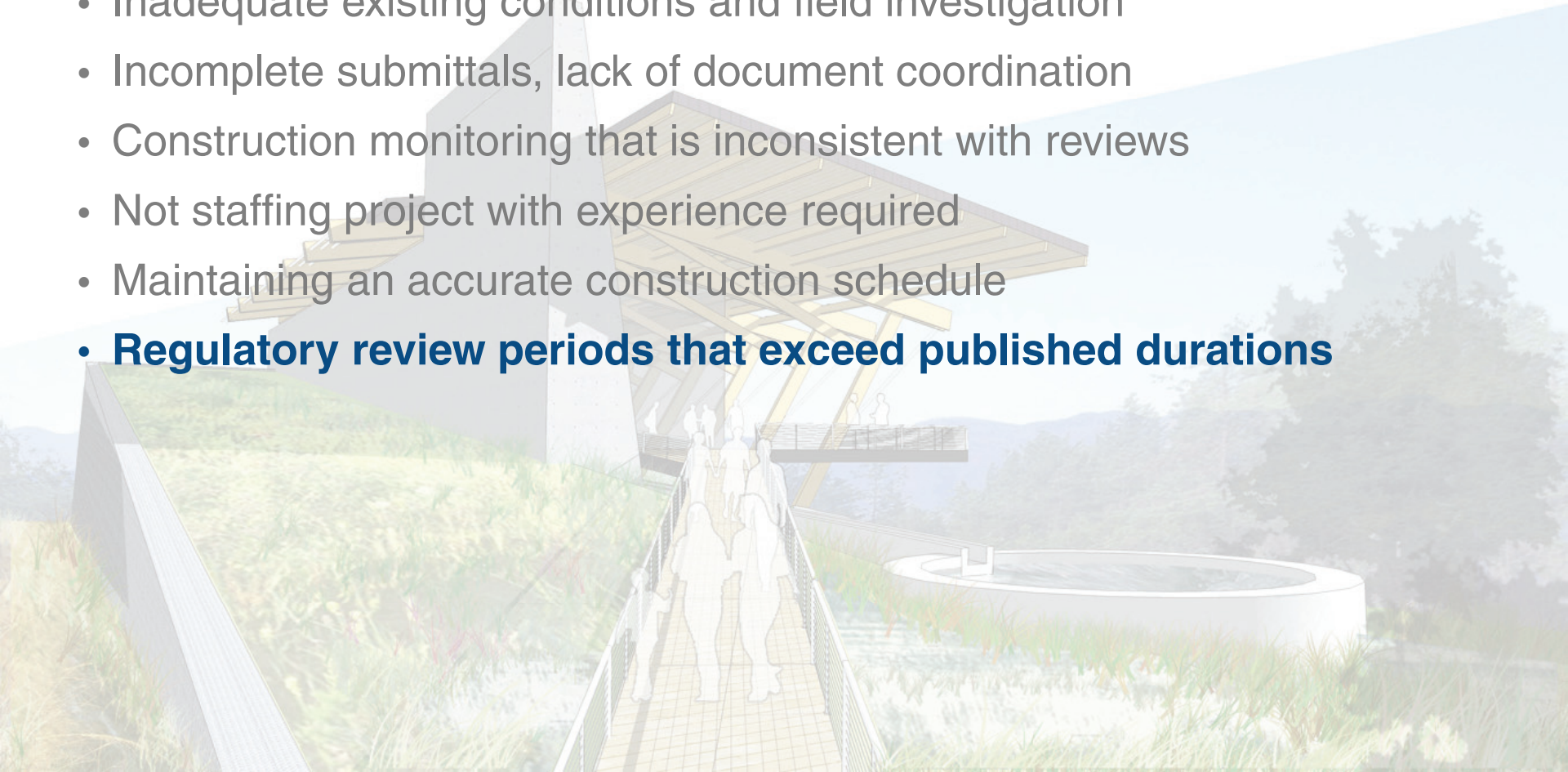
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- **Maintaining an accurate construction schedule**



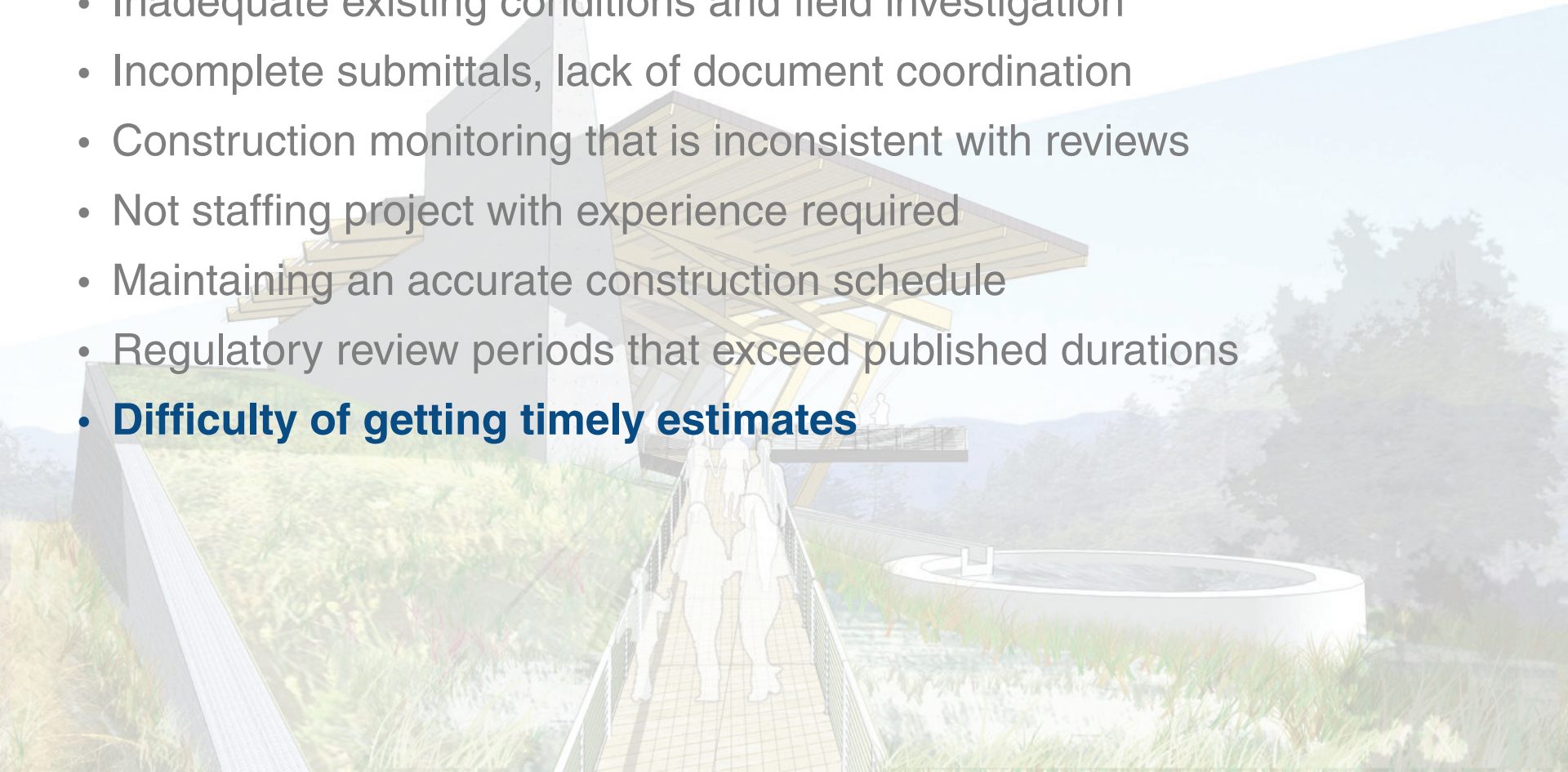
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- Maintaining an accurate construction schedule
- **Regulatory review periods that exceed published durations**



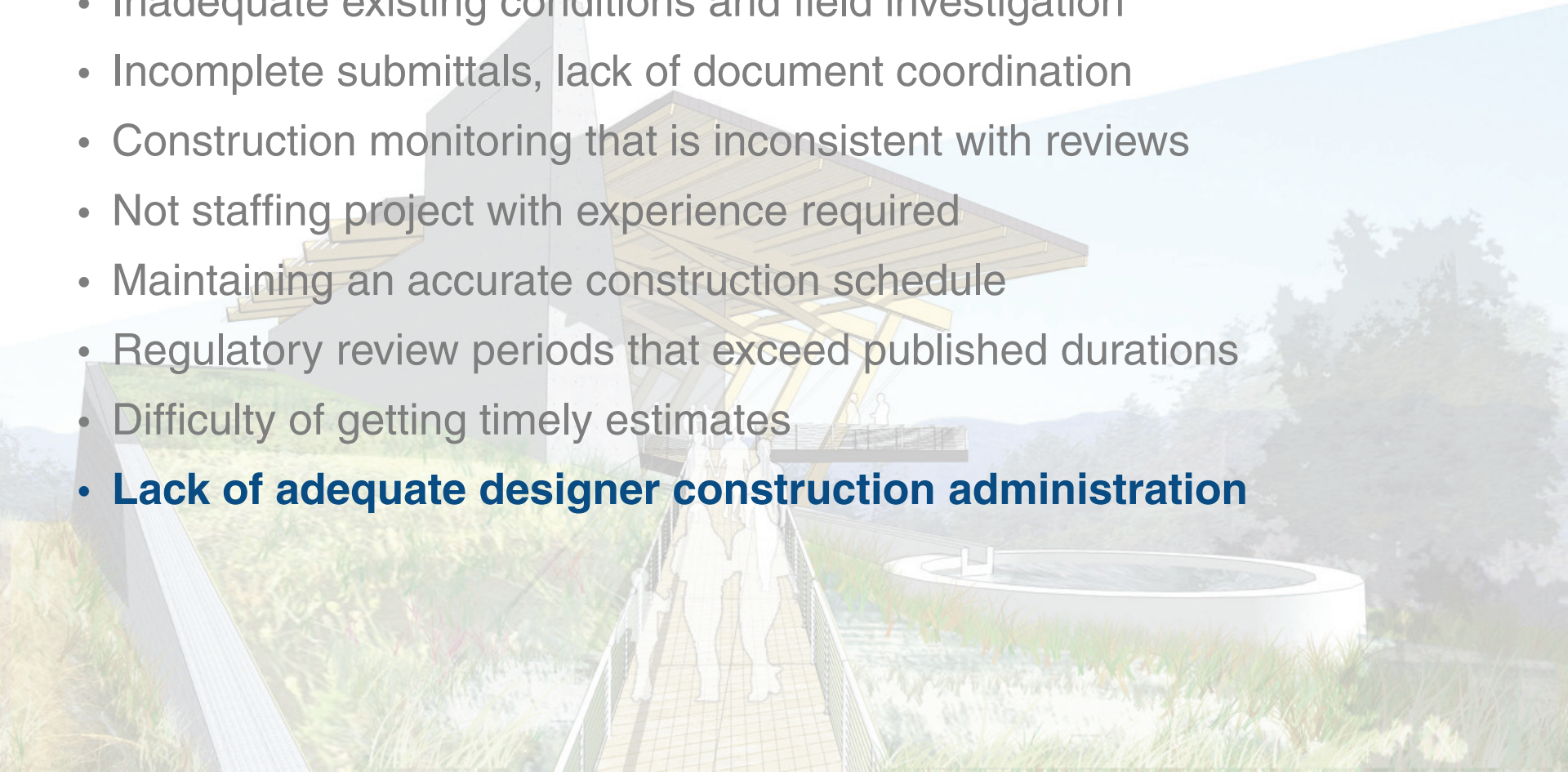
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- **Difficulty of getting timely estimates**

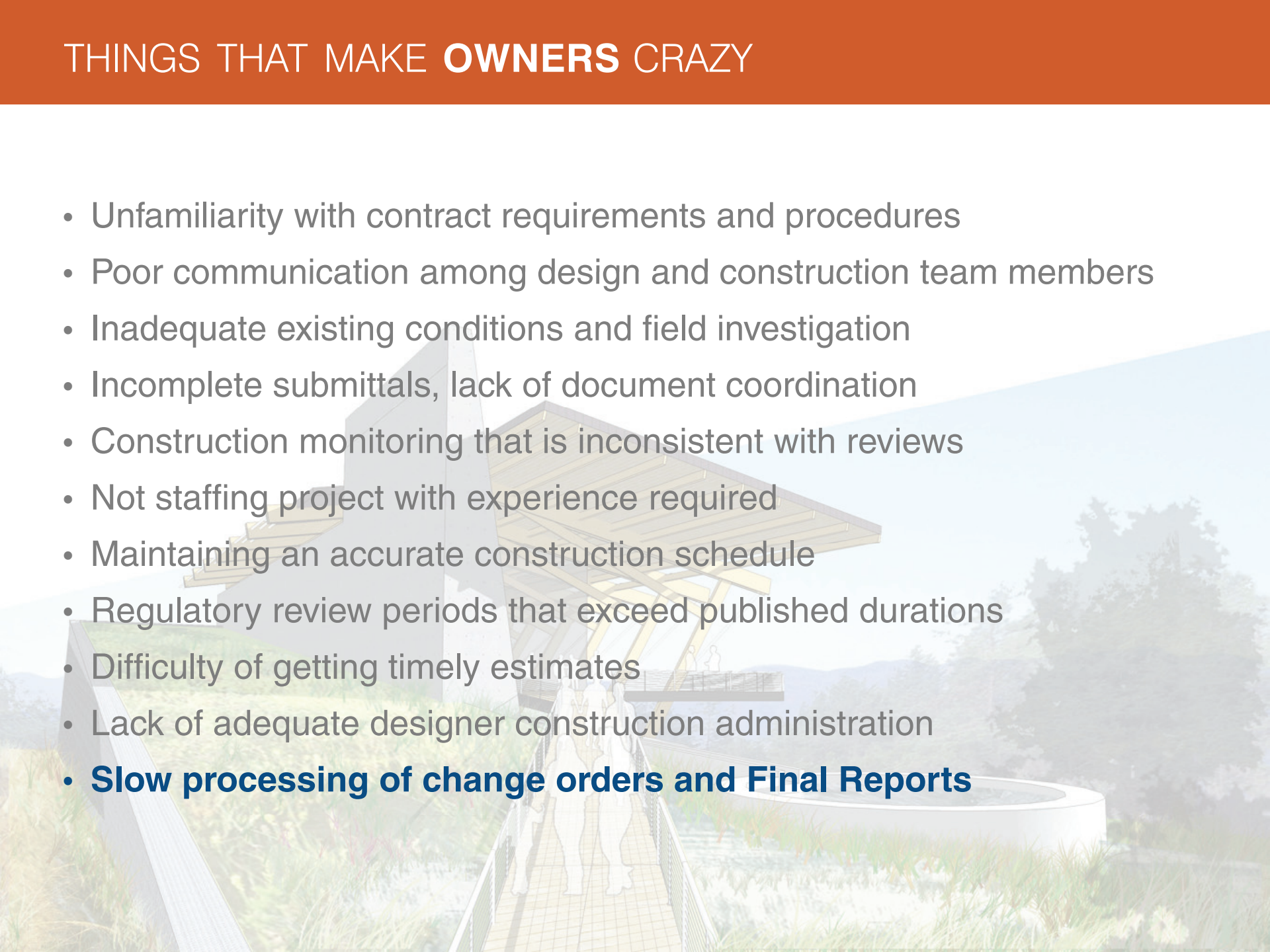


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- Difficulty of getting timely estimates
- **Lack of adequate designer construction administration**

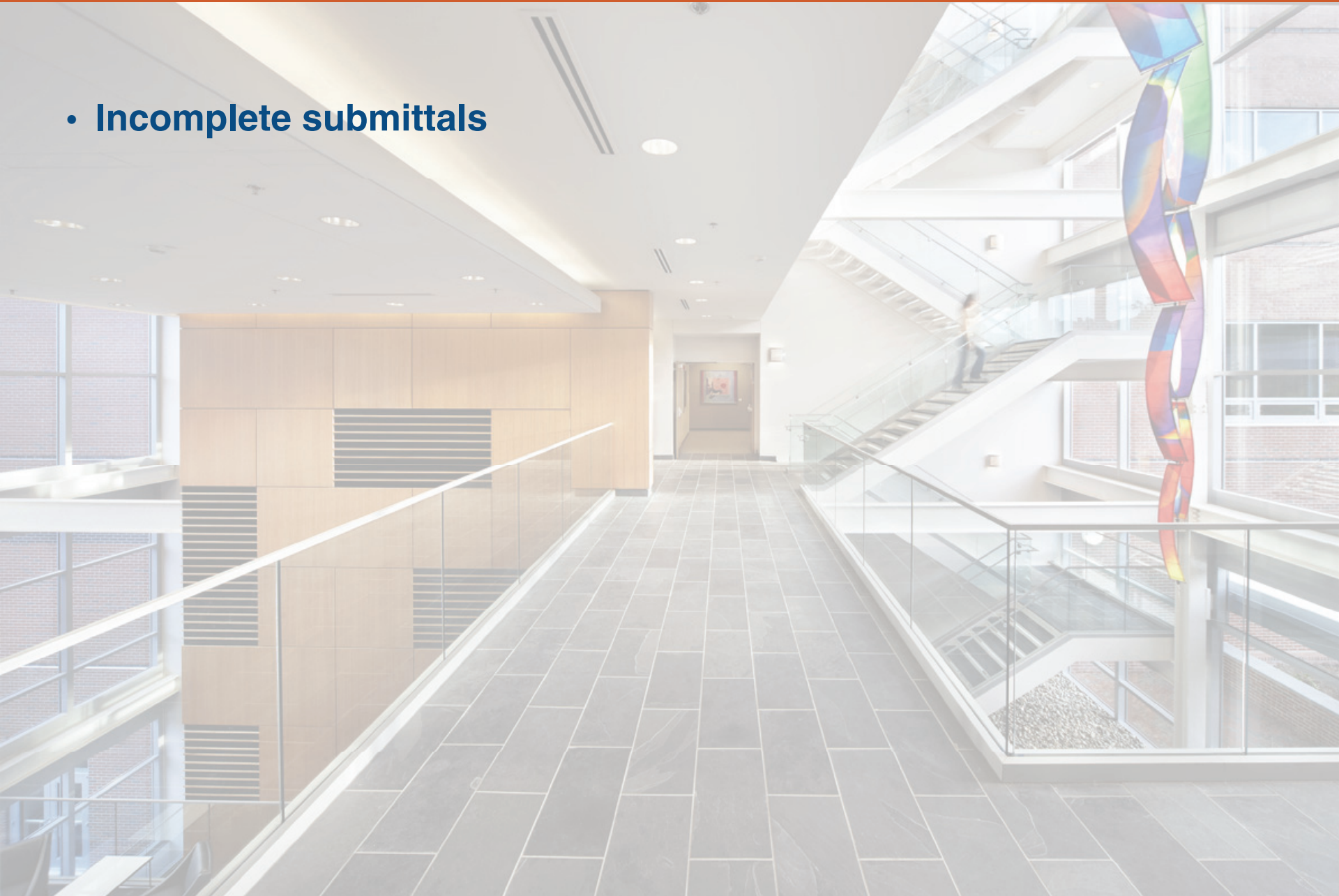


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 - Regulatory review periods that exceed published durations
 - Difficulty of getting timely estimates
 - Lack of adequate designer construction administration
 - **Slow processing of change orders and Final Reports**
- 
- An architectural rendering of a modern building with a prominent wooden walkway and a large overhanging roof structure. The scene is set in a natural, grassy environment with trees and hills in the background. Two stylized human figures are walking on the bridge-like structure. The overall aesthetic is clean and contemporary.

THINGS THAT MAKE **AGENCIES** CRAZY

- **Incomplete submittals**



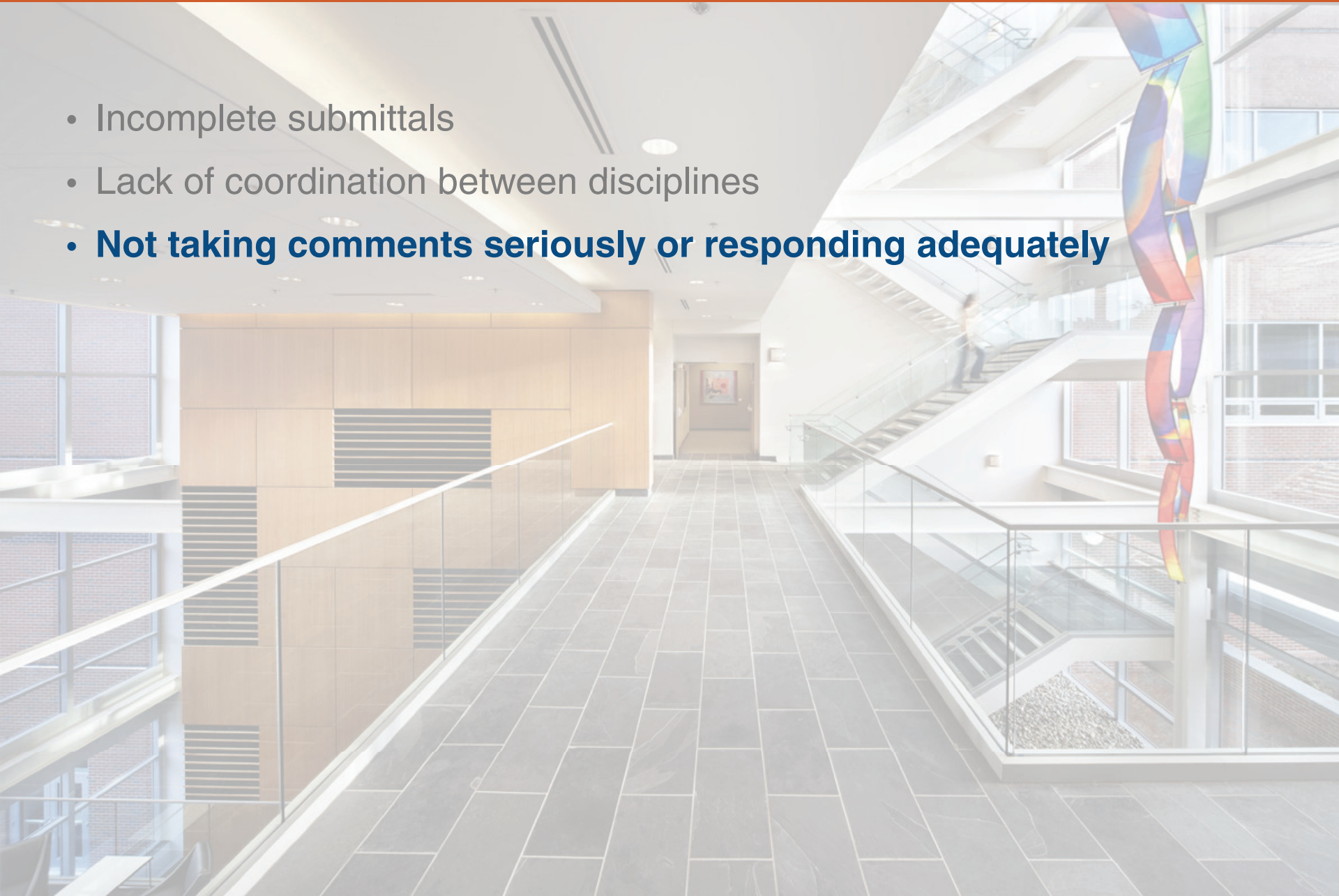
THINGS THAT MAKE **AGENCIES** CRAZY

- Incomplete submittals
- **Lack of coordination between disciplines**



THINGS THAT MAKE **AGENCIES** CRAZY

- Incomplete submittals
- Lack of coordination between disciplines
- **Not taking comments seriously or responding adequately**



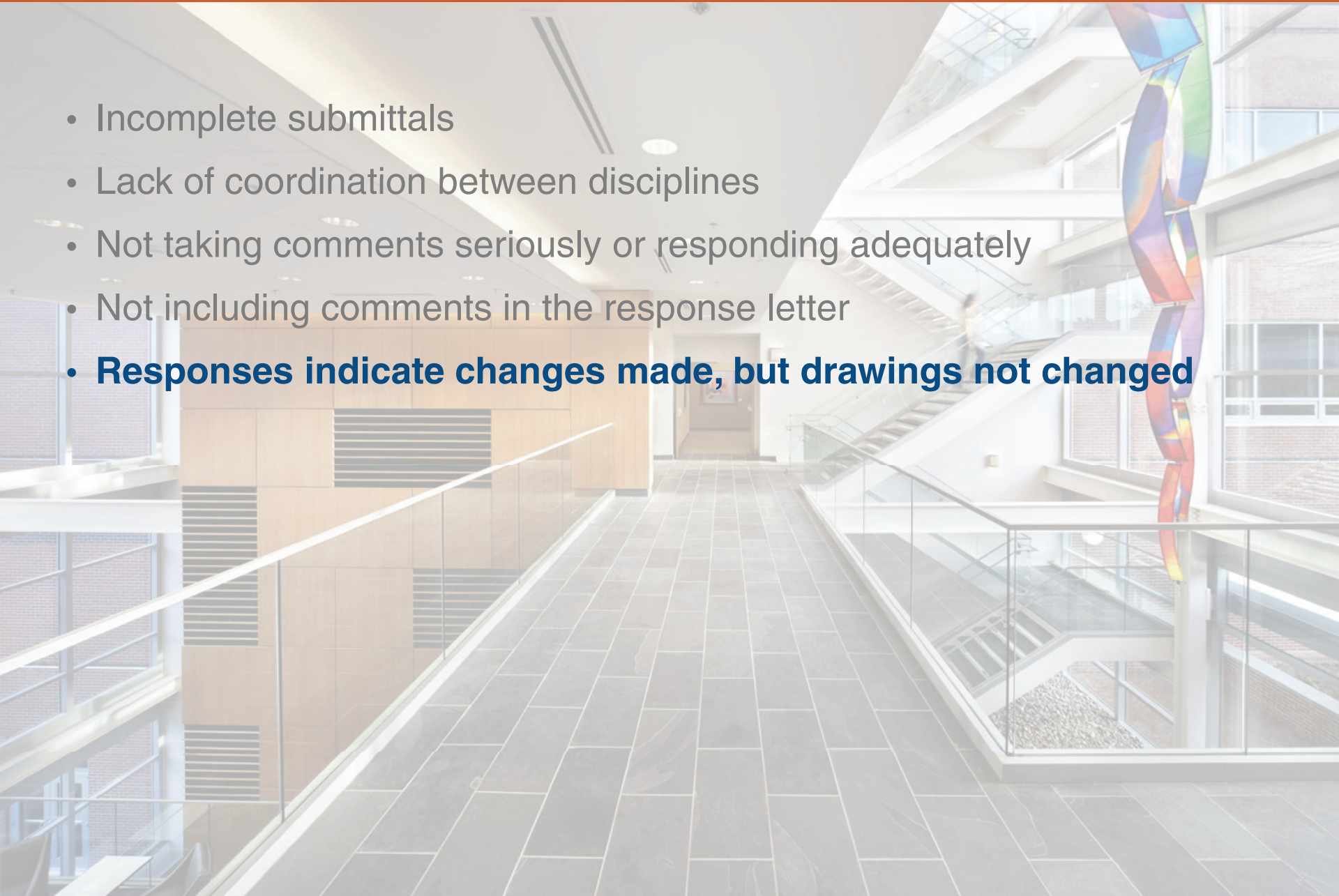
THINGS THAT MAKE **AGENCIES** CRAZY

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- Not taking comments seriously or responding adequately
- **Not including comments in the response letter**



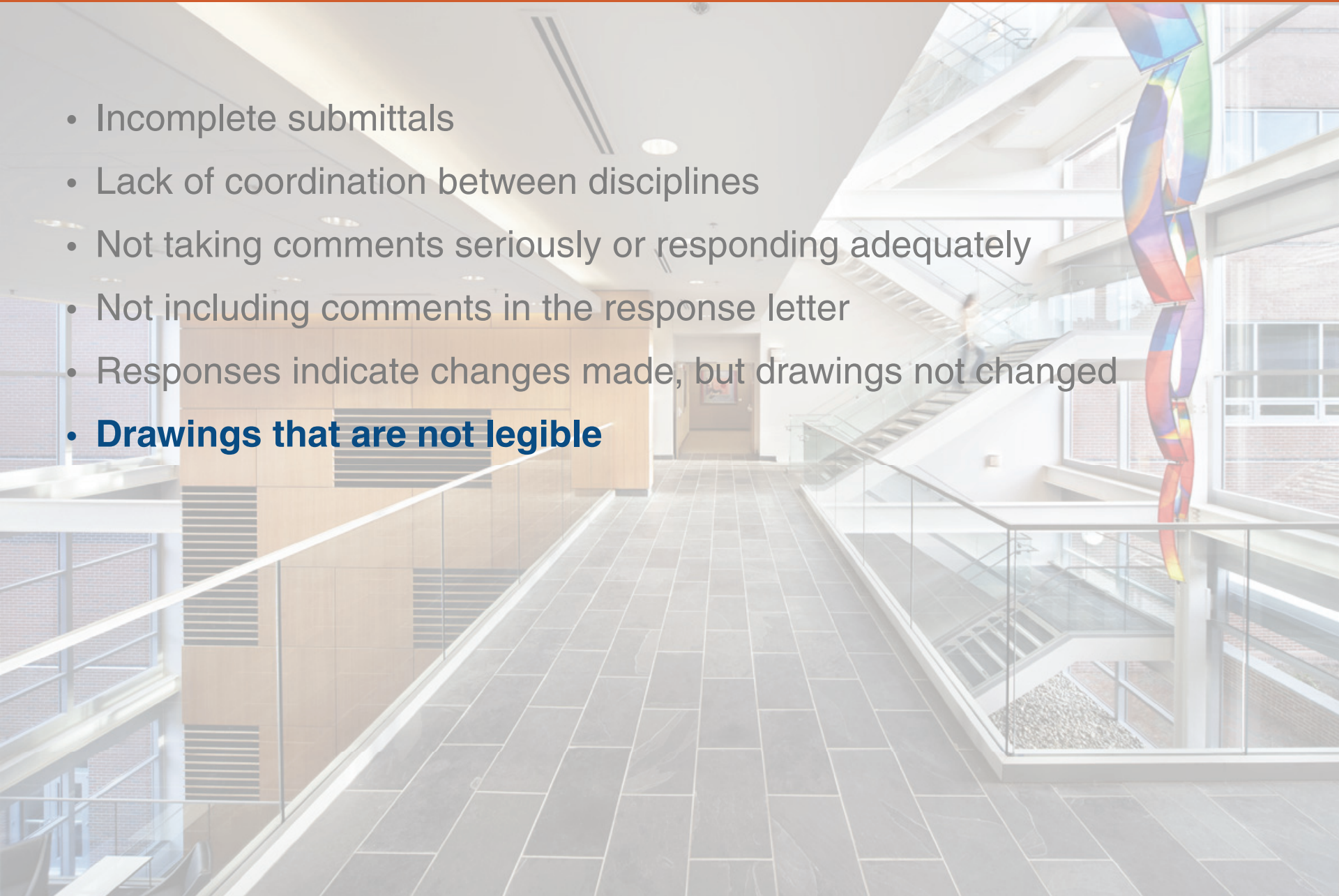
THINGS THAT MAKE **AGENCIES** CRAZY

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- **Drawings that are not legible**



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THINGS THAT MAKE **DESIGNERS** CRAZY

- **Schedules that are too optimistic**



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- Schedules that are too optimistic
- **Lack of timely decisions and last minute input from groups not involved in the project**



THINGS THAT MAKE **DESIGNERS** CRAZY

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- Lack of timely decisions and last minute input from groups not involved in the project
- **Not following through with decisions made in earlier phases**



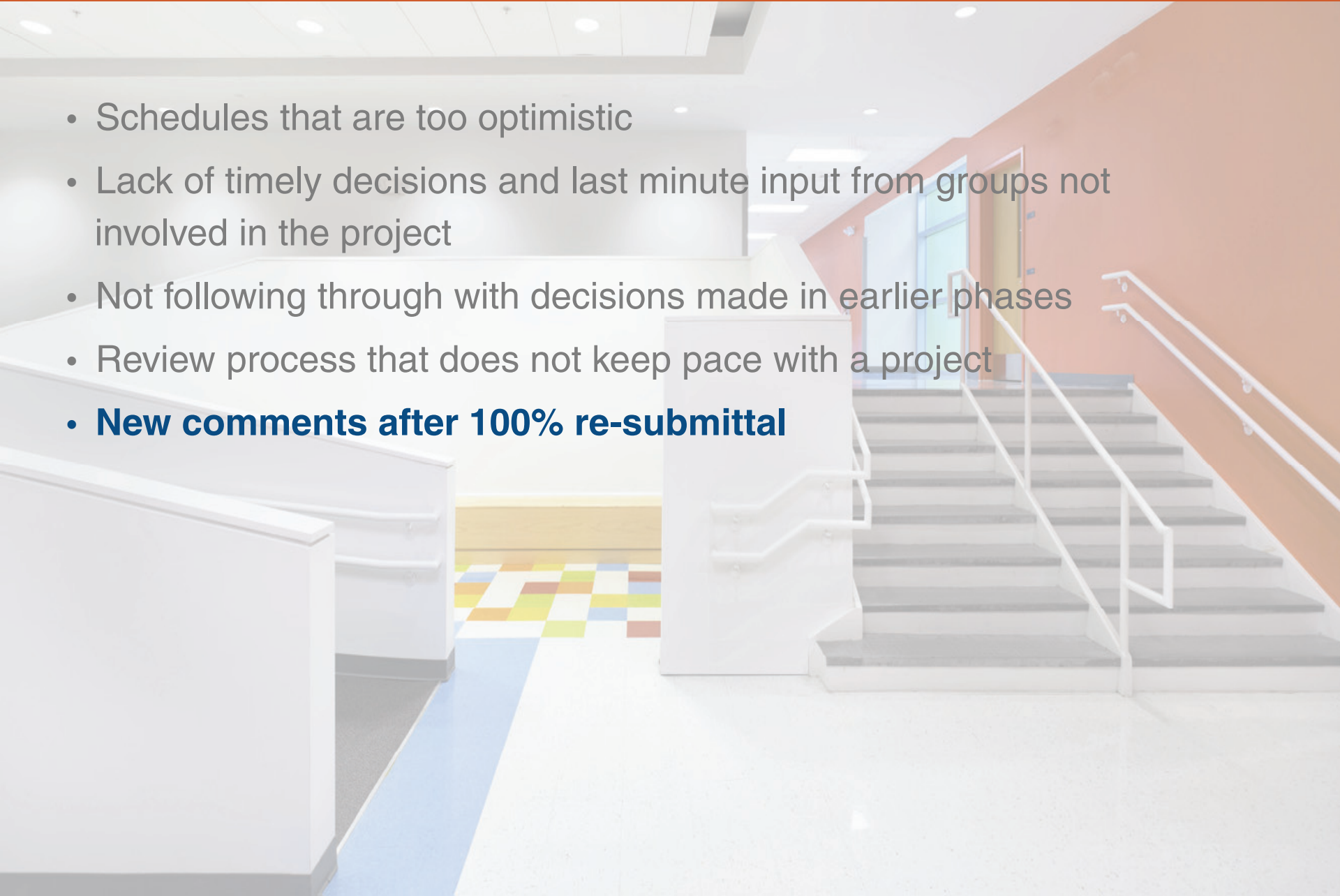
THINGS THAT MAKE **DESIGNERS** CRAZY

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- **Review process that does not keep pace with a project**



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- **New comments after 100% re-submittal**



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- **Lack of communication among regulatory agencies**

Common Areas of Concern

COMMON AREAS OF CONCERN

- Effective **communication** among team members
- Scope, design, and **budget** match
- Realistic **schedule**
- Complete and coordinated **submittals**
- Timely and consistent **reviews**
- **Review** responses are clear and complete
- Construction **administered and monitored as approved**
- **Change documentation** keeps pace with project
- Expedited **close out**

Frequent Realities of Public Projects

REALITIES OF PUBLIC PROJECTS

- Communication with a large number people
- Schedule is tight
- More program than funding

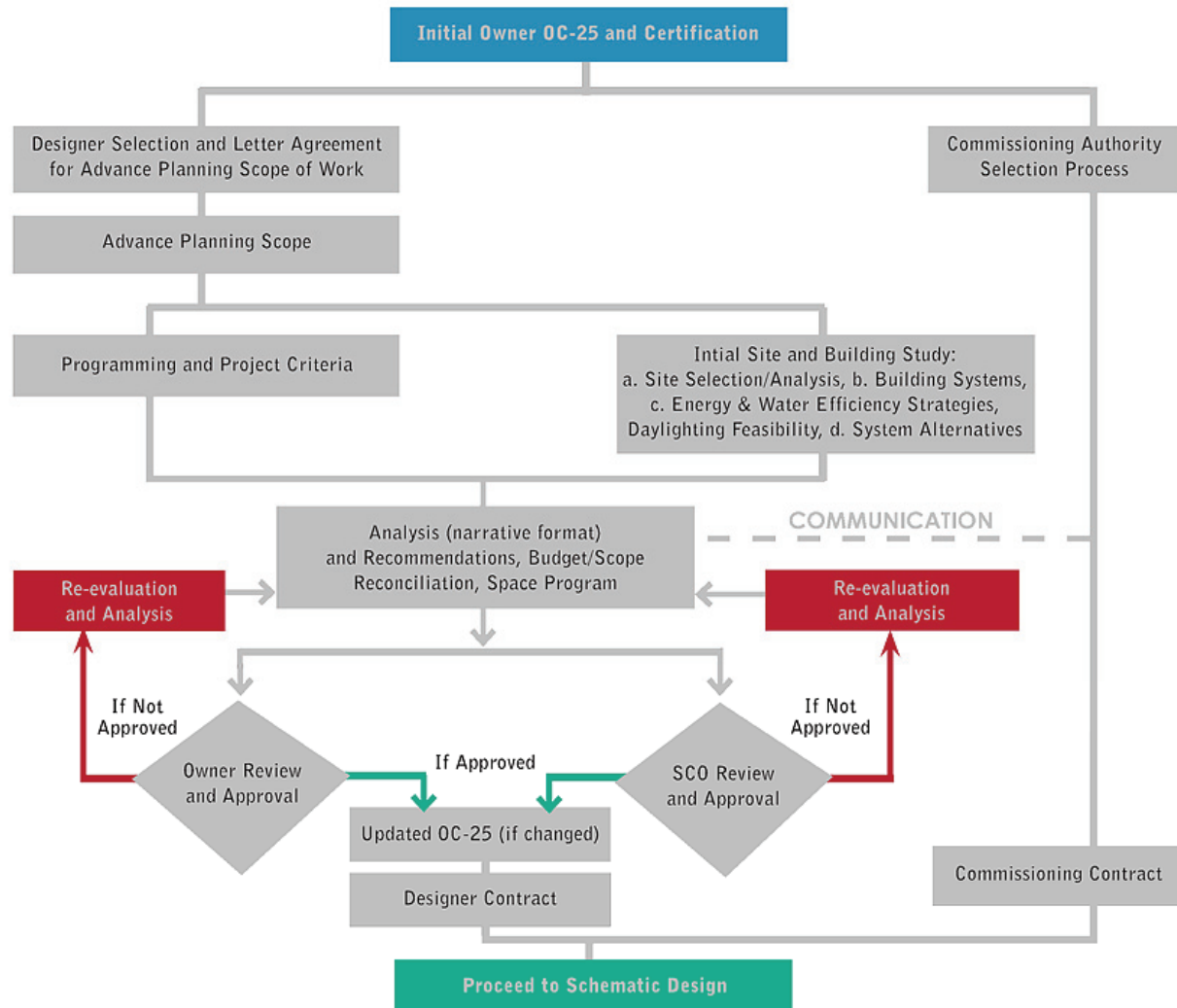


One of the challenges with communication is the assumption that it is taking place.

COMMUNICATION

SUSTAINABLE, ENERGY EFFICIENT BUILDINGS ADVANCE PLANNING FLOWCHART

GS - 143 - 135.35 - .40 (Article 8C)



Revised 29 September 2008

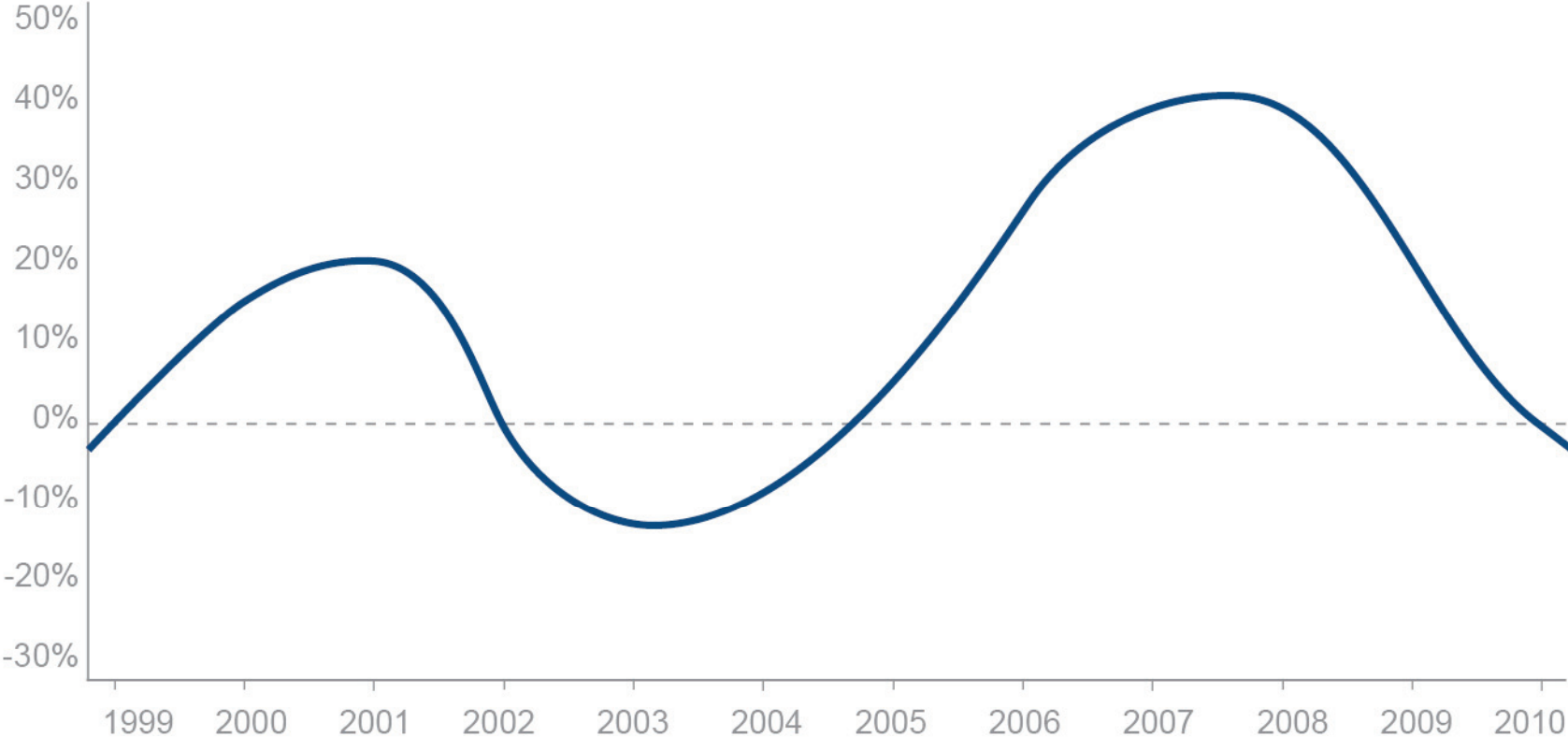
BUILDING A BUDGET

- Build budget around preliminary program and site analysis or, if starting with a budget, back into a reasonable program
- Look at comparable facilities for cost information
- Site costs can swing a project budget 20% or more
- If everyone is building a project type for \$ X and a budget is \$ X + 10% or X – 10% understand the implications
- Construction costs are only about $\frac{2}{3}$ of total project cost



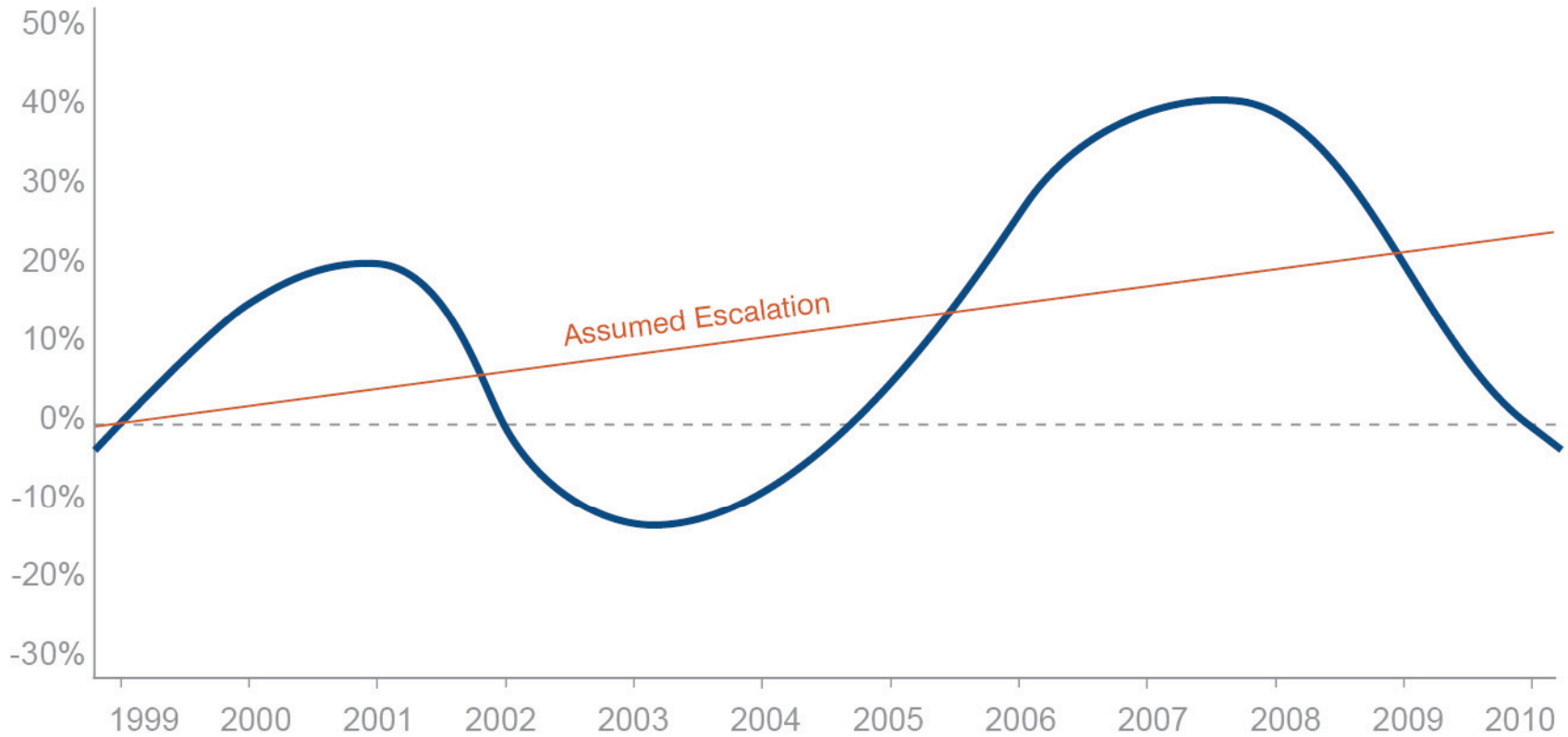
BUILDING A BUDGET

Cost history of the past ten years



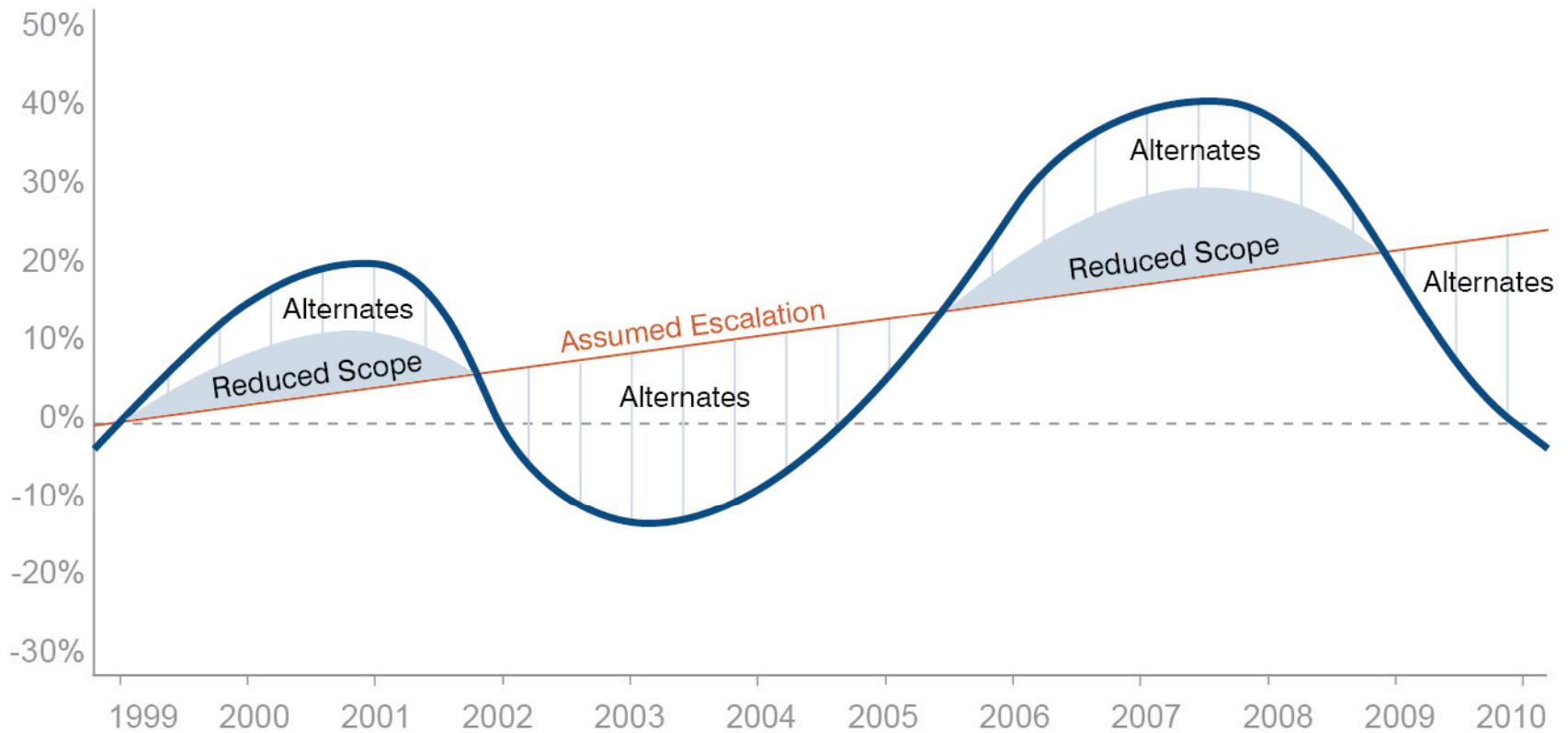
BUILDING A BUDGET

Cost trend with assumed escalation



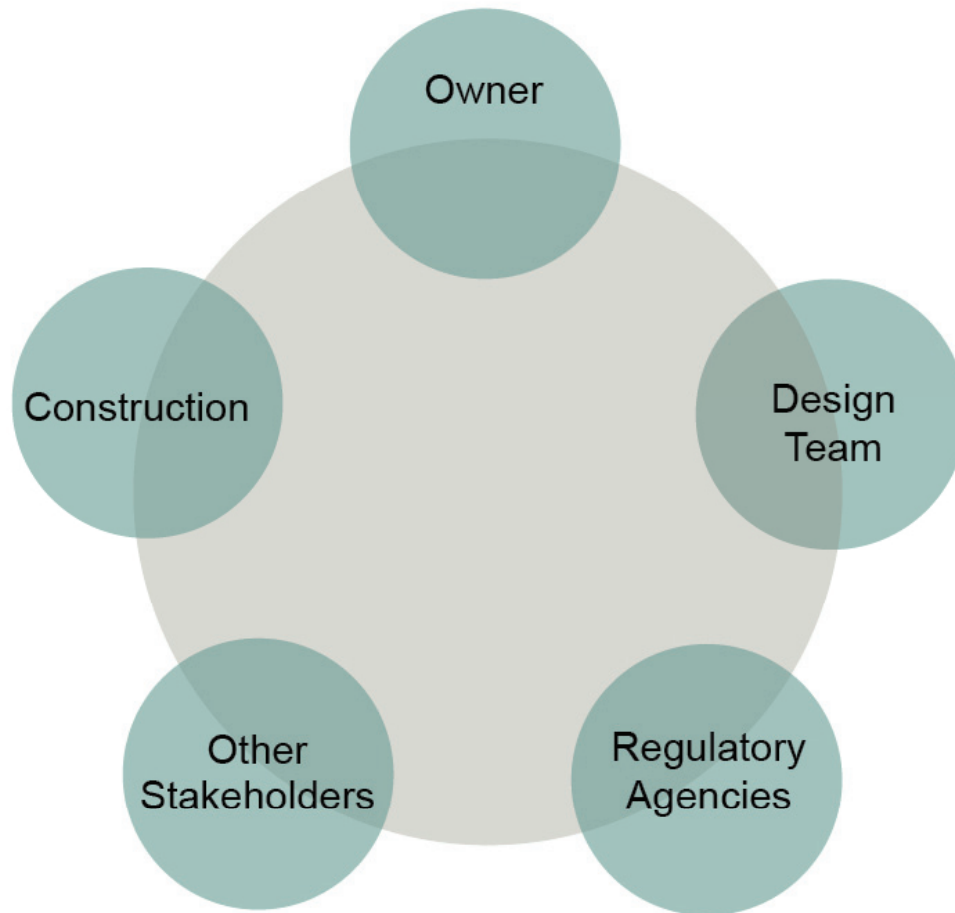
BUILDING A BUDGET

Base bid must be a complete project; use alternates to adjust cost trend



BUILDING A TEAM

People who will impact a project should be at the table early



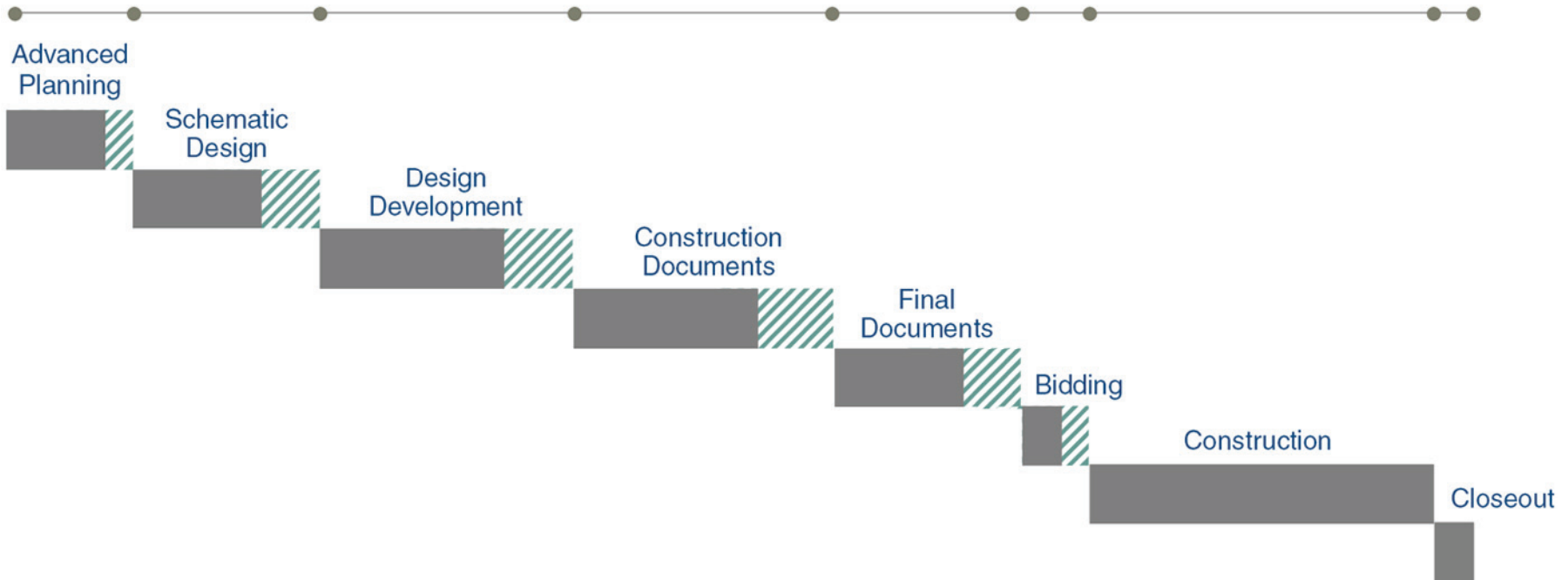
BUILDING A SCHEDULE



Advanced
Planning



BUILDING A SCHEDULE



- Owners and designers can't move fast enough during advanced planning
- Designers and reviewers can't move fast enough during design
- Contractors and monitors can't move fast enough during construction

UNDERSTANDING A PROGRAM

Establish program and project requirements



Classroom + Instruction

Seminar Room 2.5a-d

A. Area Summary

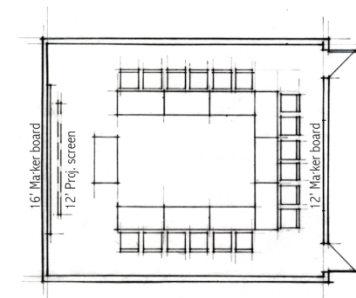
1. Space Name:	Seminar Room		
2. No. of Rooms:	4	750 NSF	3,000
Notes:			

B. Function

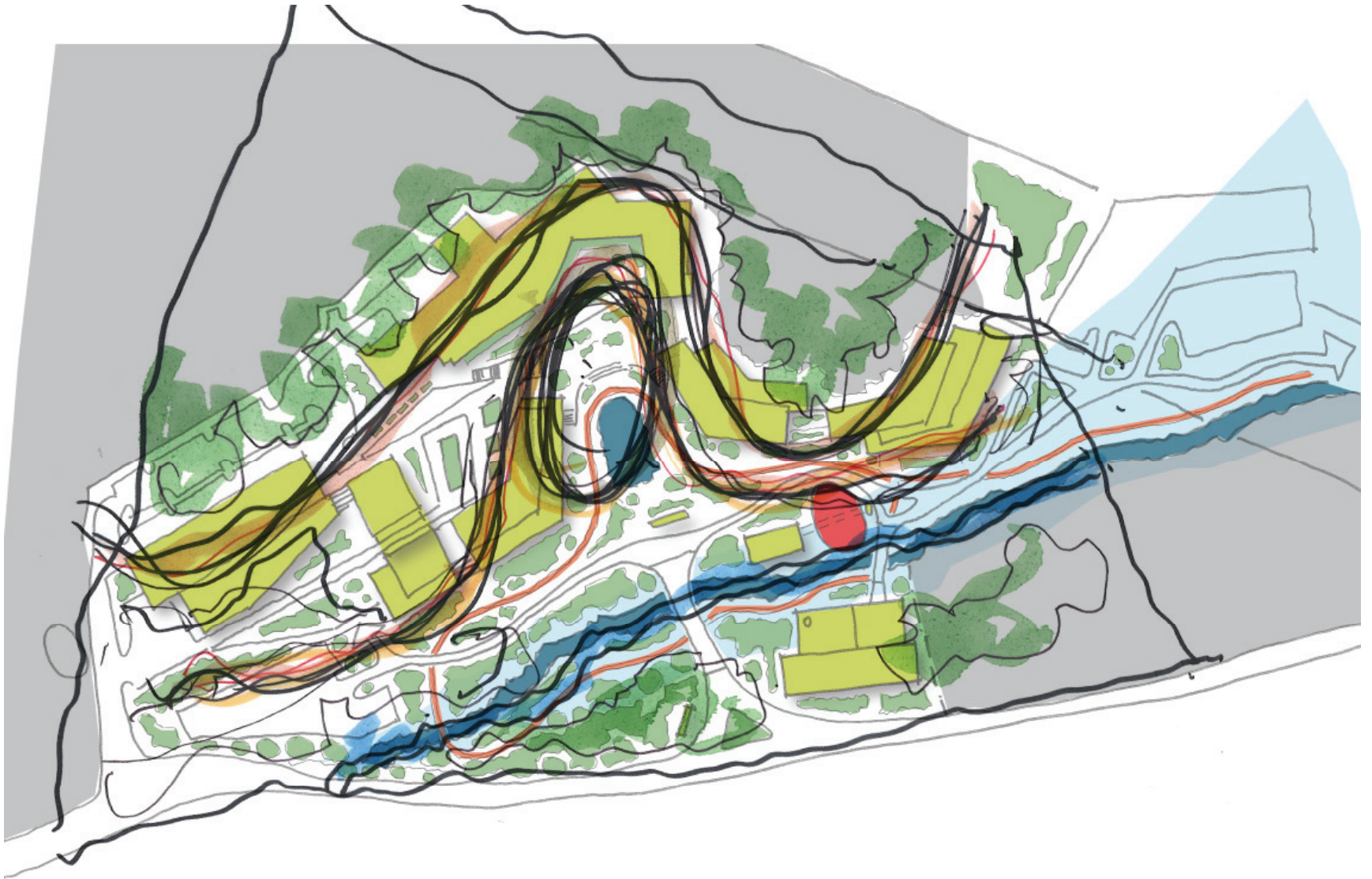
1. Adjacency:	Classrooms, Flex Classroom
2. Occupancy:	15-20 persons
Notes:	Equipped to support distance learning

C. Special Requirements

1. Finishes		4. Electrical	
Floor:	Carpet	Power:	110 V
Walls:	GWB painted	Lighting:	Fluorescent
Ceiling:	Acoustical tile	Data/Comm:	1 voice and plenty of data
Door(s):	Flush	Notes:	Equipped to support distance learning, projection, and lectures
Notes:	Natural light is not desirable	5. Equipment/Furnishings	
2. Mechanical		Furniture:	15-20 chairs, movable tables, N.I.C.
Temperature:	72 degrees +/- 4 degrees	Built-in Millwork:	No
Humidity:	45% - 50%	Computer:	Yes, at each seat
Dedicated T-Stat:	Zoned	Fax:	No
Notes:	Low air velocity, sound isolation required	Copier:	No
3. Plumbing		Notes:	Accessible to wireless network
Sink:	No		
Water Closet:	No		
Shower:	No		
Notes:	Floor Drains		

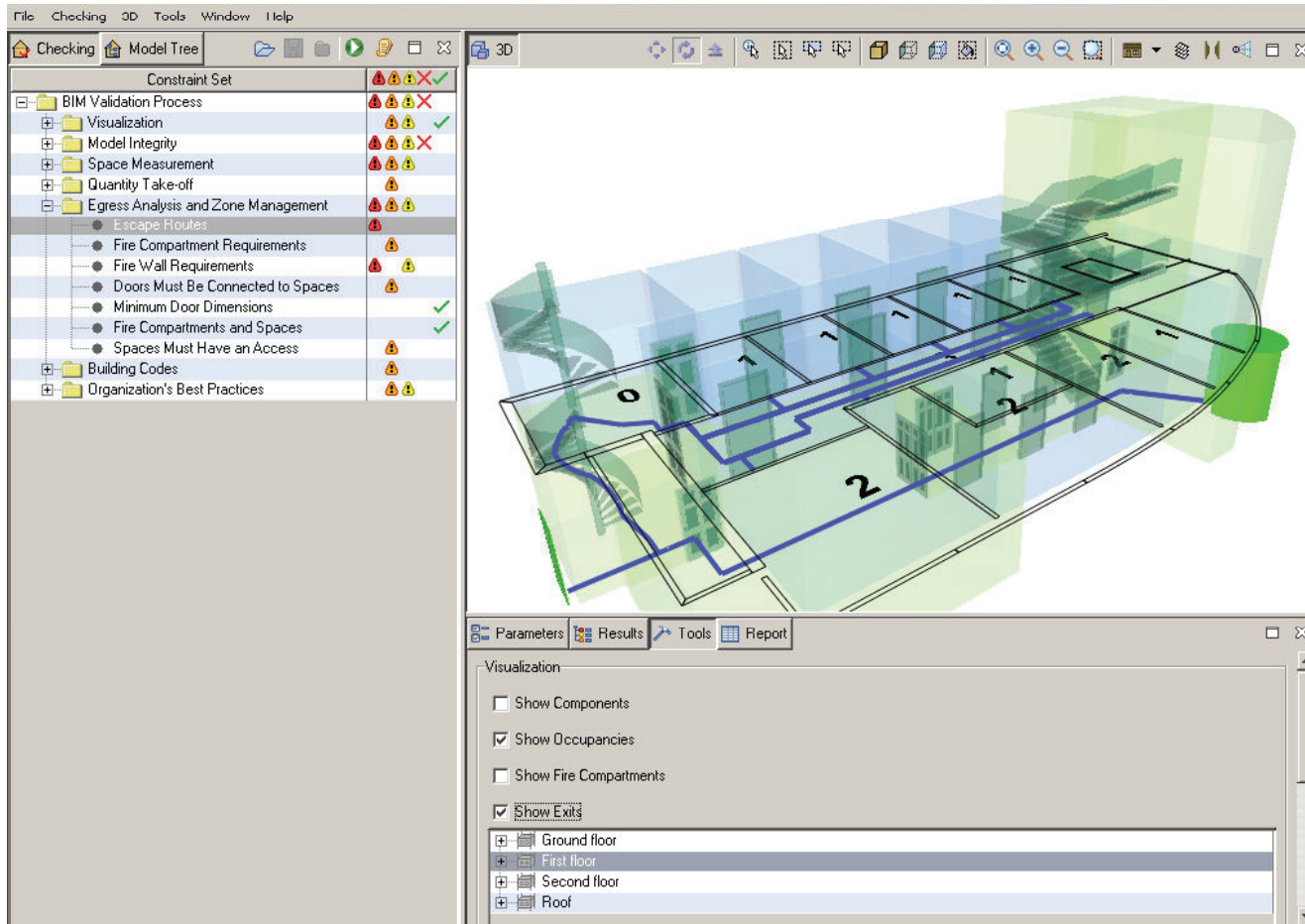


UNDERSTANDING A SITE



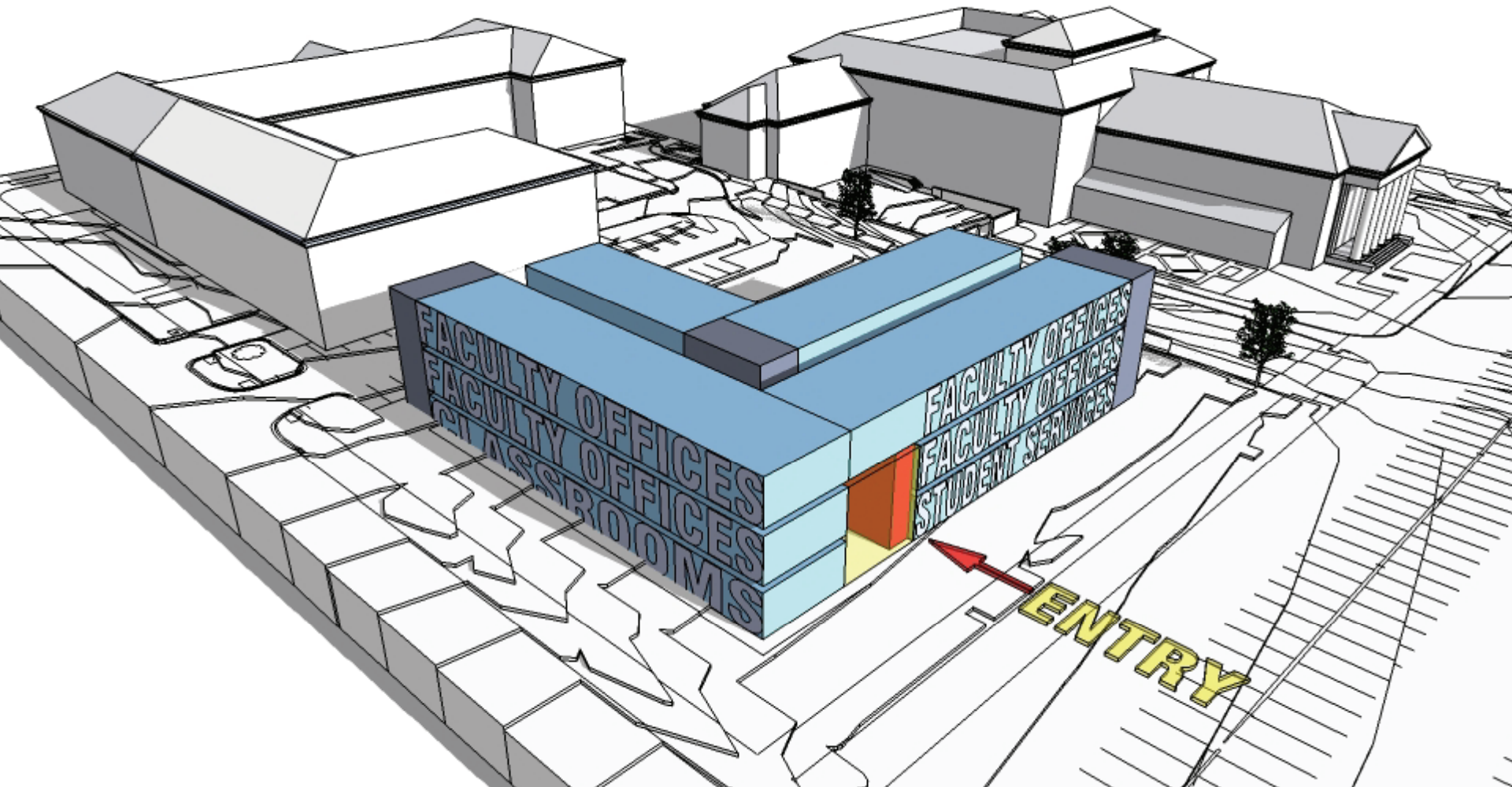
UNDERSTANDING OTHER REQUIREMENTS

Identify code, regulatory, and sustainability requirements



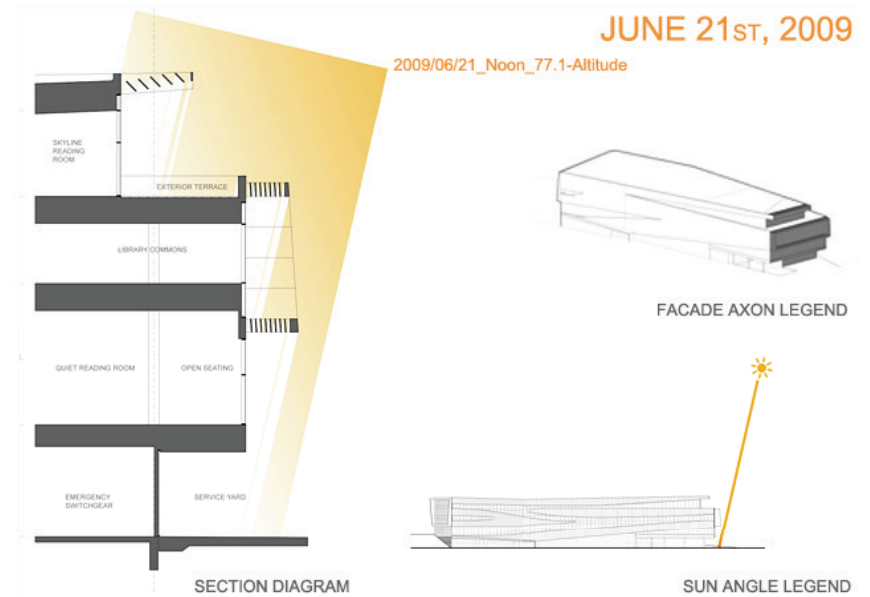
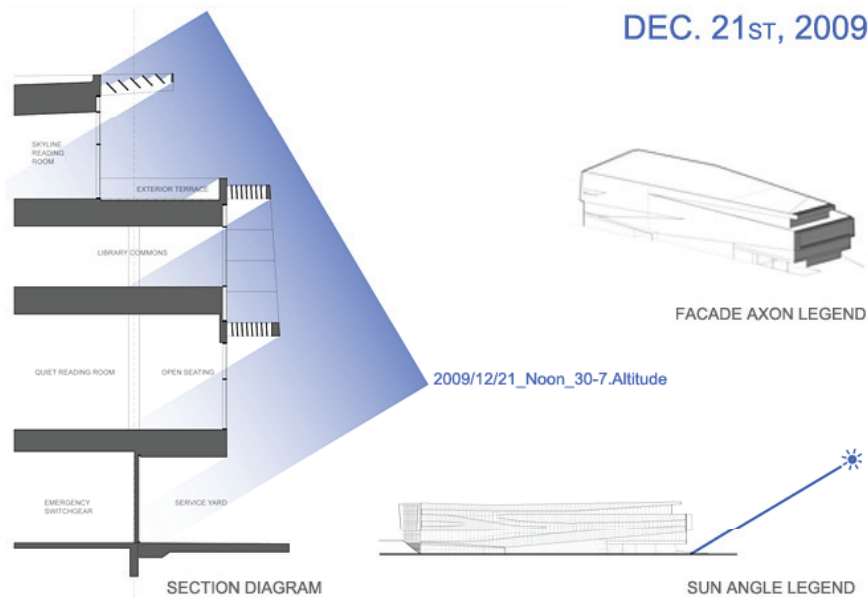
ANALYSIS AND COMMUNICATION

Provide information in ways that quickly allows understanding

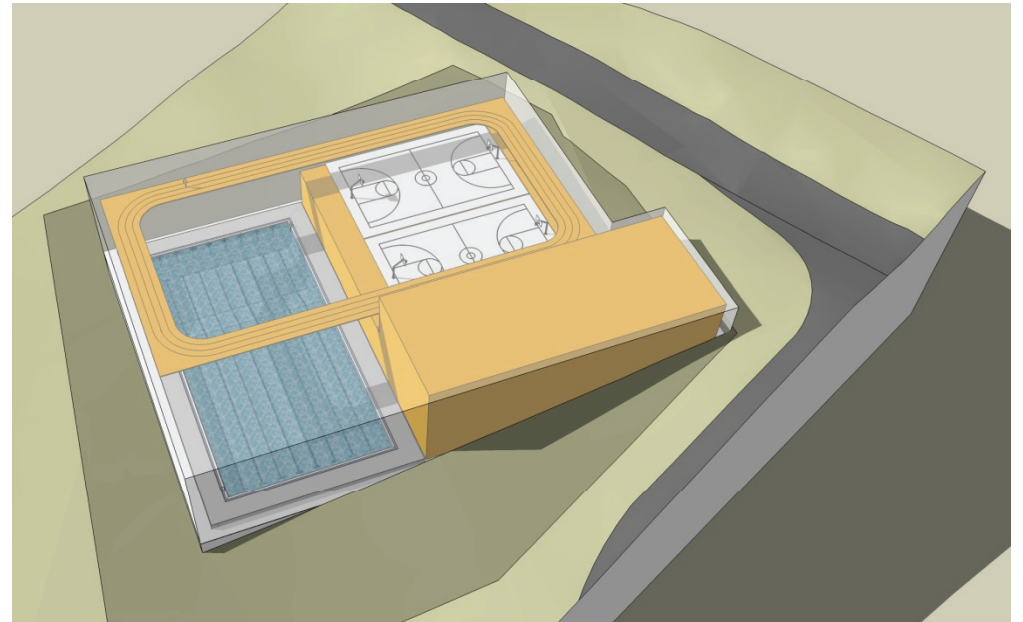
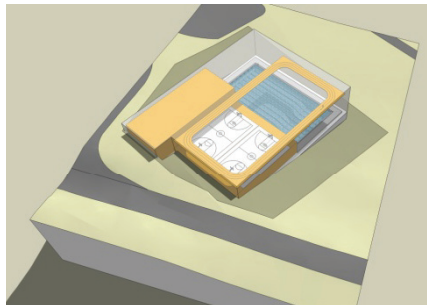
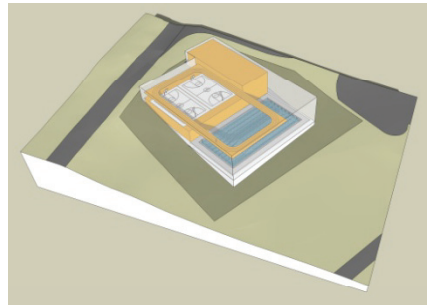


ANALYSIS AND COMMUNICATION

A key component of Advanced Planning is documentation of strategies for energy and water conservation

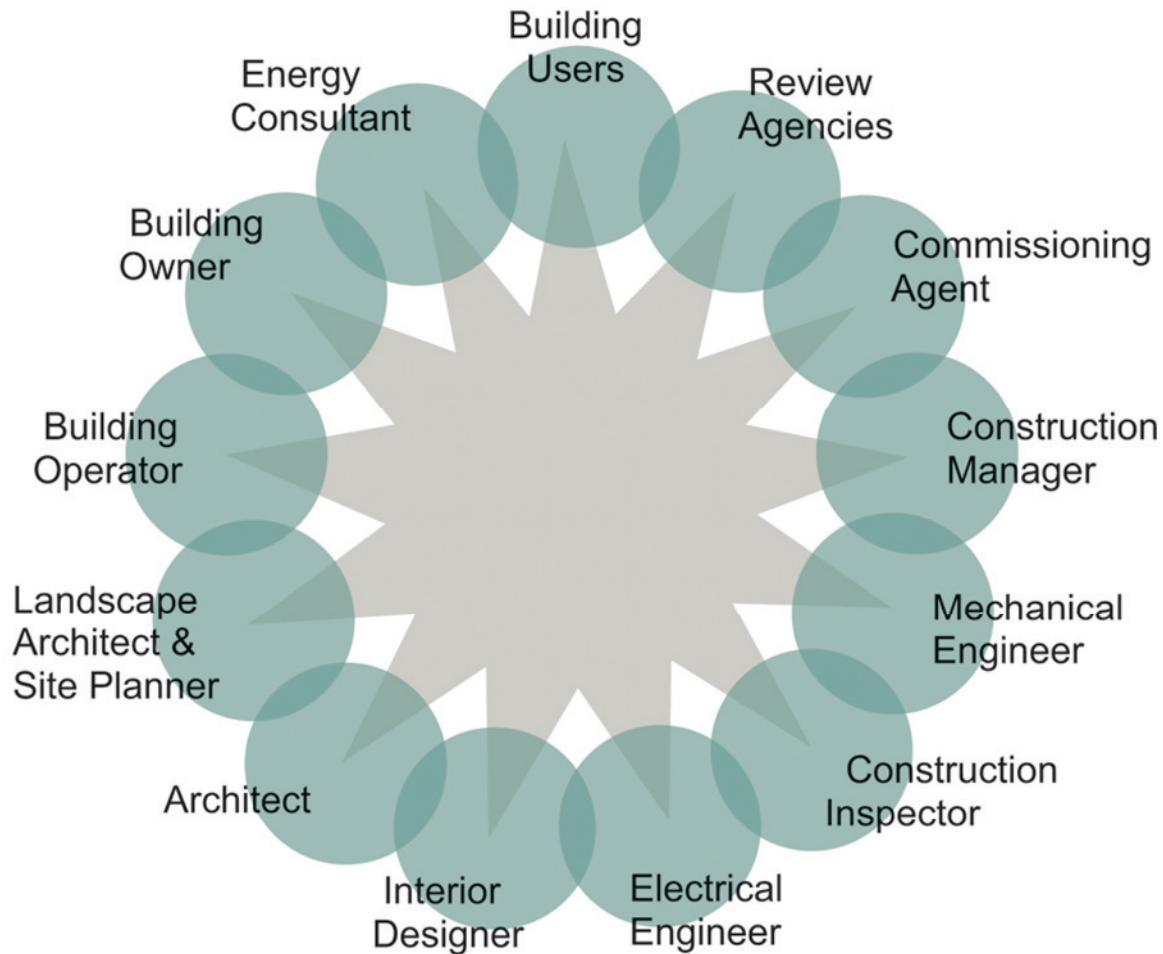


SCHEMATIC DESIGN

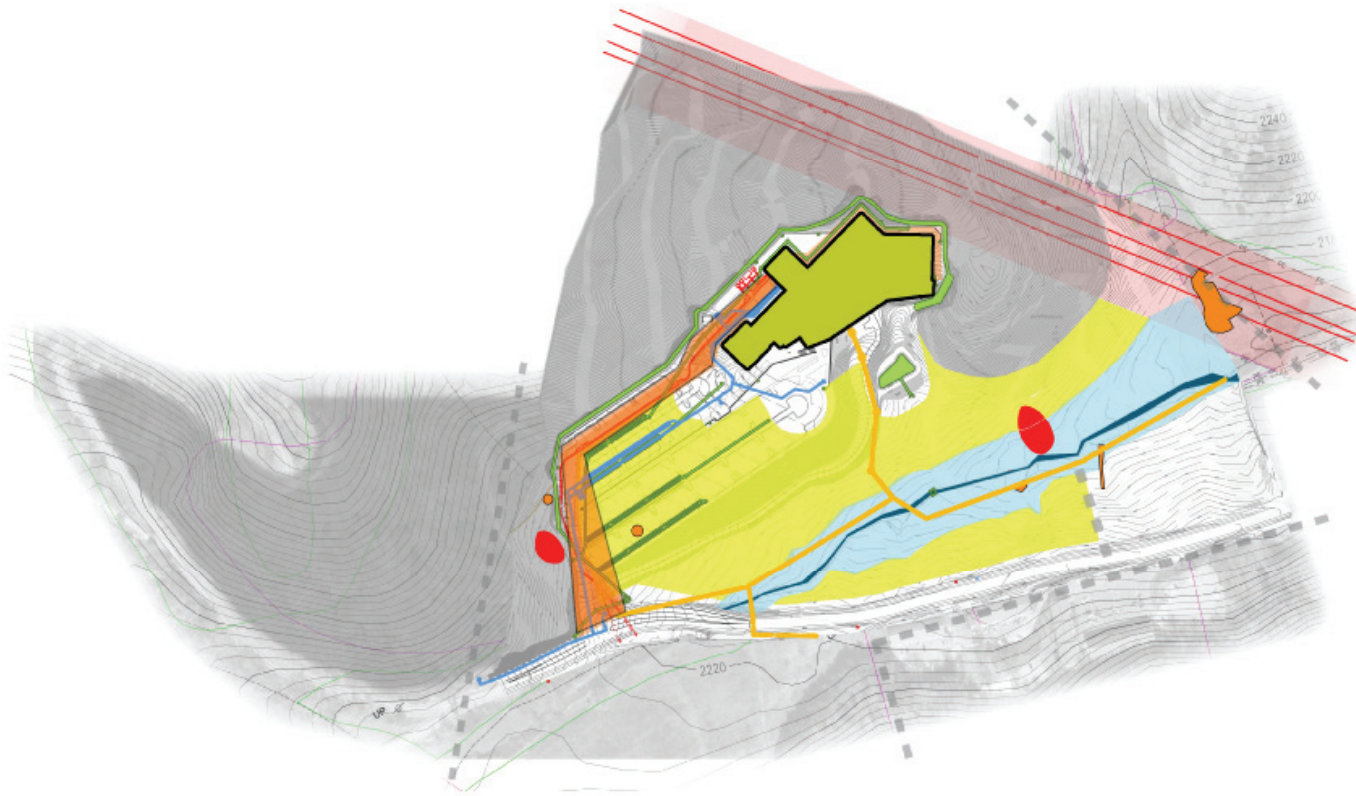


BUILDING A TEAM

Once the project is defined, move additional players in early



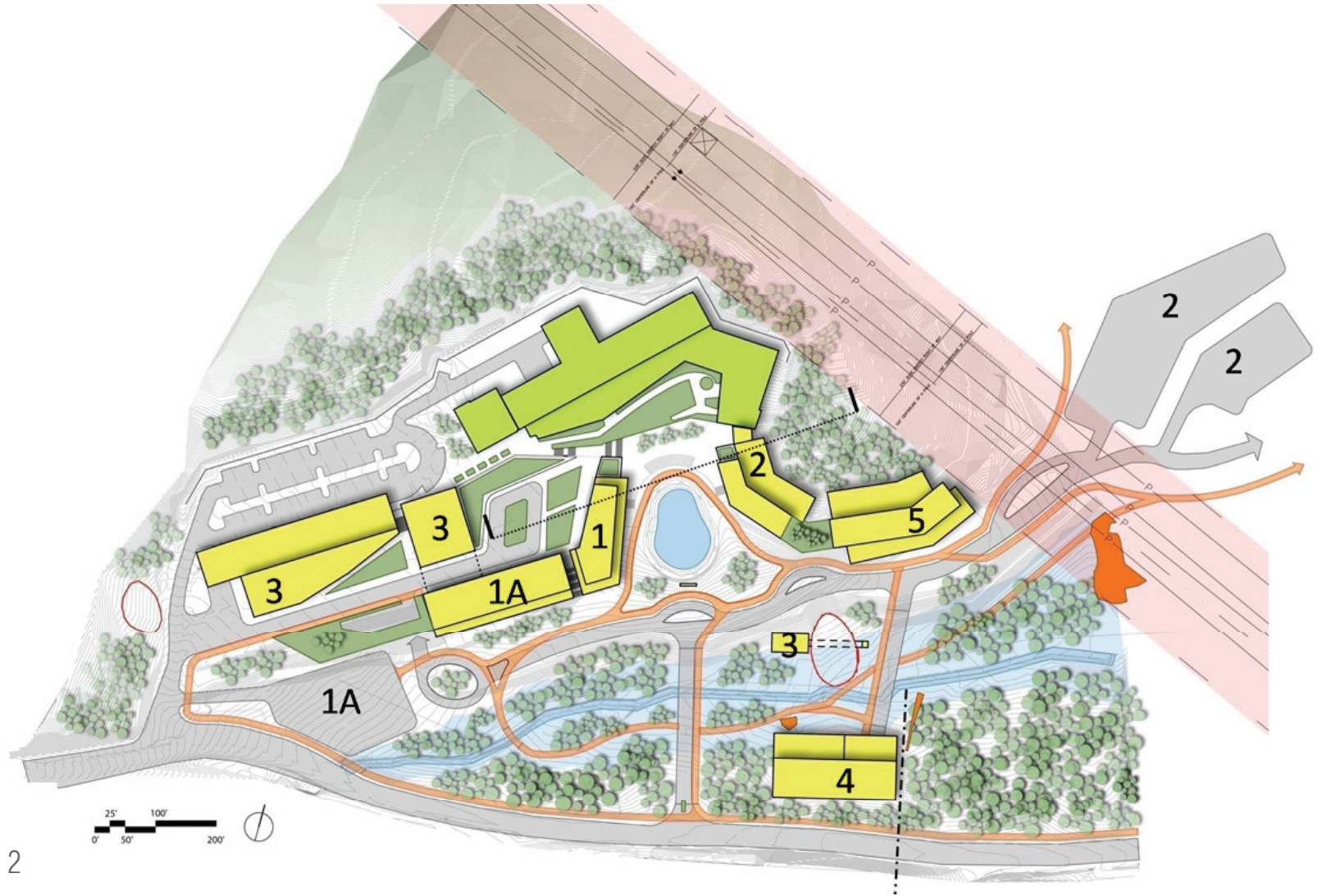
ANALYSIS AND COMMUNICATION



buildable area

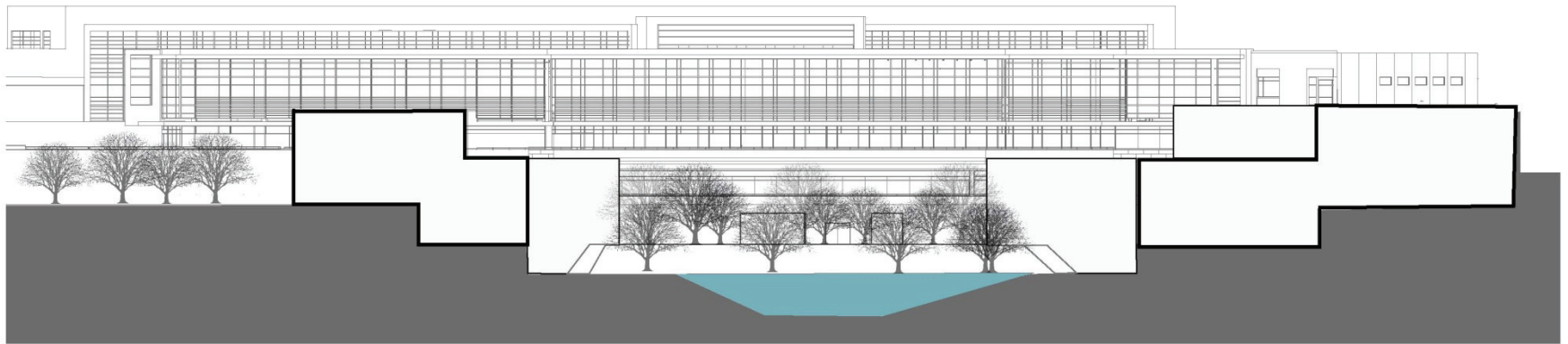


ANALYSIS AND COMMUNICATION



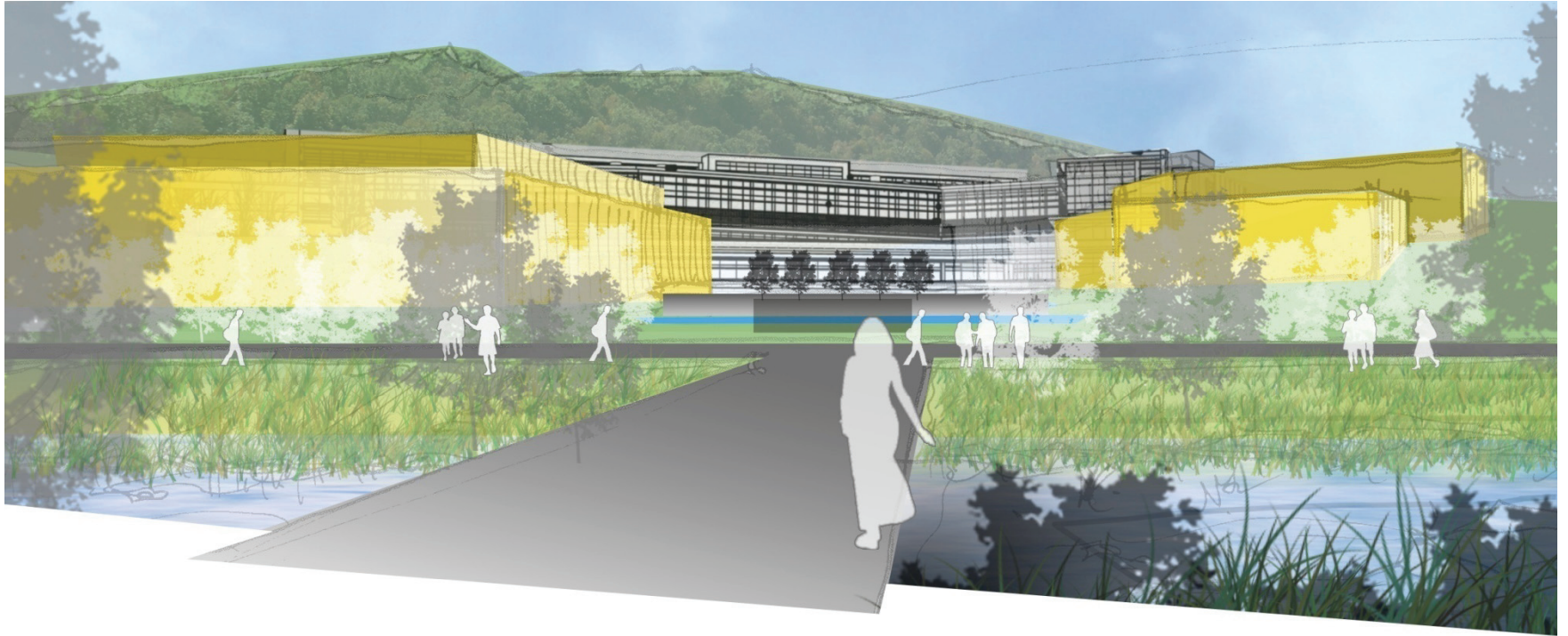
site section 2

ANALYSIS AND COMMUNICATION



site section 2 master plan study

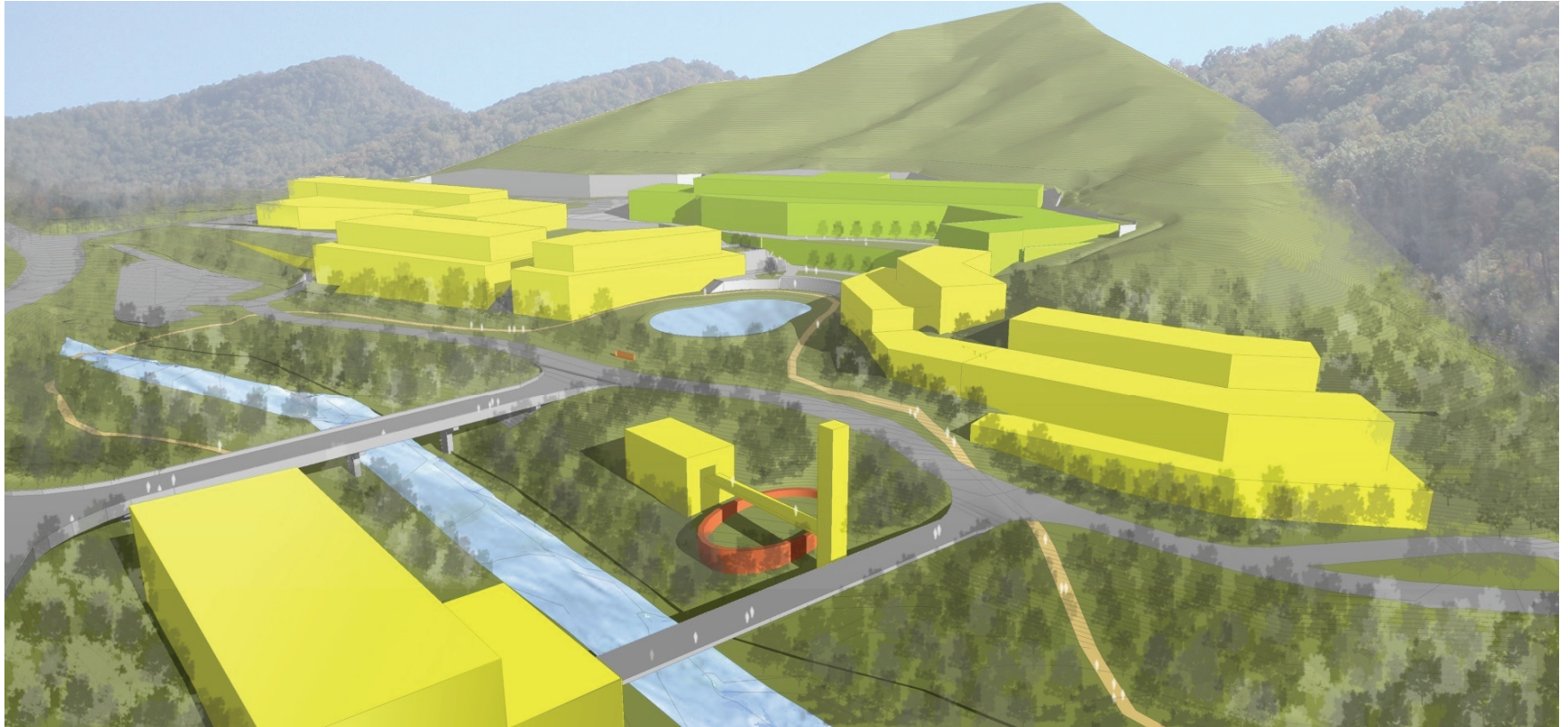
ANALYSIS AND COMMUNICATION



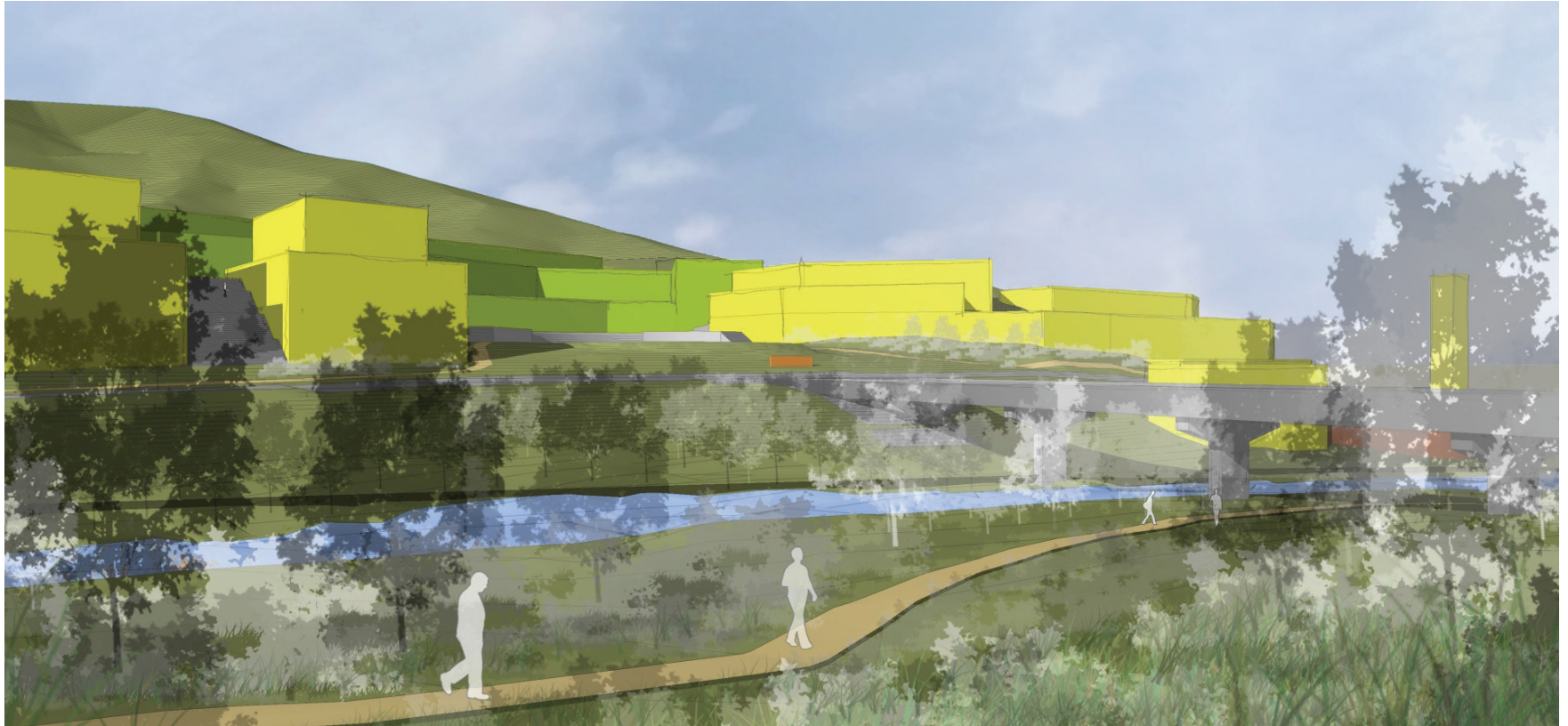
ANALYSIS AND COMMUNICATION



ANALYSIS AND COMMUNICATION

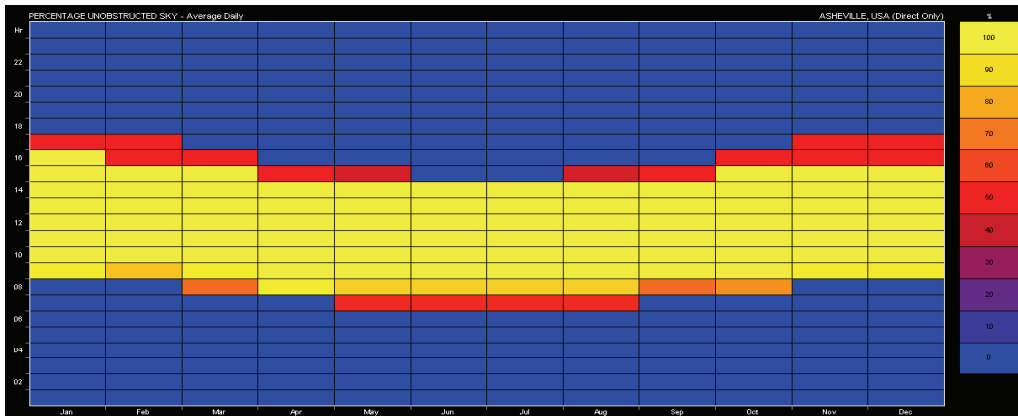


ANALYSIS AND COMMUNICATION

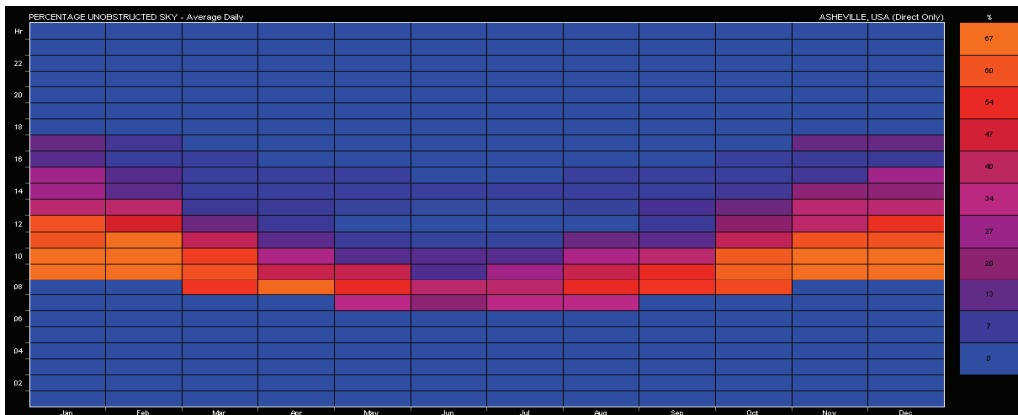


ANALYSIS AND COMMUNICATION

The Life Cycle Cost Analysis and other components of SB 668 are key elements of the SD submittal



% of glazing in direct sunlight, no shading



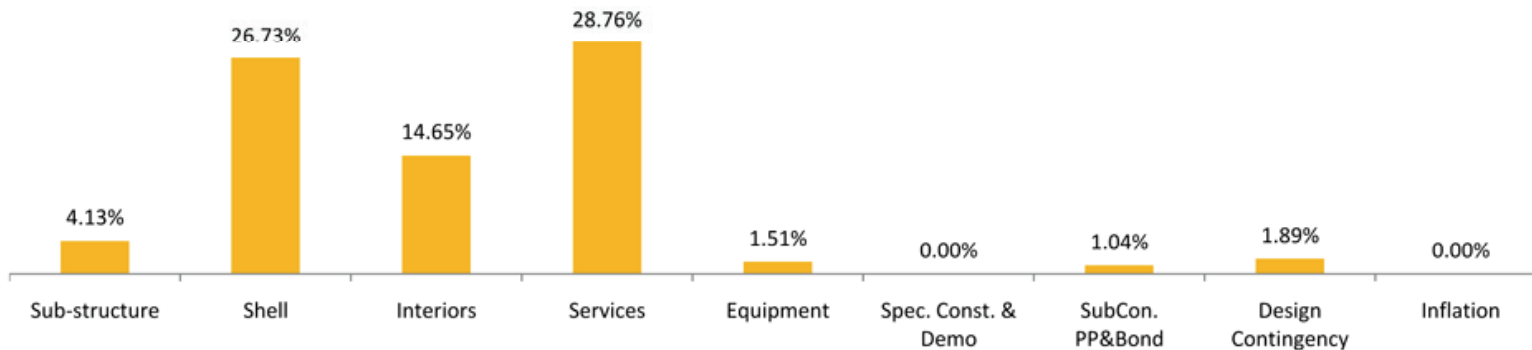
% of glazing in direct sunlight, shading in place

ANALYSIS AND COMMUNICATION

Construction Documentation Cost Report

Cost Summary - Uniformat

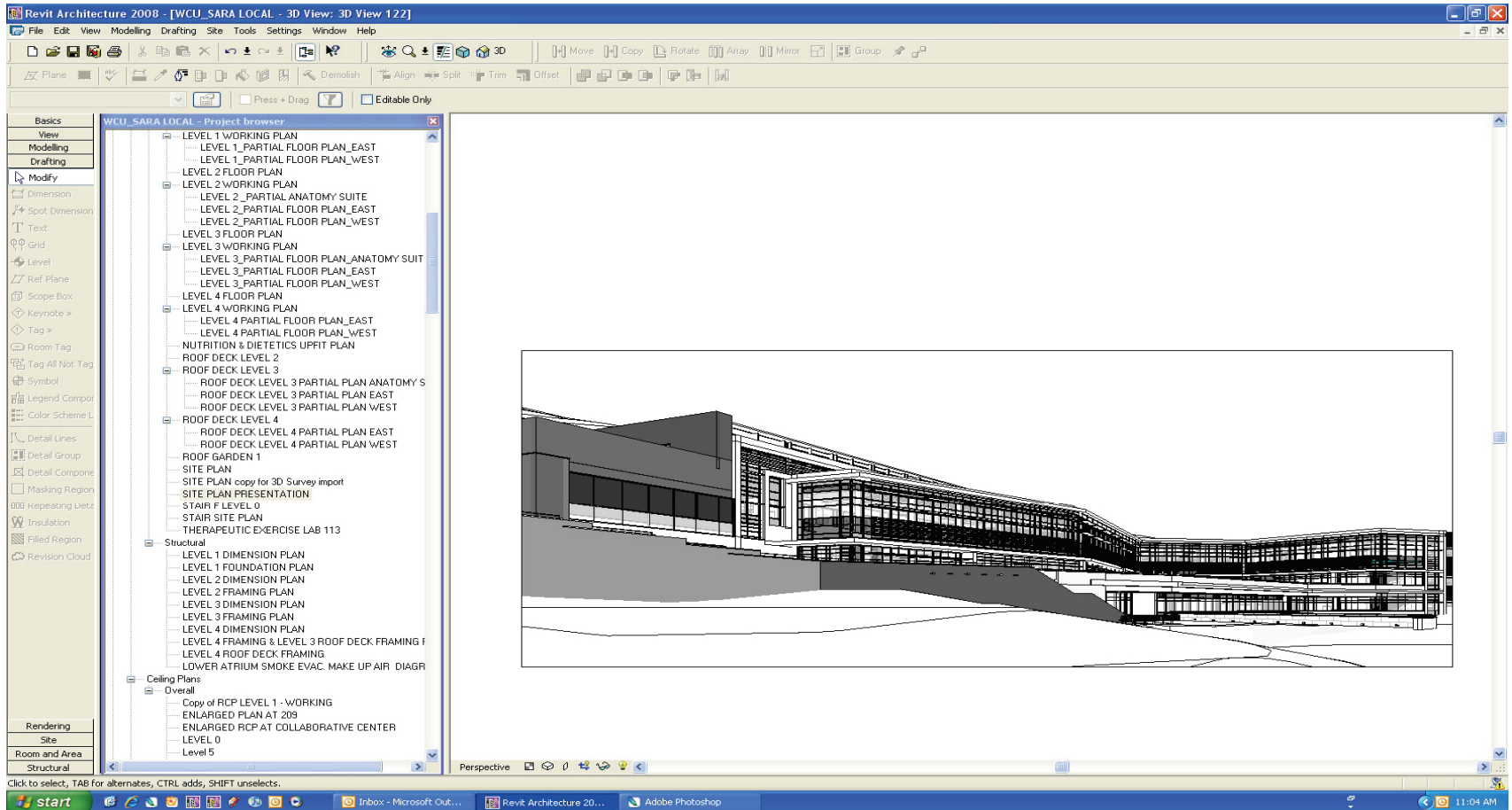
		Building			Sitework			Total			
		227,909 SF			262,000 SF			227,909 SF			
		\$	\$/SF	%	\$	\$/SF	%	\$	\$/SF	%	
A	Sub-structure	3,354	14.72	4.54%	0	0.00	0.00%	3,354	14.72	4.13%	
B	Shell	21,737	95.37	29.43%	0	0.00	0.00%	21,737	95.37	26.73%	
C	Interiors	11,912	52.27	16.13%	0	0.00	0.00%	11,912	52.27	14.65%	
D	Services	23,385	102.61	31.67%	0	0.00	0.00%	23,385	102.61	28.76%	
E	Equipment	1,225	5.37	1.66%	0	0.00	0.00%	1,225	5.37	1.51%	
F	Special Construction & Demo.	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%	
Total Building Construction		61,613	270.34	83.43%	0	0.00	0.00%	61,613	270.34	75.78%	
G	Sitework	0	0.00	0.00%	6,740	25.73	90.37%	6,740	29.57	8.29%	
Total Building & Site Construction		61,613	270.34	83.43%	6,740	25.73	90.37%	68,353	299.91	84.07%	
	Subcontractor P&P Bond	1.3%	801	3.51	1.08%	47	0.18	0.63%	848	3.72	1.04%
	CM Indirect Costs:	16%	9,986	43.82	13.52%	586	2.24	7.86%	10,572	46.39	13.00%
	Design Contingency	2%	1,448	6.35	1.96%	85	0.32	1.14%	1,533	6.73	1.89%
Building & Site Cons. Cost w/o Inflation		73,848	324.02	100.00%	7,458	28.47	100.00%	81,306	356.75	100.00%	
	Escalation Contingency (by NCSU)	0.00%	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Building Construction Cost		73,848	324.02	100.00%	7,458	28.47	100.00%	81,306	356.75	100.00%	



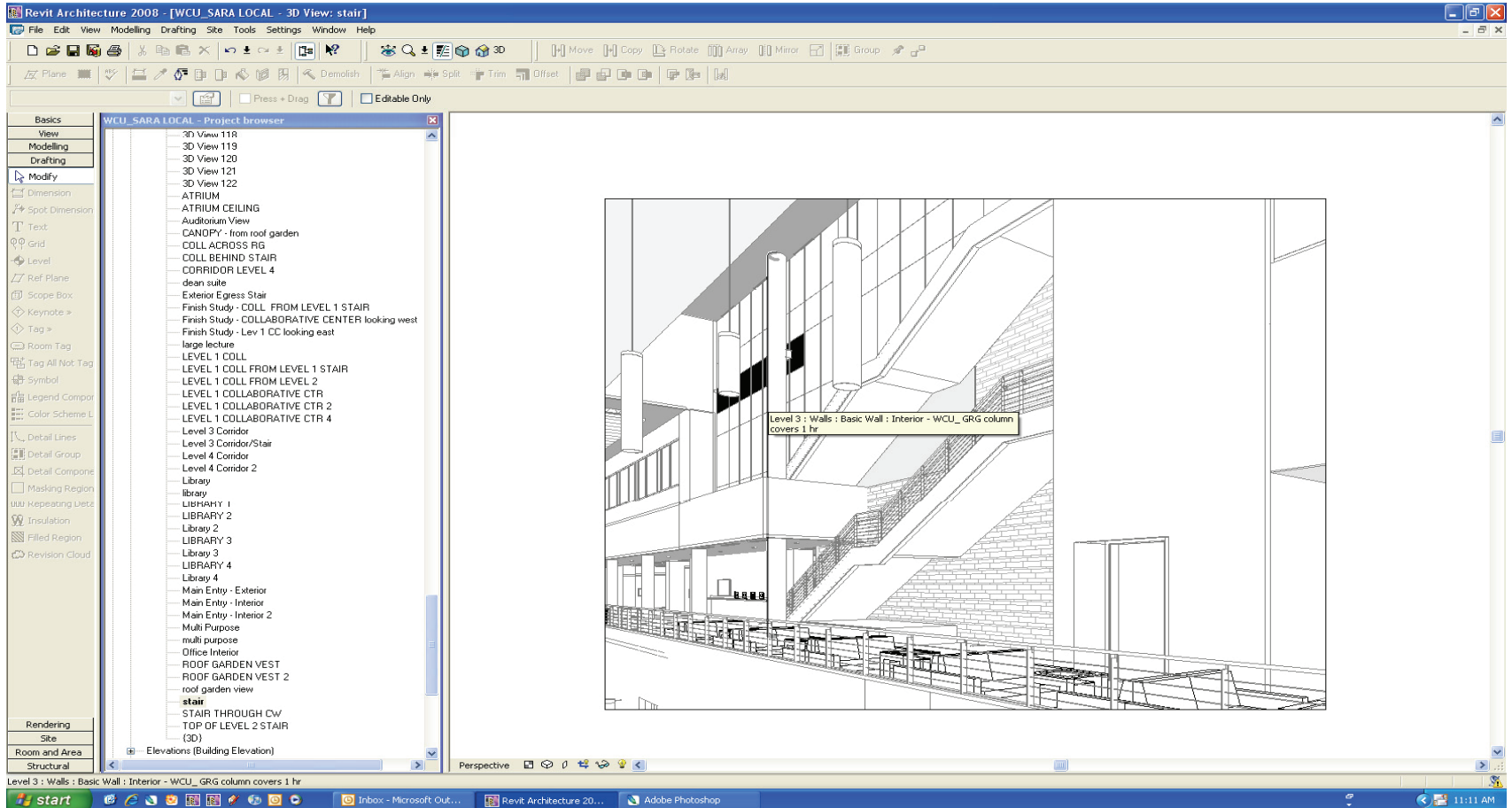
DESIGN DEVELOPMENT



REFINEMENT AND COMMUNICATION

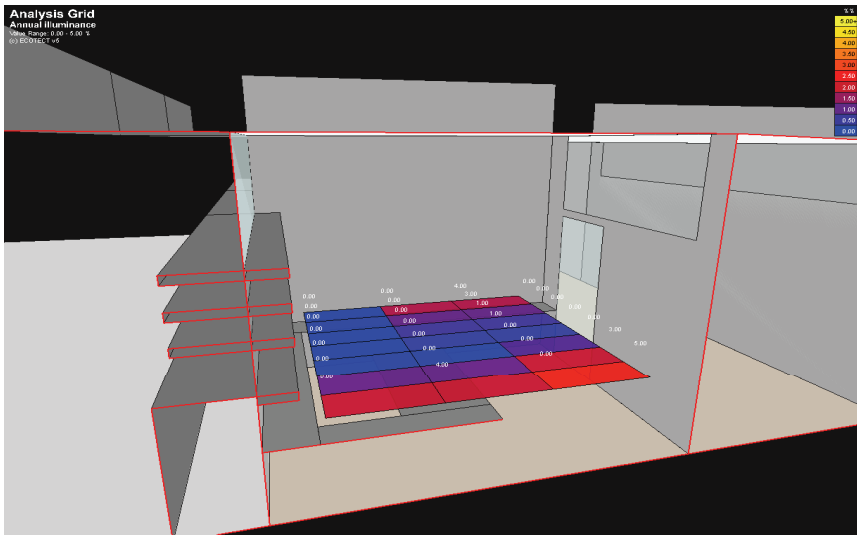


REFINEMENT AND COMMUNICATION

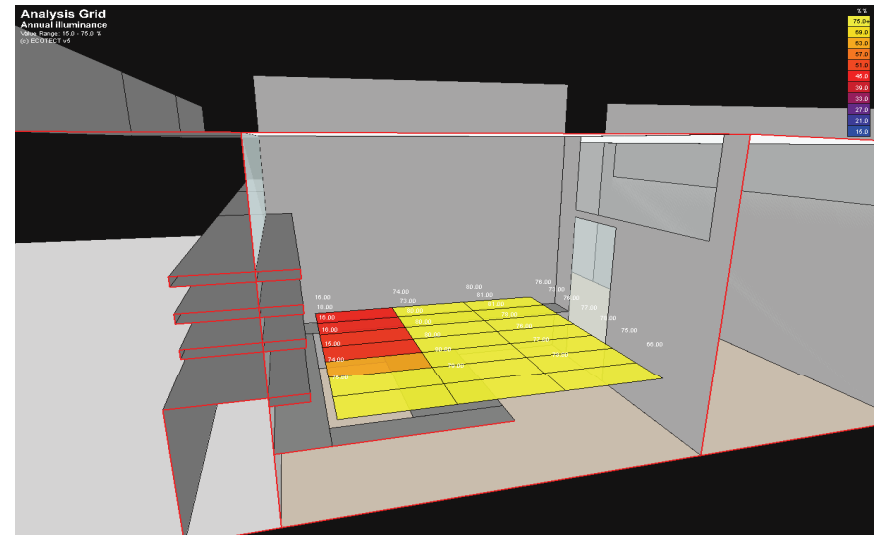


REFINEMENT AND COMMUNICATION

Implementation of strategies identified in the LCCA

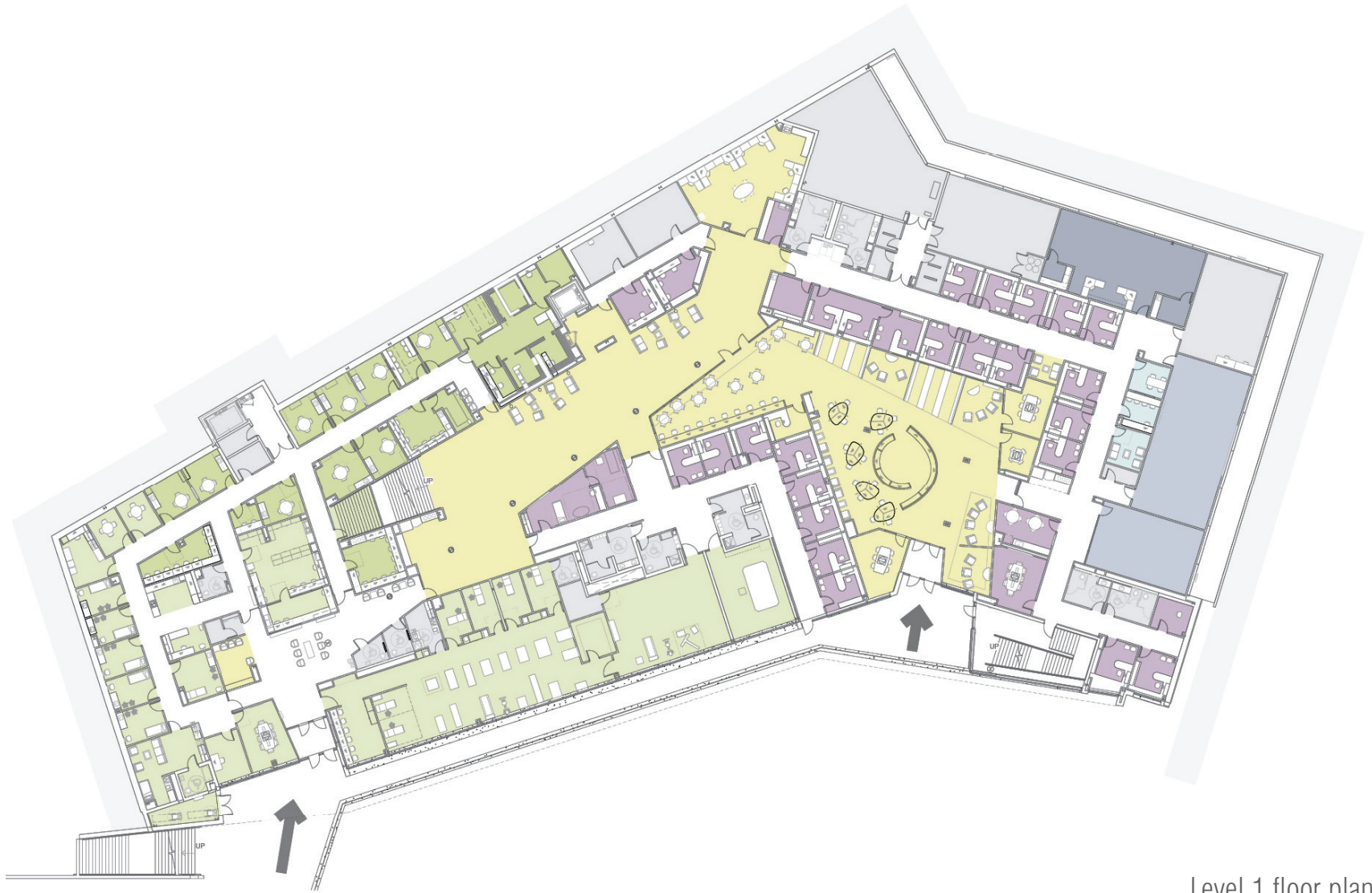


% of year, direct sunlight



% of year, natural lighting provides target light levels

REFINEMENT AND COMMUNICATION

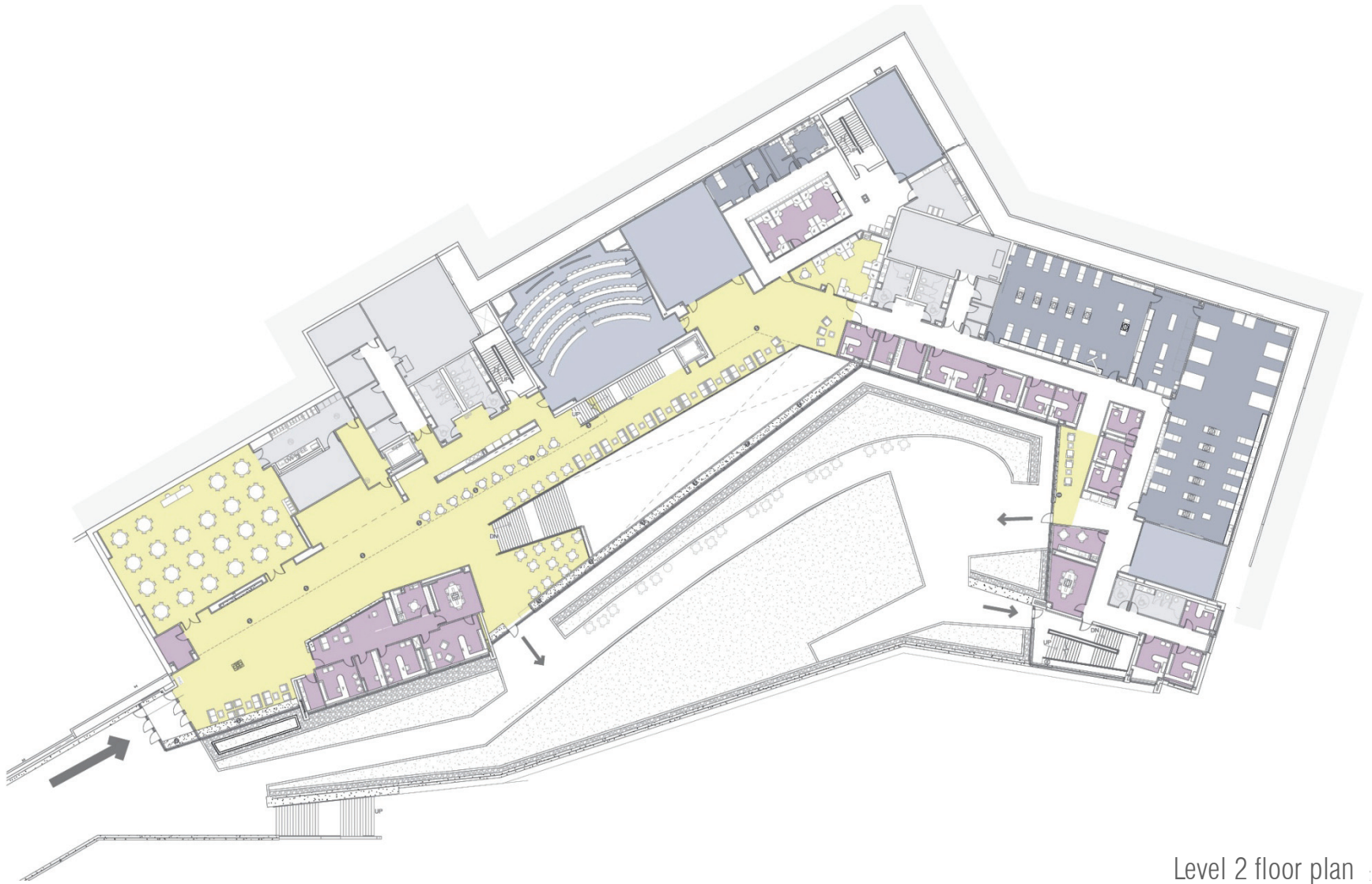


Level 1 floor plan

REFINEMENT AND COMMUNICATION

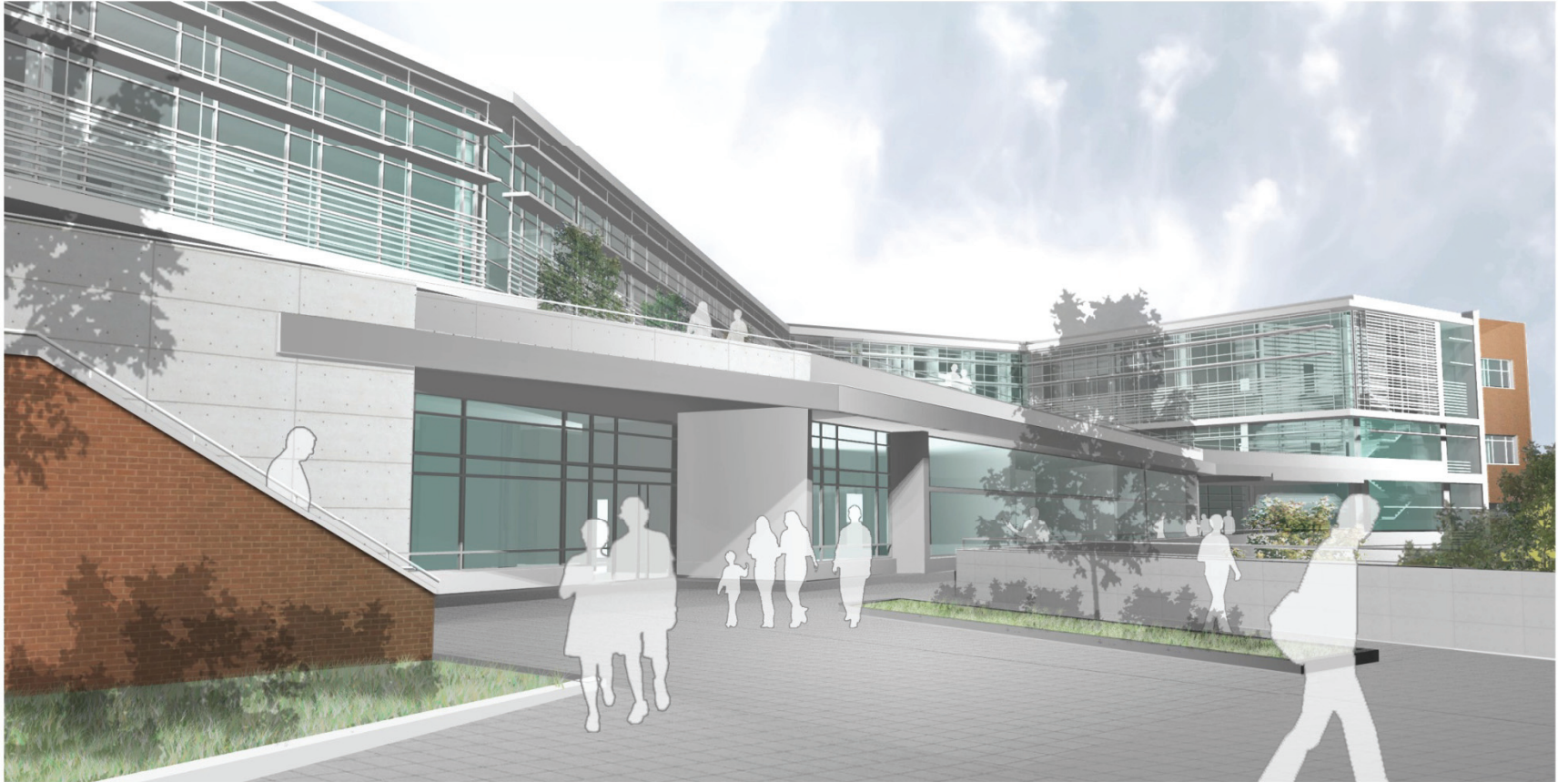


REFINEMENT AND COMMUNICATION



Level 2 floor plan

REFINEMENT AND COMMUNICATION



REFINEMENT AND COMMUNICATION



Level 3 floor plan

REFINEMENT AND COMMUNICATION



REFINEMENT AND COMMUNICATION



ANALYSIS AND COMMUNICATION

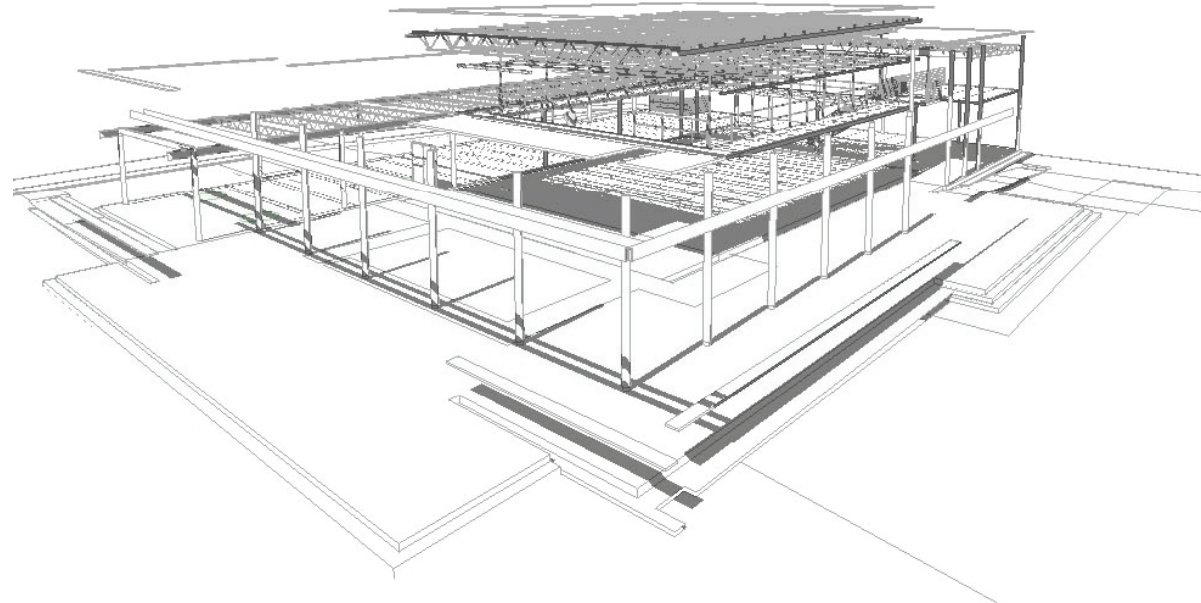
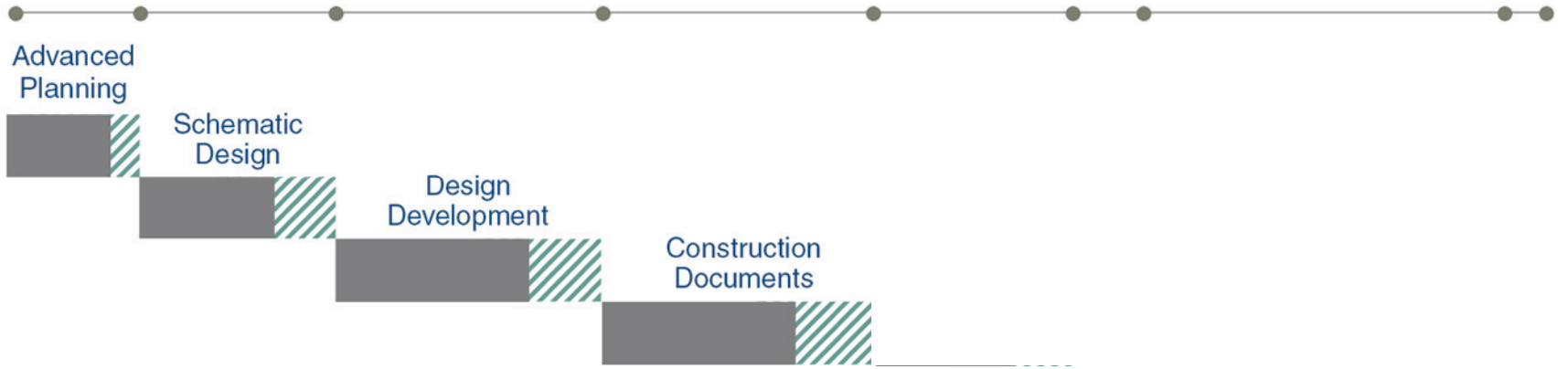
Construction Documentation Cost Report

Cost Summary - Bid Package

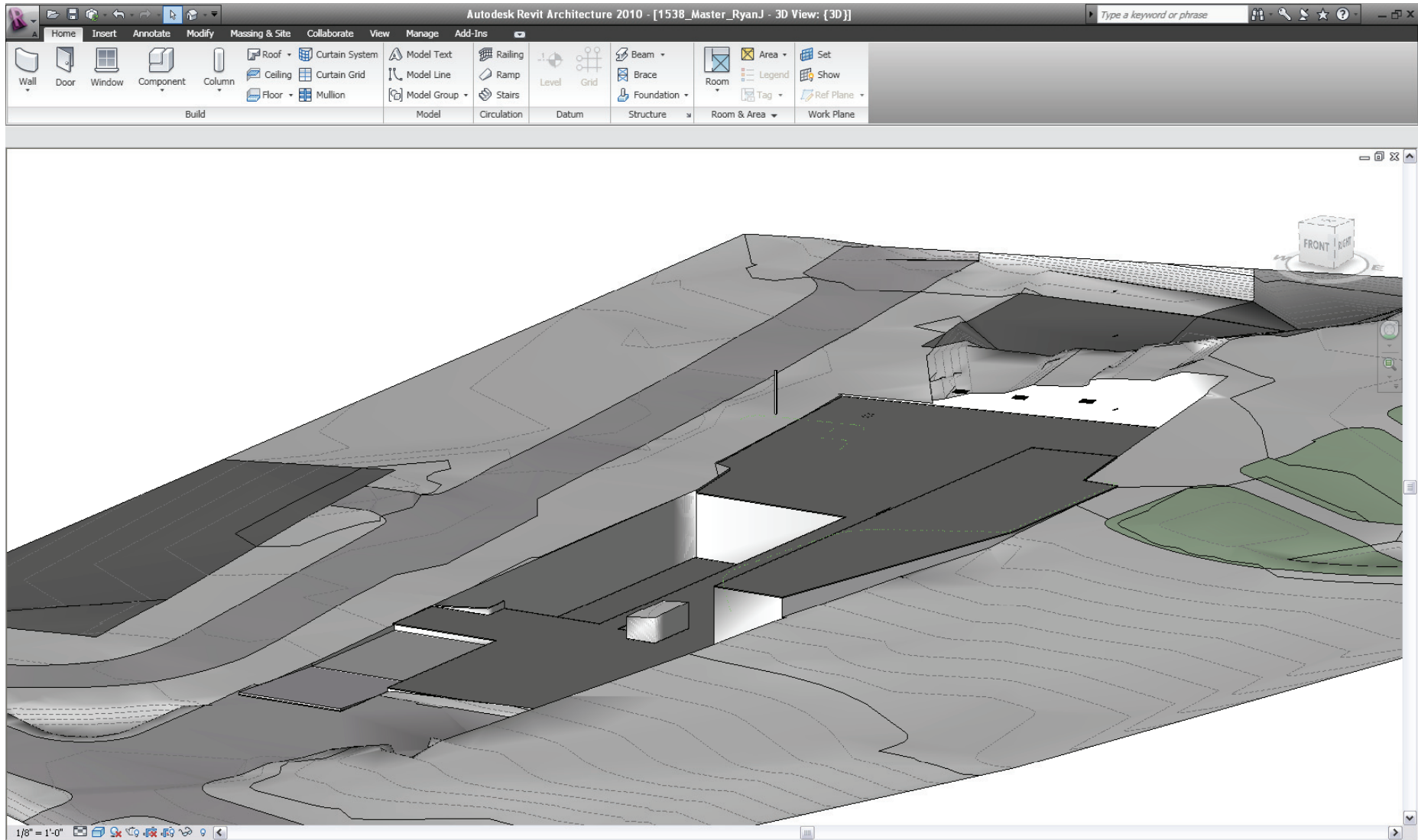
Bid Package Summary

		\$/SF	\$ (x1,000)	%
		227,909 SF		
00 10 20	Site Fencing	0.00	0	0.0%
00 20 30	Earthwork	13.70	3,122	3.8%
BP's Deck	Parking Deck / Infrastructure Packages	0.00	0	0.0%
00 30 00	CIP Concrete	20.82	4,744	5.8%
05 00 00	Structural Steel / Misc Iron	23.94	5,455	6.7%
00 70 00	Waterproofing	1.85	421	0.5%
00 82 00	Curtain Wall	33.93	7,732	9.5%
00 10 00	General Trades	2.61	595	0.7%
00 10 30	Final Clean	0.57	129	0.2%
00 20 00	Final Site Package	6.29	1,433	1.8%
00 22 00	Site Concrete	3.87	883	1.1%
00 22 50	Brick Pavers	1.84	420	0.5%
00 23 00	Site Furnishings	1.58	360	0.4%
00 39 00	Precast Concrete	0.00	0	0.0%
00 40 00	Masonry	1.90	432	0.5%
00 51 00	Miscellaneous Metals & Pan Stairs	5.68	1,295	1.6%
00 70 60	Spray Fireproofing	1.86	423	0.5%
00 73 00	Roofing & Skylights	5.31	1,211	1.5%
00 87 00	Metal Panels & Louvers	23.33	5,316	6.5%
00 80 00	Doors, Frames & Hardware	2.65	603	0.7%
00 81 00	Overhead Doors	0.83	190	0.2%
00 82 50	Interior Glazing	4.30	980	1.2%
00 90 00	Framing & Drywall	11.06	2,520	3.1%
00 90 90	Terrazzo	0.71	161	0.2%
00 91 00	Hard Tile & Polished Concrete	0.79	181	0.2%
00 92 00	Acoustical Ceiling & Wall Panels	12.91	2,941	3.6%
00 93 00	Carpet & VCT	4.06	926	1.1%
00 94 00	Painting	2.84	647	0.8%
01 00 00	Specialties	1.43	326	0.4%
01 03 00	Operable Partitions	1.08	246	0.3%
01 04 00	Access Flooring	2.24	509	0.6%
01 10 00	Equipment - Projection Screens	0.38	87	0.1%
01 11 00	ARS	0.00	0	0.0%
01 20 00	Millwork - Casework	1.28	292	0.4%
01 22 00	Window Treatments	0.72	163	0.2%
01 23 00	Fixed Seating	0.99	226	0.3%
01 40 00	Elevators	4.23	965	1.2%
01 50 10	Fire Protection	4.62	1,054	1.3%
00 15 20	Plumbing	5.84	1,332	1.6%
01 50 30	H.V.A.C.	42.41	9,665	11.9%
01 60 10	Electrical	45.48	10,366	12.7%
TOTAL DIRECT WORK		\$ 300	\$ 68,353	84.1%
1.3%	Subcontractor P&P Bond	3.72	848	1.0%
16%	CM Indirect Costs:	46.39	10,572	13.0%
2%	Design Contingency	6.73	1,533	1.9%
TOTAL CONSTRUCTION COST (March 2010)		\$ 357	\$ 81,306	100.0%
	Escalation Contingency (by NCSU)	0.00	-	0.0%
TOTAL CONSTRUCTION COST (March 2010)		\$ 357	\$ 81,306	100.0%

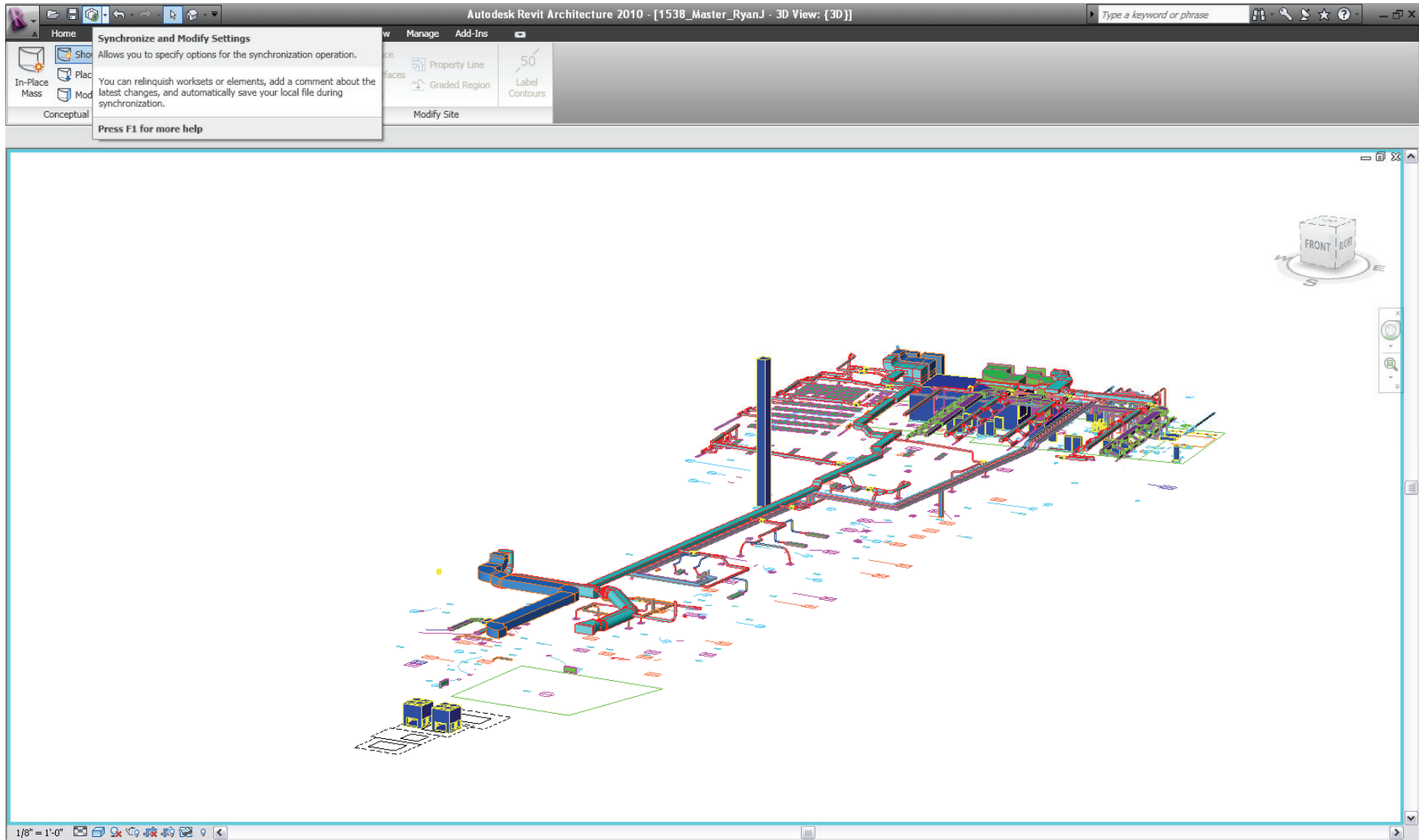
CONSTRUCTION DOCUMENTS



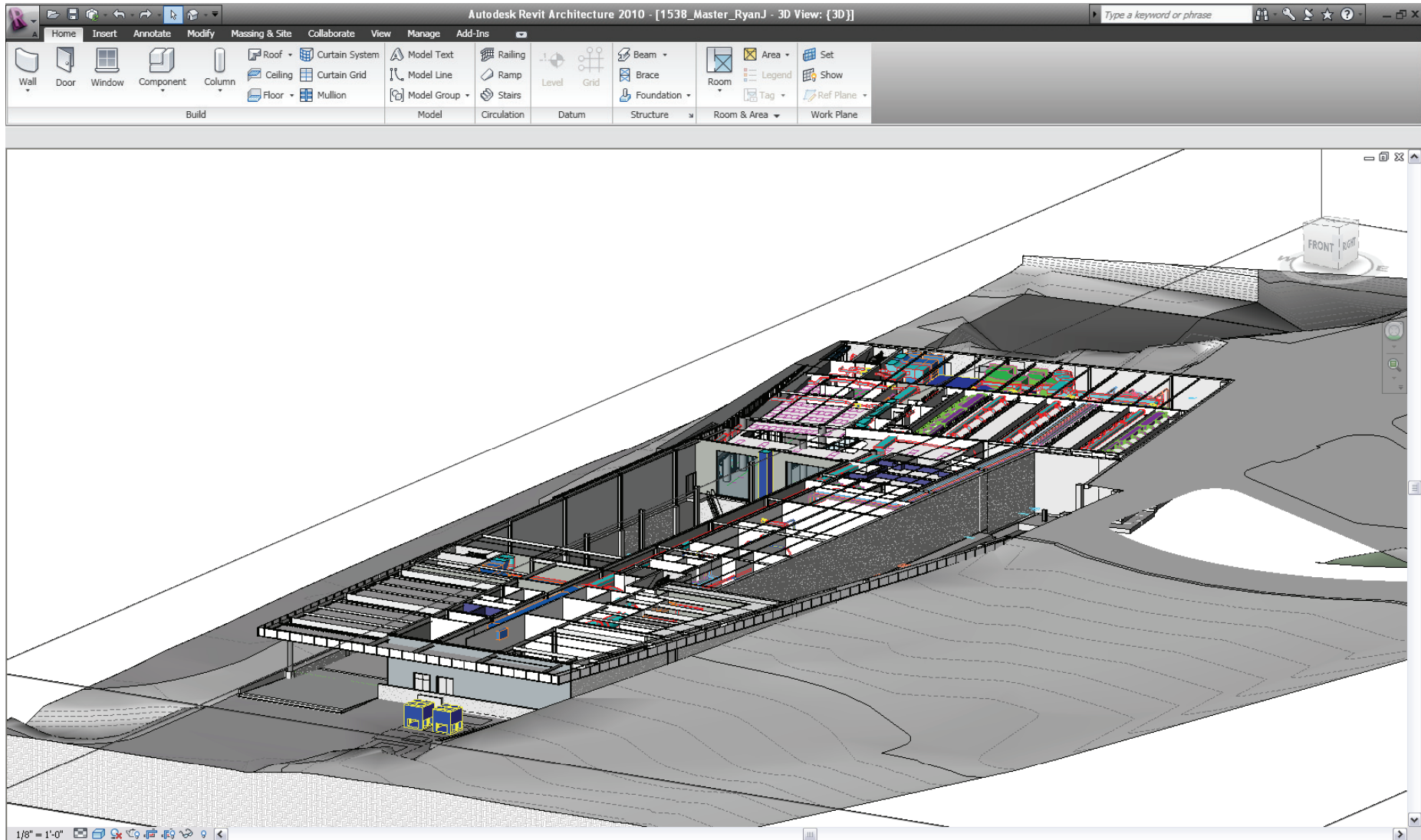
BUILDING CONSTRUCTION DOCUMENTS



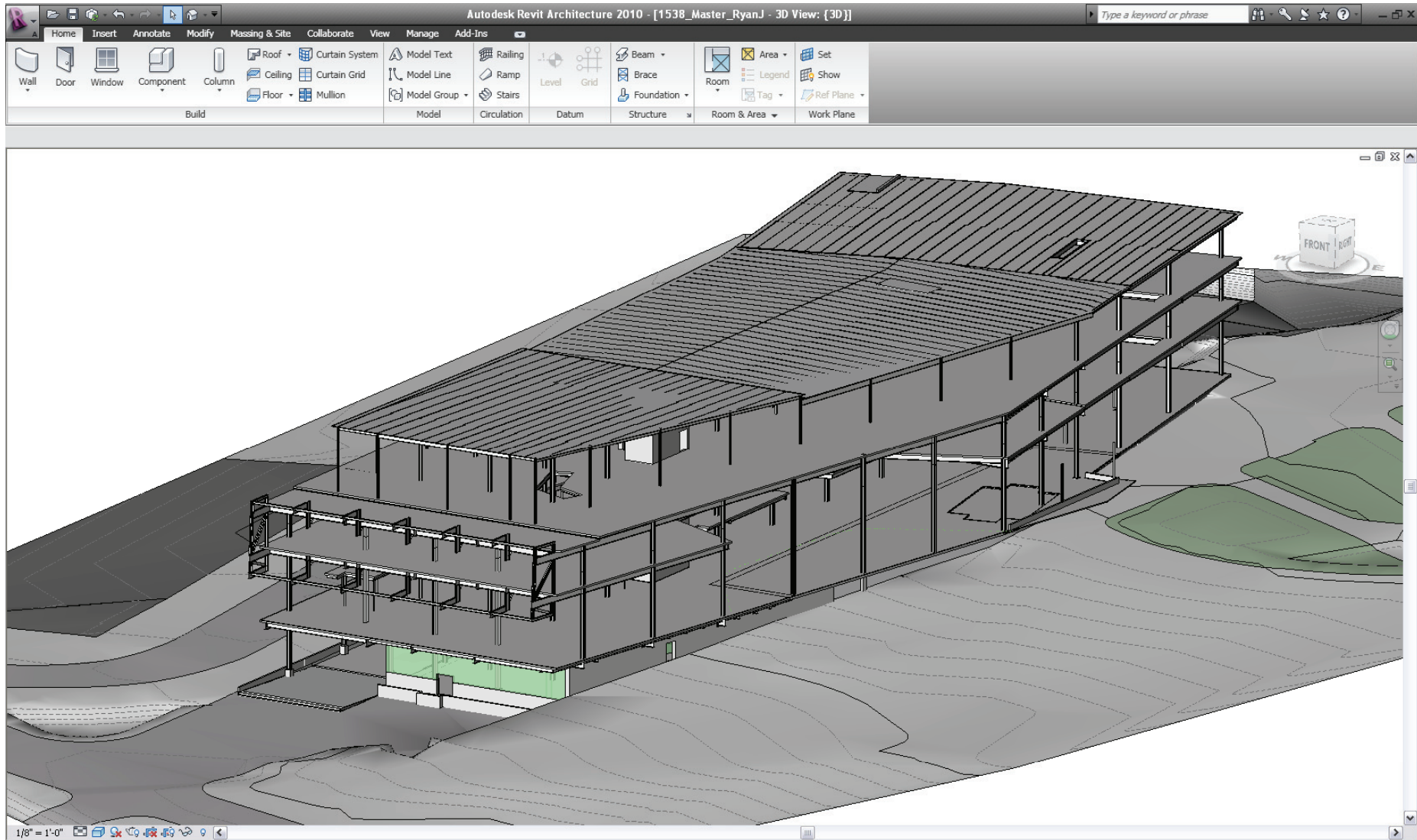
BUILDING CONSTRUCTION DOCUMENTS



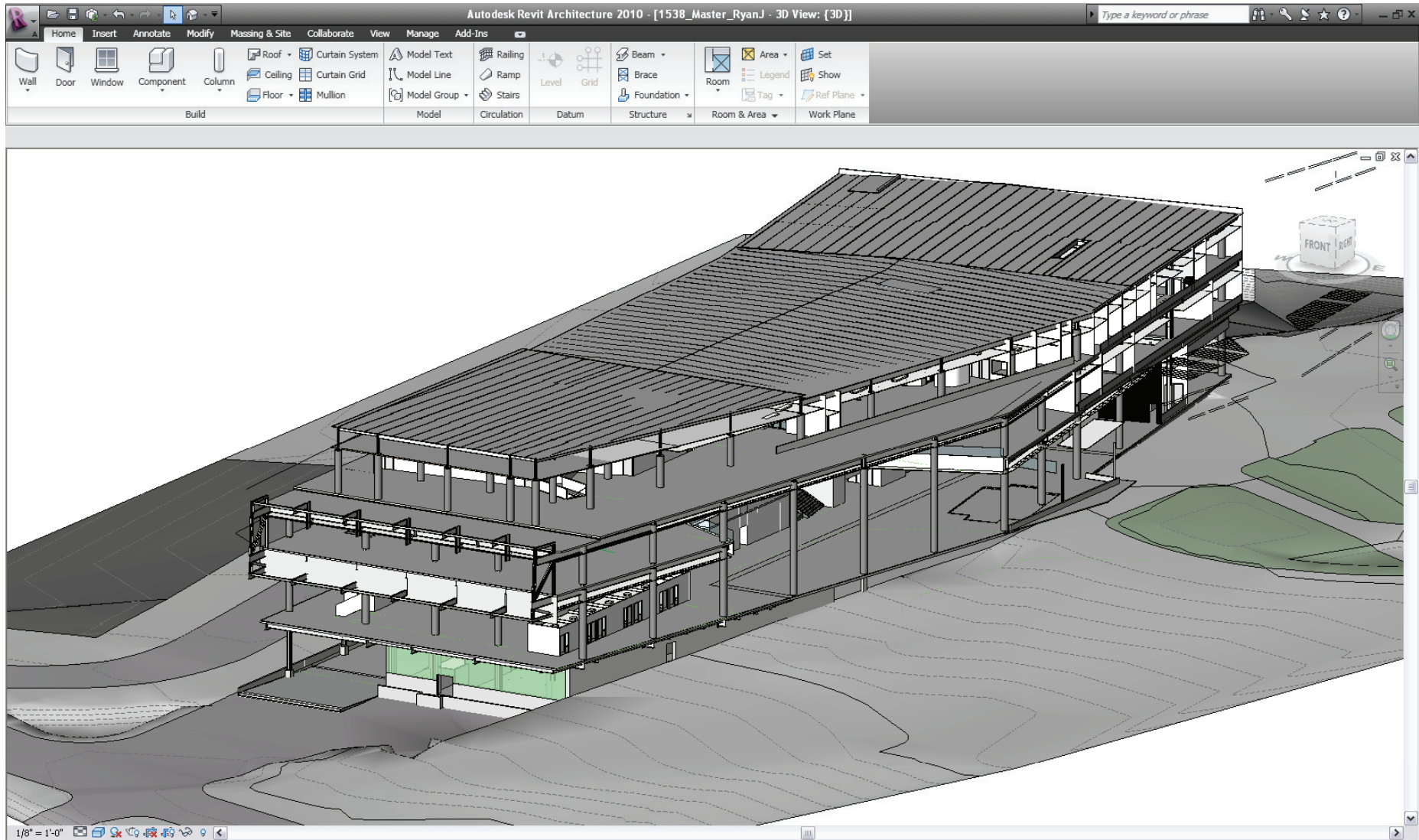
BUILDING CONSTRUCTION DOCUMENTS



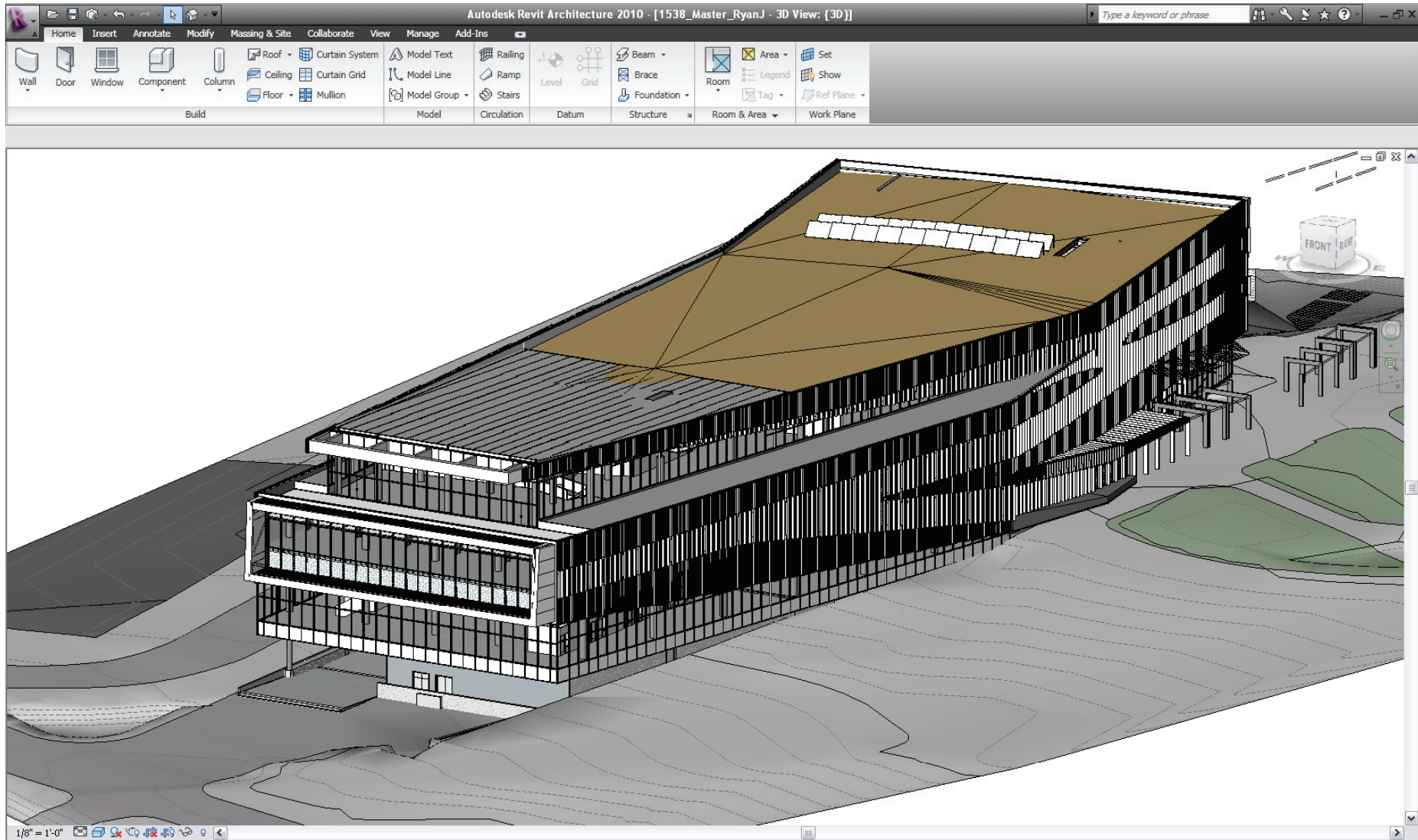
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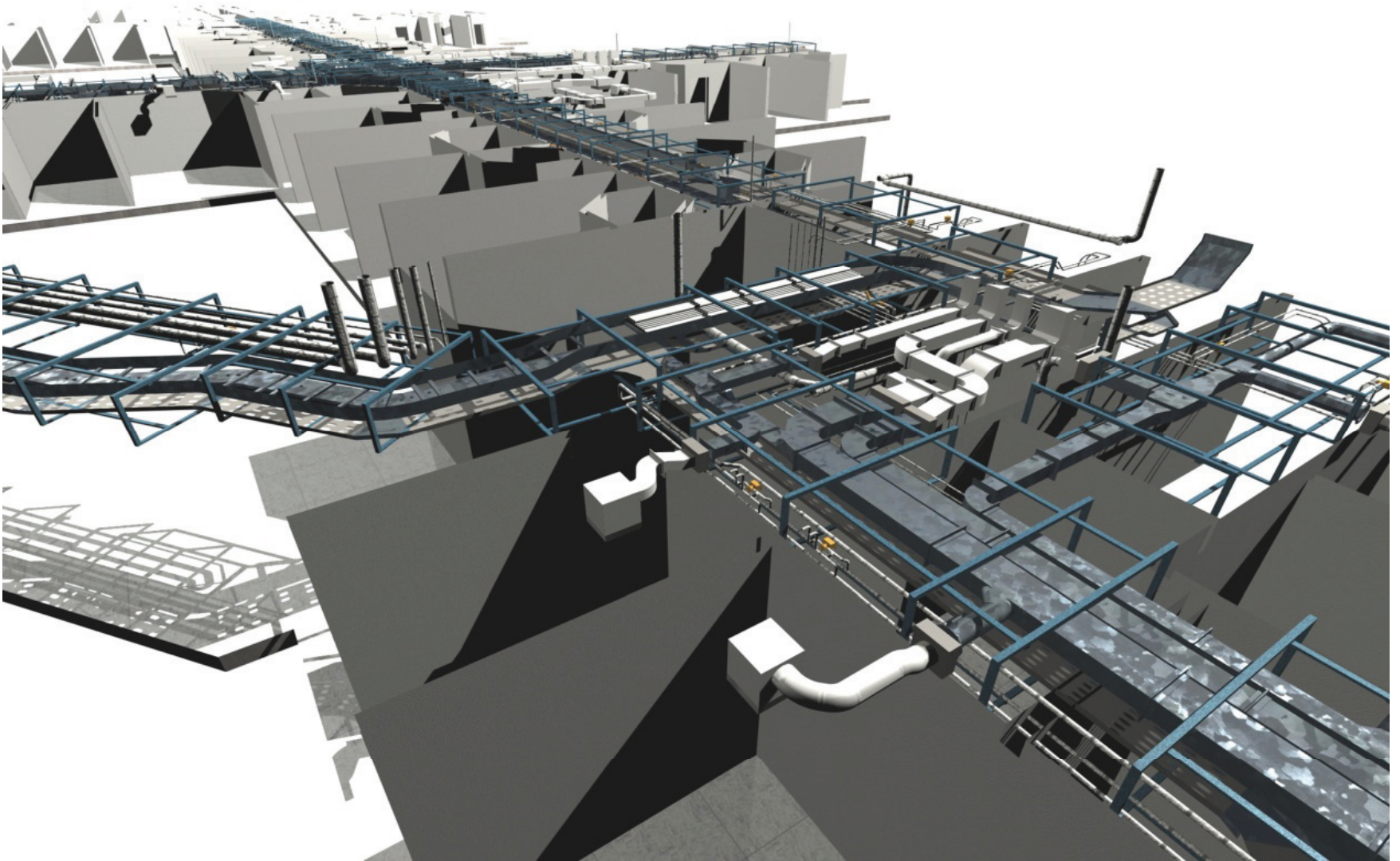
BUILDING CONSTRUCTION DOCUMENTS



BUILDING CONSTRUCTION DOCUMENTS



BUILDING CONSTRUCTION DOCUMENTS



COMMUNICATING THE VISION



COMMUNICATING THE VISION



COMMUNICATING THE VISION



ANALYSIS AND COMMUNICATION

Construction Documentation Cost Report

Cost Tracking Uniformat

Element	CD (\$)	DD (\$)	Delta
	227,909 SF	226,839 SF	1,070 SF
A 10 Foundation	1,695	1,522	173
A 20 Basement Const.	1,659	1,372	287
A Sub-structure	3,354	2,894	460
B 10 Superstructure	7,531	7,277	254
B 20 Enclosure	12,314	11,718	596
B 30 Roofing	1,892	1,857	35
B Shell	21,737	20,852	885
C 10 Interior Const.	4,630	4,368	262
C 20 Stairs	1,492	1,245	247
C 30 Interior Finishes	5,790	6,207	(417)
C Interiors	11,912	11,820	92
D 10 Conveying	1,008	954	54
D 20 Plumbing	1,332	1,278	54
D 30 HVAC	9,665	9,568	97
D 40 Fire Protection	1,054	948	106
D 50 Electrical	10,327	8,967	1,360
D Services	23,385	21,715	1,670
E 10 Equipment	780	5,389	(4,609)
E 20 Furnishings	444	402	42
E Equip. & Furnishings	1,225	5,791	(4,566)
Building Cost	61,613	63,072	(1,459)
Special Construction	0	0	0
Selective Bldg. Demolition	0	0	0
F Spec. Const. & Demo.	0	0	0
Site Preparation	903	826	77
Site Improvement	2,321	1,931	390
Site Mechanical Utilities	393	297	96
Site Electrical Utilities	0	0	0
Mass Grading GMP #1	3,122	2,583	539
G Sitework	6,740	5,637	1,103
Total Building & Site	68,353	68,709	(356)
Design Allowance	1,533	3,885	(2,352)
Subtotal	69,886	72,594	(2,708)
Overhead & Profit	11,420	11,578	(158)
Subtotal	81,306	84,172	(2,866)
Inflation Allowance	0	0	0
Building Const. Cost	81,306	84,172	(2,866)

Analysis

The 90% Construction Document estimate total of \$81,306,000 is \$2,866,000 less than the 100% Design Document cost estimate.

Sub-structure increase is due to the thickened slab edges and basement foundation walls. Foundations generally increase with additional grade beams & mat slabs. The Superstructure reflects a slight increase with a larger amount of steel tonnage and concrete core wall cubic yardage.

The cost of the shell increased primarily due to the design development of the exterior cladding. Curtain wall and sunshading devices (fins/frames) affected the overall movement in the cost profile of the skin. Market feedback suggesting a general increase in the glazed curtain wall rates was appropriate.

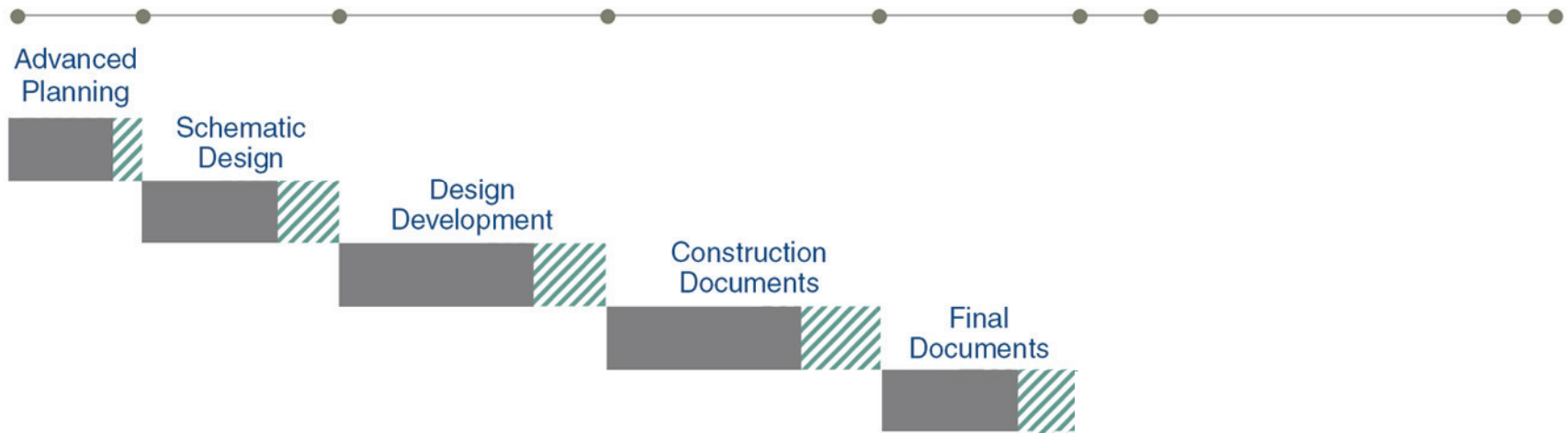
Overall interior construction costs did not vary greatly from DD, though interior finishes decreased per the design intent for a lesser amount of high-end material usage.

There is an overall increase of \$1.67M for Services, primarily driven by Electrical sections. Addition of floor boxes with provisions for Power, IT, and AV resulted in increase tele-data cabling. Lighting costs have been steadily increasing on the project through all phases. This currently represents a significant cost of \$18/SF, which is the high end range due to both lighting fixture density and specification.

The major decrease in the Equipment section, (as well as in the entire estimate), is due to the removal of the Automated Storage and Retrieval System (ASRS) from the base estimate to the Alternates.

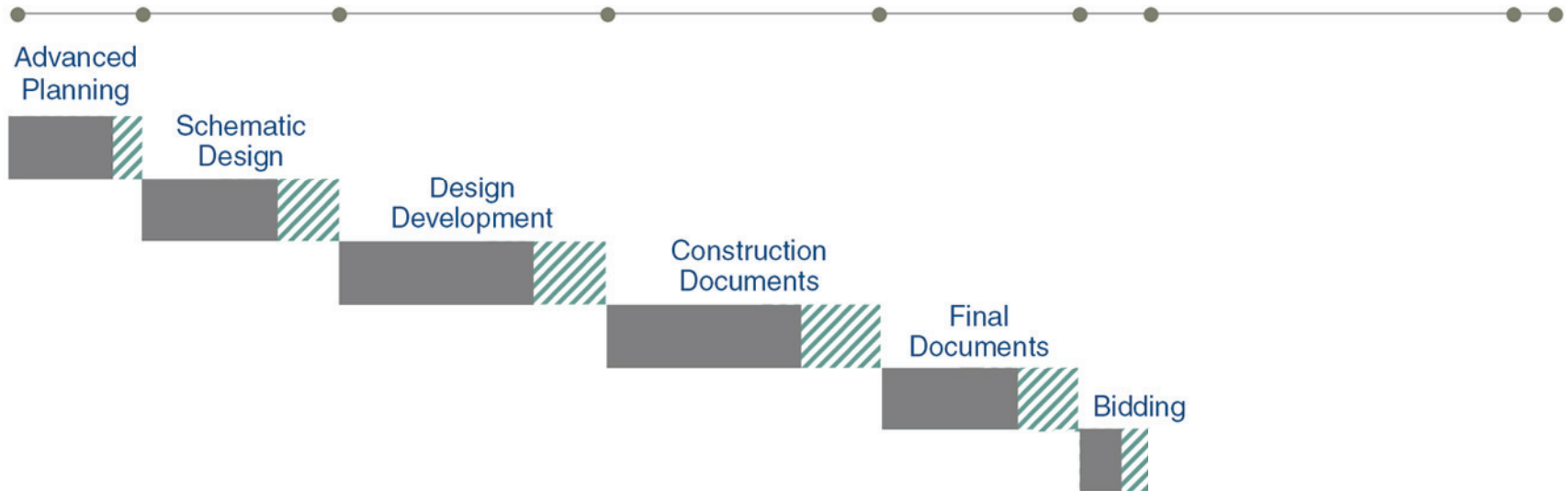
The added cost in Sitework is due to the increase in scope for Site Furnishings, Site Structures, and the Mass Grading GMP #1.

FINAL DOCUMENTS



- Final documents are refinement and confirmation that previous review documents have been incorporated into the design
- Not the time to add new scope
- Not the time to add new review comments

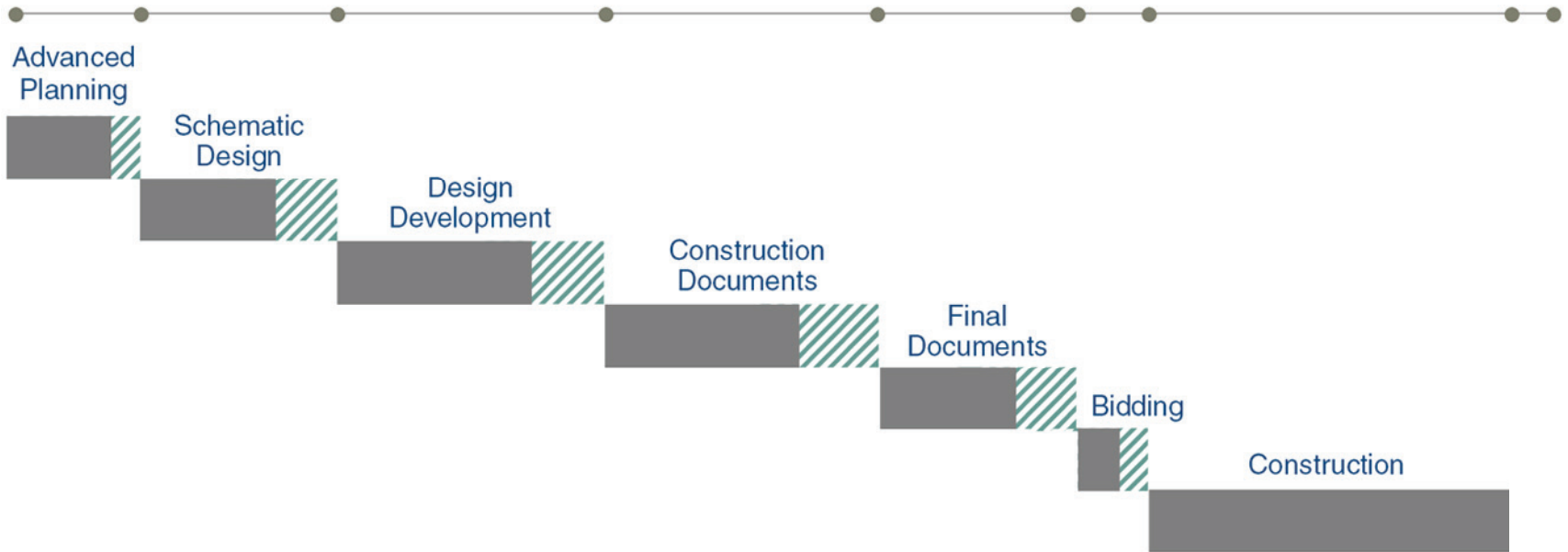
BIDDING



- Careful use of alternates

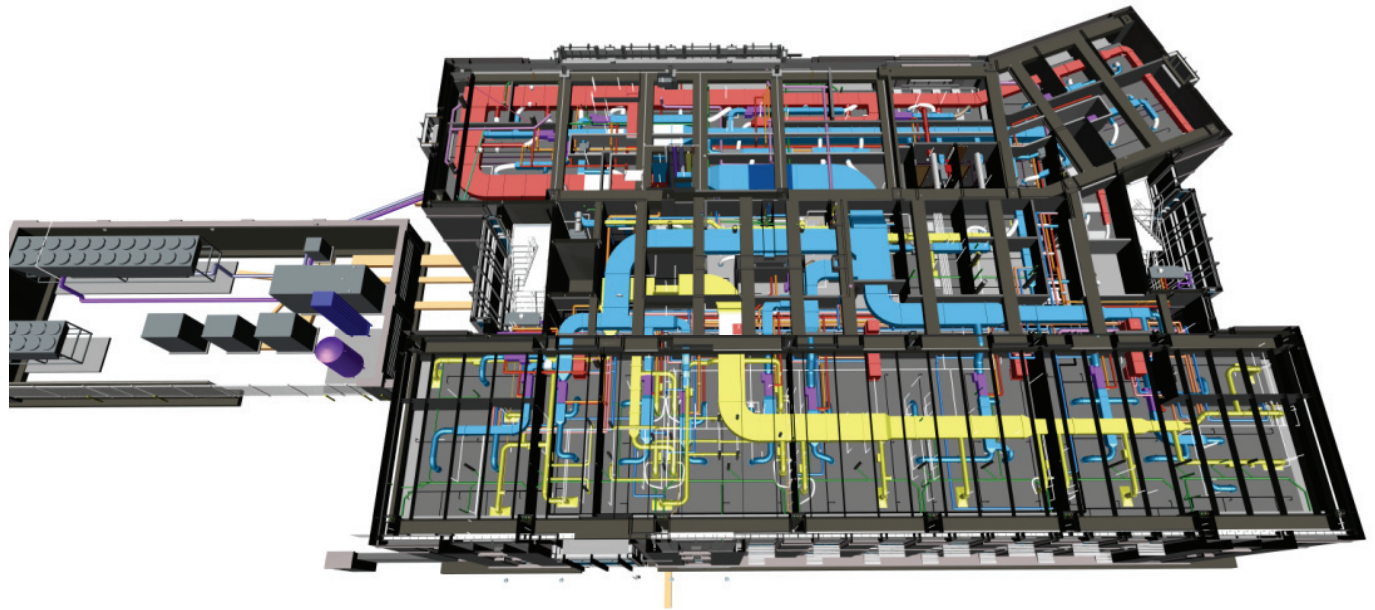


CONSTRUCTION



CONSTRUCTION

- Change order processing needs to keep pace with project
- Construction requirements consistent with reviews



BUILD THE DESIGN



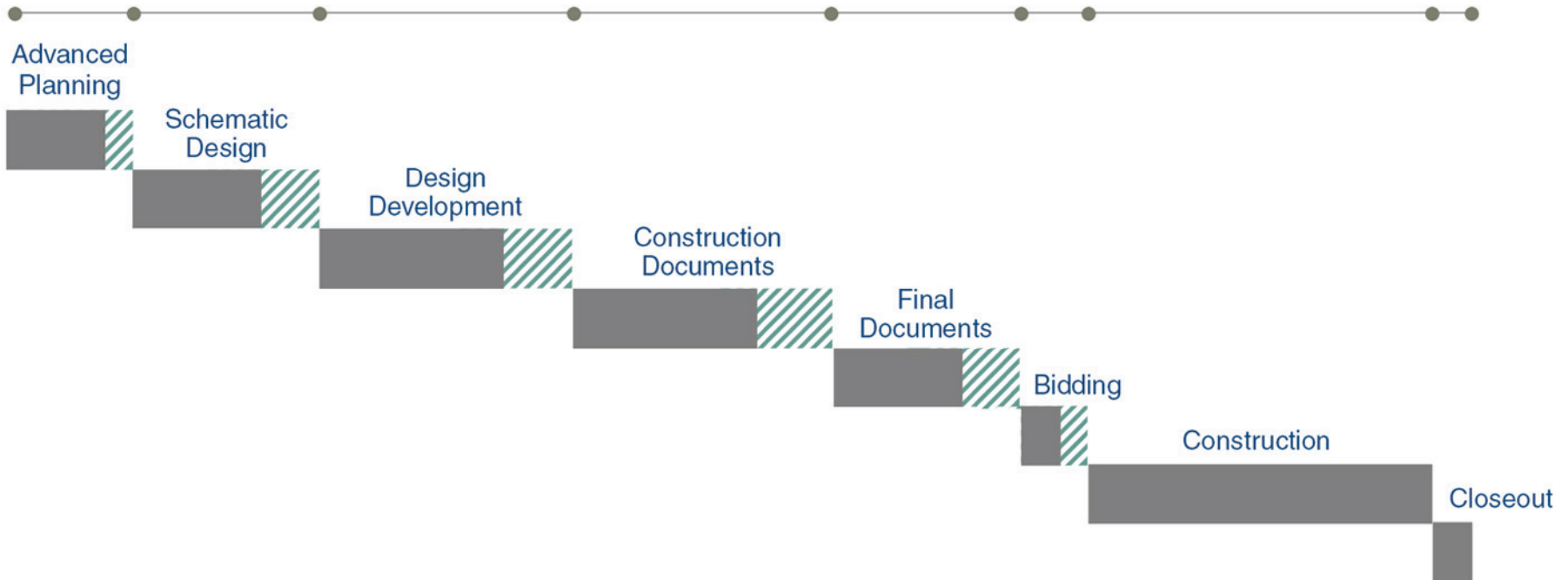
BUILD THE DESIGN



BUILD THE DESIGN



CLOSEOUT



- Complete punchlist
- Record drawings
- Equipment manuals
- Final pay applications
- Final Report



SUMMARY

PEOPLE: Get the right people at the table early

SCHEDULE: Use realistic assumptions

BUDGET: Match program and budget

REVIEWS: Communicate effectively and comprehensively

CONSTRUCTION: Build as designed and reviewed

CLOSE OUT: Make it a priority, get it done

Do what you say you will do,
when you say you will do it.

Elements of a Successful State Construction Project

