HOW FAST IS TOO FAST?

presenters

Robert Schulz
University Architect, *SDSU*

Susan O'Connell
Principal, AIA, DBIA, LEED-AP BD+C, *AC Martin*

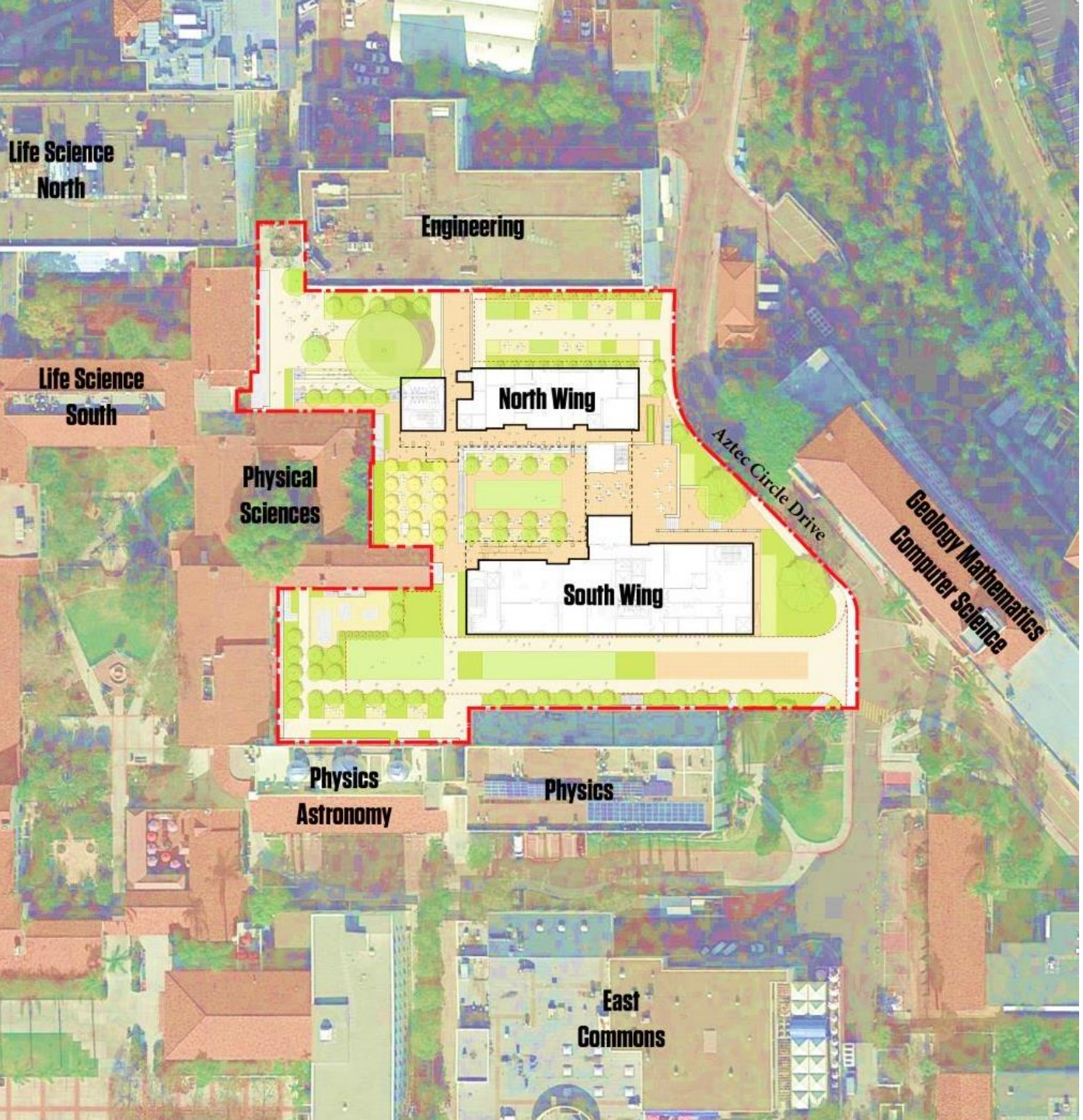
Albert Valdivia
Project Executive *Clark Construction*

agenda

- Project Introduction
- Delivery & Selection
- Tools for Speed
- Challenges of Speed
- Enemy of Speed

project goals

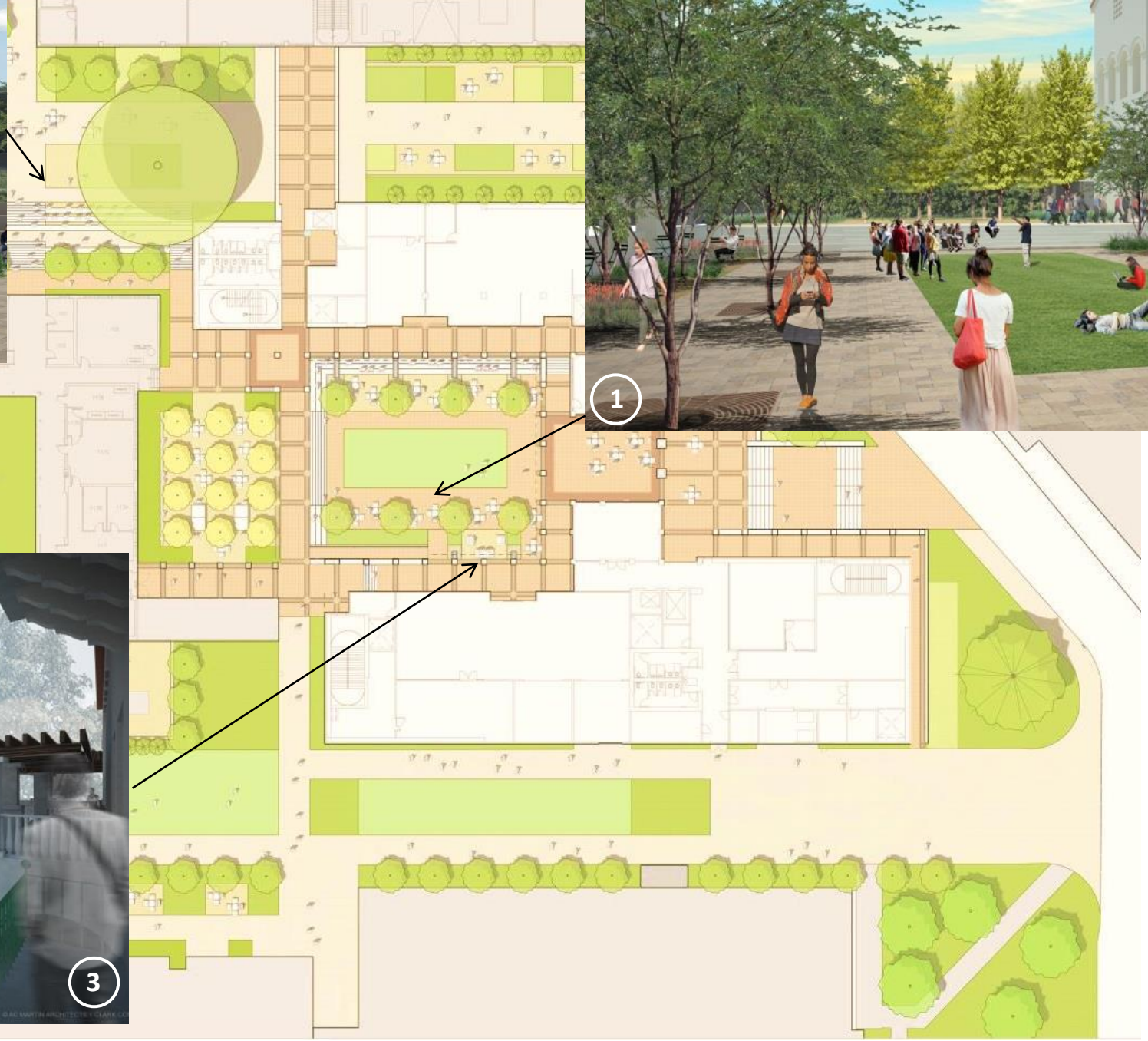
- Enhance the historic campus
- STEM courtyard for all the Sciences
- Flexible labs for research
- Teaching labs that anticipate the future
- Future Proof building systems
- Building that encourages collaboration



project description

- 90,000 GSF
- $50m construction costs
- $90m project costs
- Program:
  - Teaching labs
  - Research labs
  - PI offices
  - GS offices
  - Collaboration Spaces
  - Maker Space
  - Clean Room
  - MRI Suite
  - Café

SDSU Engineering & Interdisciplinary Complex



3 Colleges, 3 Deans, 1 STEM Complex


Stem Quad
©AC MARTIN ARCHITECTS + CLARK CONSTRUCTION


GS/PI Collaboration zone
©AC MARTIN ARCHITECTS + CLARK CONSTRUCTION


Main Entry
© AC MARTIN ARCHITECTS + CLARK CONSTRUCTION


Design Garage/Maker Space

FLOOR 0 (Basement)

Schematic Design Planning

- Core + Building Service
- 1 Fluids Lab
- 2 Hydraulics Lab
- 3 Environmental Lab
- 4 Energy Lab
- 5 Mech, Thermal + Materials Lab
- 6 Soils Lab
- 7 MRI Suite
- 8 Meeting Room
- 9 Research Lab
- 10 Meeting Room*
- 11 "Sticky Space" Student Collaborative
- 12 "Sticky Space" Student Collaborative
- 13 Meeting Room*

* *Could become PI office.*

San Diego State University
Engineering &
Interdisciplinary Science Building

May 7, 2015

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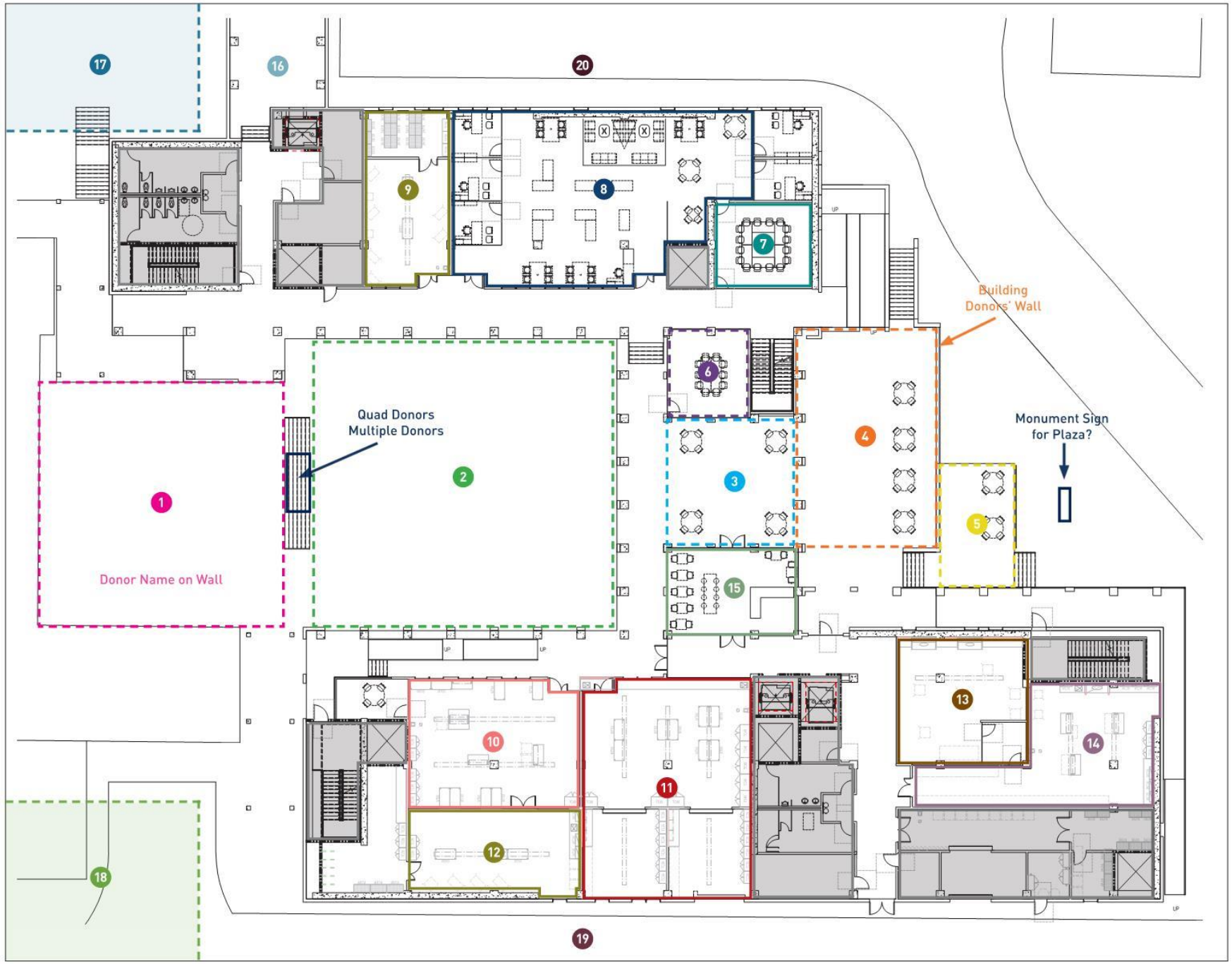
FLOOR 1 - Option B

Schematic Design Planning

- Core + Building Service
- 1 Upper Student Court
- 2 STEM Quad
- 3 Entry Pavilion
- 4 STEM Court Entry
- 5 STEM Lower Court
- 6 Meeting Room
- 7 Board Room
- 8 Entrepreneurial Center
- 9 Fabrication
- 10 Creative Studio
- 11 Student Organization
- 12 Fabrication Studio

Maker Space

- 13 Nano Fab Clean Lab
- 14 Nano Fab Research Lab
- 15 Café
- 16 Bridge
- 17 NW Lower Court (Outdoor Classroom)
- 18 SW Court
- 19 South Paseo (See Site Plan)
- 20 North Paseo (See Site Plan)



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FLOOR 2 - Option B

Schematic Design Planning

- Core + Building Service
- 1 Outdoor Deck
- 2 BSL-2 Lab
- 3 Viromics Lab
- 4 Student Porch
- 5 Student/Faculty Lounge
- 6 Meeting Room
- 7 Meeting Room
- 8 SE Wing - Research Lab
- 9 SW Wing - Research Lab
- 10 STEM Quad N Porch
- 11 STEM Quad S Porch

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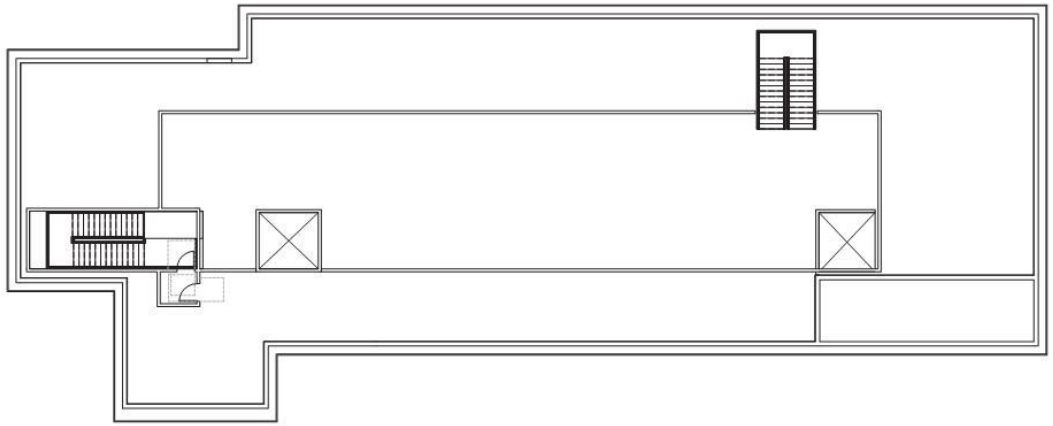
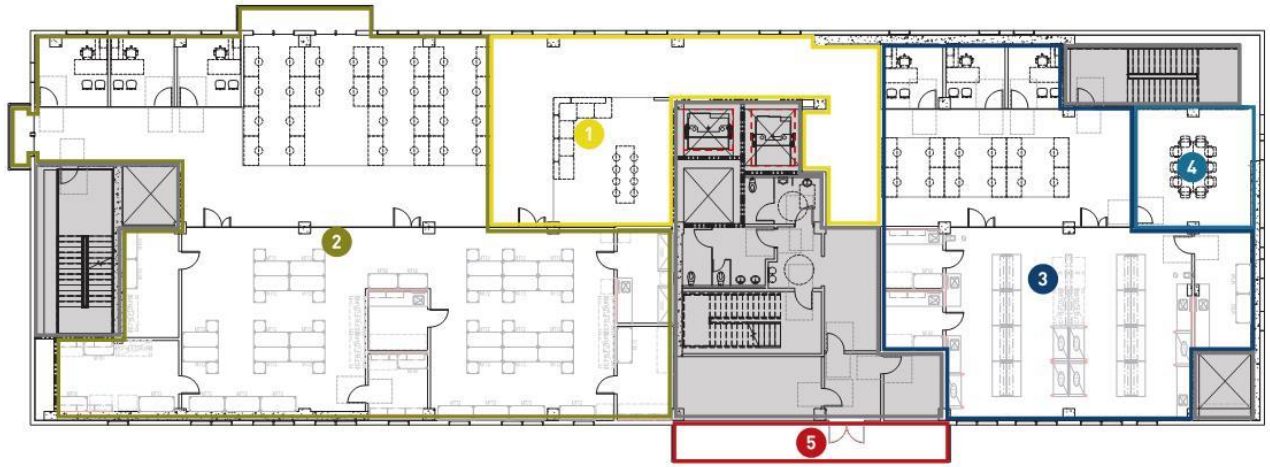
FLOOR 3 - Option A

Schematic Design Planning

- Core + Building Service
- 1 Student / Faculty Lounge
- 2 SW Wing - Research Lab
- 3 SE Wing - Research Lab
- 4 Meeting Room
- 5 Research Porch





San Diego State University
Engineering &
Interdisciplinary Science Building

May 7, 2015

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President Hirshman gave our Team 3 years

- $90 million Project Costs
- 50,000 ASF project size
- Move-in January 2018
- 3 Colleges
- STEM Showcase

California State University

delivery options

Characteristics of each delivery method

	CM @ RISK	DESIGN/BUILD Competition	(progressive) COLLABORATIVE DESIGN/BUILD
Budget/GMP	Budget ROM set after Design Phases with contingencies for change	Budget fixed & set before design competition begins	Progressive GMP, budget fixed after DD
Pre-work	Conceptual program required to start design	Detailed program & RFP completed PRIOR to competition	Design exploration in Program verification and Schematic Design
Schedule	longer schedule due to less pre-work	Shorter schedule if pre-work is complete	**Shortest schedule**
Design Control	Allows maximum design control by owner, lots of time in design process	Allows the least design control by owner	Allows design control up front by owner
O/A/C Team Communication	Allows the most design communication between O/A/C	Allows the least design communication between O/A/C	Allows design communication from programming thru start of construction
Building User Communication w/Design team	Allows dialogue with building users, builder and design team	Allows the least dialogue with building users, builder and design team	Allows dialogue up front with users campus stakeholders and design team
Changes	Changes negotiated incrementally throughout design and construction phases	All changes after RFP are Change Orders	Early changes may be absorbed/traded, later changes in construction are Change Orders
Risk	Partnered approach controlling risk/costs O/A/C in open dialogue	Designed locked early, at award, responsibility for changes are the owners	**Flexibility in SD's & DD's. Design locked down after DD, later changes are owners risk**

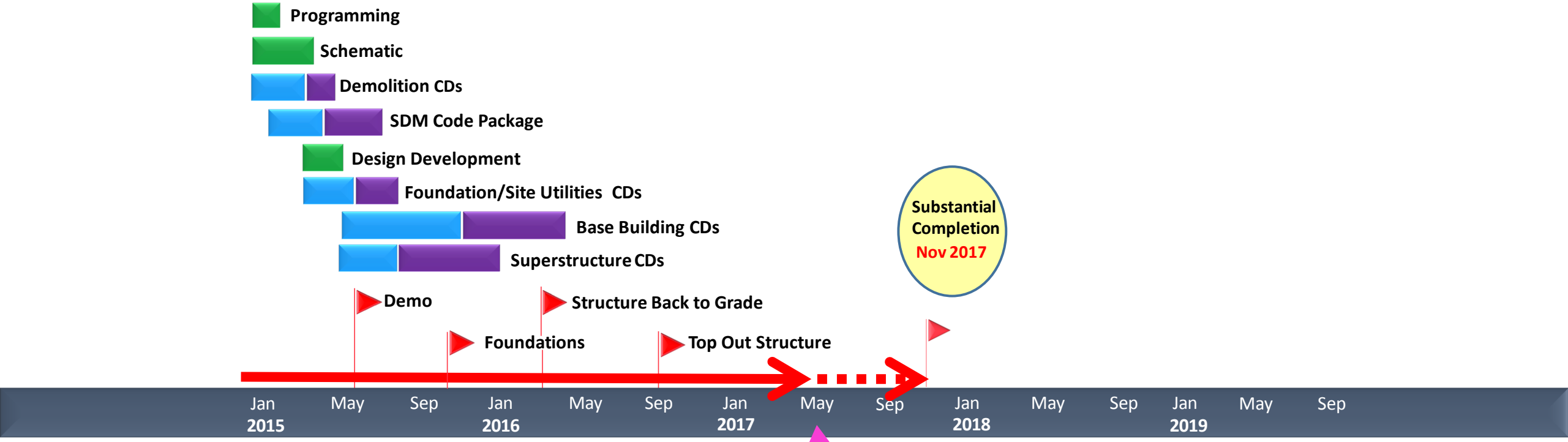
delivery

- Evolution of CSU “Design Collaboration”
- Selected Clark/ACM Oct 2015-Dec 2015
- Project start Jan 20, 2015
- Project Complete Dec 2017
- Progressive GMP

selection process

- RFQ
- Shortlist to 5 teams
- RFP
- 2 Proprietary meetings
- Final Presentation
- Selection - tech, interview & fees

San Diego State Engineering and Interdisciplinary Sciences Complex Schedule



Traditional CM @ Risk Delivery Schedule

tools for speed

- Plan, plan, plan
- Visual schedules
- Use tools for timely decisions
- STRONG building committee
- VP level decisions and support
- Train your Team

Pull Planning with the D/B team right after the selection, scheduling all of our meetings with the D/B Team, consultants, agency reviews, campus facilities, user groups, vendor input

Decision Schedule

Schematic Design #2 - March 10/11th

Arch:

- Site positioning/site constraints, site sections
- Location of building service / receiving
- Location of all elevator and stair cores
- Location of all exterior access points
- Major MEP equipment room positions
- Simple conceptual massing
- Program distribution

Lab:

- Decision on program distribution
- Location and adjacencies for all Teaching Labs approved
- Location of each of the Centers and confirmation of arrangement of labs and rooms in each cluster
- Decision on separate or combined fabrication shops for Entrepreneurial Center and Creative Design Center
- Location of PI offices and student work stations relative to research lab space
- Ratio of each type of research lab
- Density and location of fixed support rooms within research areas.
- Fume Hood density: Floor by Floor, wing by wing
- Issue equipment lists for each lab space for users to fill out

Landscape:

- Discuss exterior program/use opportunities

	Subtotal	Total	Delta	Subtotal	Total	Delta	Subtotal	Total	Delta from All-In	Subtotal	Total	Delta from All-In	Subtotal	Total	Delta from All-In	Subtotal	Total	Delta from All-In	Subtotal	Total	Delta from All-In	Subtotal	Total	Delta from All-In
	11,500	**11,500**	0	11,440	**11,440**	-60	11,440	**11,440**	0	11,440	**11,440**	0	11,440	**11,440**	0	11,440	**11,440**	0	11,440	**11,440**	0	11,440	**11,440**	0
ort	6,210			6,050		*-160*	6,050		*0*	6,050		*0*	6,050		*0*	6,050		*0*	6,050		*0*	6,050		*0*
ace	2,600			2,750		*150*	2,750		*0*	2,750		*0*	2,750		*0*	2,750		*0*	2,750		*0*	2,750		*0*
	2,690			2,640		*-50*	2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*
	22,340	**22,340**	-2,160	23,020	**23,020**	680	7,030	**7,030**	-15,990	15,640	**15,640**	-7,380	19,638	**19,638**	-3,383	17,485	**17,485**	-5,535	21,483	**21,483**	-1,538	17,116	**17,116**	-5,904
	14,280	**17.0**		14,960	**17.0**	*680*	3,520	**4.0**	*-11,440*	9,680	**11.0**	*-5,280*	12,540	**14.3**	*-2,420*	11,000	**12.5**	*-3,960*	13,860	**15.8**	*-1,100*	10,736	**12.2**	*-4,224*
	2,090			2,090		*0*	660		*-1,430*	1,430		*-660*	1,788		*-303*	1,595		*-495*	1,953		*-138*	1,562		*-528*
nts	4,080			4,080		*0*	960		*-3,120*	2,640		*-1,440*	3,420		*-660*	3,000		*-1,080*	3,780		*-300*	2,928		*-1,152*
	1,890			1,890		*0*	1,890		*0*	1,890		*0*	1,890		*0*	1,890		*0*	1,890		*0*	1,890		*0*
aces	15,460	**15,460**	3,120	18,820	**18,820**	3,360	18,820	**18,820**	0	14,294	**14,294**	-4,526	10,700	**10,700**	-8,120	13,304	**13,304**	-5,516	9,710	**9,710**	-9,110	13,085	**13,085**	-5,735
	4,000			3,594		*-406*	3,594		*0*	3,594		*0*	0		*-3,594*	3,594		*0*	0		*-3,594*	2,525		*-1,069*
	0	**0.0**		990	**0.8**	*990*	990	**0.8**	*0*	990	**0.8**	*0*	990	**0.8**	*0*	990	**0.8**	*0*	990	**0.8**	*0*	990	**0.8**	*0*
	3,700	**2.0**		3,700	**2.0**	*0*	3,700	**2.0**	*0*	3,700	**2.0**	*0*	3,700	**2.0**	*0*	3,700	**2.0**	*0*	3,700	**2.0**	*0*	3,740	**2.0**	*40*
	4,000			4,140		*140*	4,140		*0*	4,140		*0*	4,140		*0*	4,140		*0*	4,140		*0*	3,960		*-180*
	1,280	**1.0**		880	**0.7**	*-400*	880	**0.7**	*0*	880	**0.7**	*0*	880	**0.7**	*0*	880	**0.7**	*0*	880	**0.7**	*0*	880	**0.7**	*0*
	2,480	**0.0**		5,516	**0.0**	*3,036*	5,516	**0.0**	*0*	990	**0.8**	*-4,526*	990	**0.8**	*-4,526*	0	**0.0**	*-5,516*	0	**0.0**	*-5,516*	990	**0.8**	*-4,526*
Suppo	5,440	**5,440**	0	5,500	**5,500**	60	5,500	**5,500**	0	5,500	**5,500**	0	5,500	**5,500**	0	5,500	**5,500**	0	5,500	**5,500**	0	5,500	**5,500**	0
	2,000			1,980		*-20*	1,980		*0*	1,980		*0*	1,980		*0*	1,980		*0*	1,980		*0*	1,760		*-220*
	2,640			2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*	2,640		*0*
	800			880		*80*	880		*0*	880		*0*	880		*0*	880		*0*	880		*0*	880		*0*
																						220		*220*
		54,760	960		**58,800**	4,040		**42,797**	-16,003		**46,889**	-11,911		**47,296**	-11,504		**47,745**	-11,056		**48,152**	-10,649		**47,157**	-11,643

	Research	***17.0***	***PI's***	*Research*	***17.0***	***PI's***	*Research*	***4.0***	***PI's***	*Research*	***11.0***	***PI's***	*Research*	***14.3***	***PI's***	*Research*	***12.5***	***PI's***	*Research*	***15.8***	***PI's***	*Research*	***12.2***	***PI's***
	Centers	***3.0***	***PI's***	*Centers*	***3.4***	***PI's***	*Centers*	***3.4***	***PI's***	*Centers*	***4.2***	***PI's***	*Centers*	***4.2***	***PI's***	*Centers*	***3.4***	***PI's***	*Centers*	***3.4***	***PI's***	*Centers*	***4.2***	***PI's***
	Total	***20.0***	***PI's***	*Total*	***20.4***	***PI's***	*Total*	***7.4***	***PI's***	*Total*	***15.2***	***PI's***	*Total*	***18.4***	***PI's***	*Total*	***15.9***	***PI's***	*Total*	***19.2***	***PI's***	*Total*	***16.4***	***PI's***
		62.5%			**58.0%**			**58.0%**			**58.0%**			**58.0%**			**58.0%**			**58.0%**			**58.0%**	
		Overly Aggressive Ratio				Delta GSF			Delta GSF			Delta GSF			Delta GSF			Delta GSF			Delta GSF			Delta GSF
GSF		**87,616**	**1,568**		**101,380**	**13,764** 15.7%		**73,788**	**-13,828** -15.8%		**80,843**	**-6,773** -7.7%		**81,545**	**-6,071** -6.9%		**82,318**	**-5,298** -6.0%		**83,020**	**-4,596** -5.2%		**81,305**	**-6,311** -7.2%
		Cannon Final 1-9-15			**All - In 2/12/2015**			**Reduced PI's, Large Clean Room**			**Reduced PI's, Small Clean Lab**			**No MRI Imaging**			**No Clean Lab**			**No Clean Lab, No MRI Imaging**			**Redc'd PI's, Clean Lab, Sm MRI**	
		20 Faculty Res Allocations			**20** Faculty Res Allocations			**7** Faculty Res Allocations			**15** Faculty Res Allocations			**18** Faculty Res Allocations			**16** Faculty Res Allocations			**19** Faculty Res Allocations			**16** Faculty Res Allocations	
		Clean Room Missing Chases			Bay & Chase Clean Room			Bay & Chase Clean Room			Small Clean Lab			Small Clean Lab			No Clean Room or Clean Lab			No Clean Room or Clean Lab			Small Clean Lab	
		MRI Imaging Facility & Admin			MRI Imaging Facility & Admin			MRI Imaging Facility & Admin			MRI Imaging Facility & Admin			No MRI Imaging Facility			MRI Imaging Facility & Admin			No MRI Imaging Facility			Smaller MRI Imaging	
		No Mat'l Sci Imaging for EMs			Small Mat'l Sci Imaging for EMs			Small Mat'l Sci Imaging for EMs			Small Mat'l Sci Imaging for EMs			Small Mat'l Sci Imaging for EMs			Small Mat'l Sci Imaging for EMs			Small Mat'l Sci Imaging for EMs			Mat'l Sci Imaging as Research	
		Over Budget			**Over Budget**			**On Budget**			**On Budget**			**On Budget**			**On Budget**			**On Budget**			**On Budget**	

Managing design consultants

- *Clear communication*
- *Homework with deadlines*
- *Encouraging "best guess based on experience"*

1. **Take the 3 options for heating/cooling the bedrooms** and elaborate with LCC information and pros and cons. For each option define, size, location, make-up air options, cost magnitude and other factors that will help SDSU make a GOOD decision
   - FCU
   - Chill Beam
   - Valance
   - Other
2. **For equipment listed below provide**: size, type, site position and required clearances
   - Emergency Generator
   - Transformers and switches
   - Fire Booster Pump
   - Sewer pump
   - Other large exterior equipment required
   - Roof top make-up air units
   - Bathroom exhaust fans and shafts
   - Stair pressurization fans
   - Other required roof top equipment

bring D/B subs on early

- 2 steps - RFQ, RFP
- Program and 50% SD drawings
- overlap design engineers and D/B subs
- Involve team in selection
- Maintain appropriate contingencies

RFP scoring for d/b subs

Project Approach
- Staffing plan
- Availability
- Design Management
- Project Challenges
- Delay mitigation
- Schedule

Project Team,
- narrative &
- staff experience

VE ideas
- Creativity
- Feasibility

Interview
- Estimate Review
- Project Approach
- Unique qualifications

challenges of speed

- Being inclusive
- Designing w/o users
- Chemical quantities
- SDSU – vacating existing buildings
- Preparing temp spaces

inclusive process

- Use town hall meetings
- President & VP level decisions
- Build campus support for the big ideas
- Involve the Development team

designing without users

1

- Large group (20+) discussion, “areas of study” in Energy research

2

- Medium group (10-15) discussion about the future of Energy research

3

- Medium group (8-10) discussion looking at lab layout precedents and partnerships with other disciplines

…a process of listening, finding strengths and intersections for collaboration

designing with out users

- Don’t over-customize
- How would 7/10 PI’s use this space?
- Trust your team’s experience
- Benchmark peer institutions
- Don’t over think the small stuff

ENGINEERING RESEARCH BUILDINGS

STRUCTURES & MATERIALS ENGINEERING BLDG
University of California, San Diego

Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: ?' - ?"
Level 2 - R: ?' - ?"

SANDLER NEUROSCIENCES CENTER 19A
University of California, San Francisco

Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: ?' - ?"
Level 2 - R: ?' - ?"

MATERIALS SCIENCE & ENGINEERING BLDG
University of California, Riverside

Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: 20' - 0"
Level 2 - R: 15' - 4"

SCIENCE & ENGINEERING BUILDING 2
University of California, Merced

Steel Frame/Braced Frame
Floor to Floor Heights: Level B: 18' - 0"
Level 1 - R: 15' - 0"

ENGINEERING RESEARCH BUILDING
University of Texas, Arlington

Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: 16' - 0"
Level 2 - R: 16' - 0"

PHYSICS & NANOTECHNOLOGY BUILDING
University of Minnesota

Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: 16' - 0"
Level 2 - R: 16' - 0"

HEALTH SCIENCE BIOMED RESEARCH BLDG 2
University of California, San Diego

Concrete Frame/Shear Wall
Floor to Floor Heights: Level B: 21' - 0"
Level 1 - R: 17' - 0"

CLEAN TECHNOLOGY LABORATORY BLDG
Washington State University

Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: 16' - 0"
Level 2 - R: 16' - 0"

ENGINEERING VI PHASE I
University of California, Los Angeles

Concrete Frame/Shear Wall
Floor to Floor Heights: Level B - 1: 18' - 0"
Level 2 - R: 15' - 6"

INTERDISCIPLINARY SCI & ENGINEERING BLDG
University of Delaware

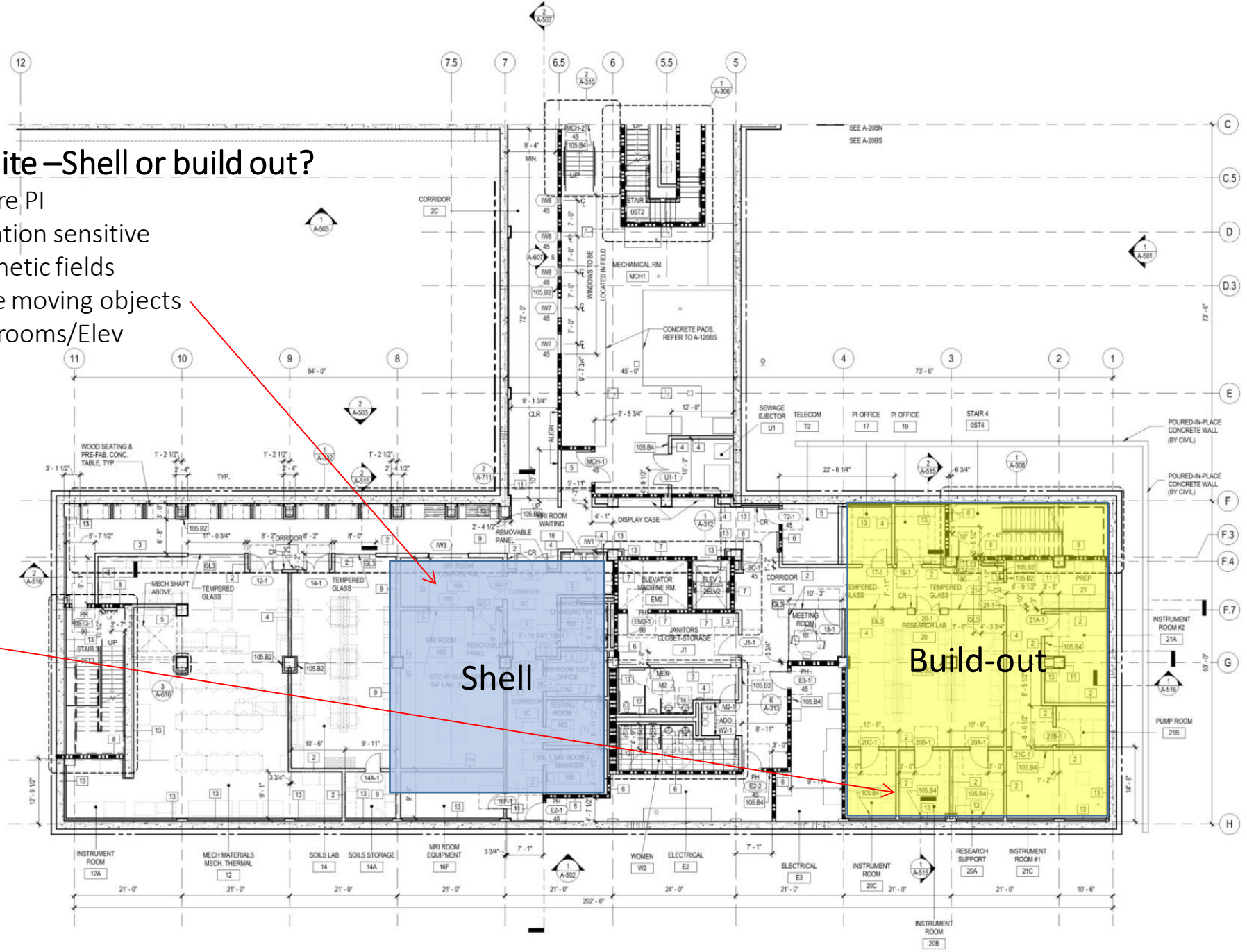
Concrete Frame/Shear Wall
Floor to Floor Heights: Level 1: 16' - 0"
Level 2 - R: 16' - 0"

MRI Suite –Shell or build out?

- Future PI
- Vibration sensitive
- Magnetic fields
- Large moving objects
- Elec rooms/Elev

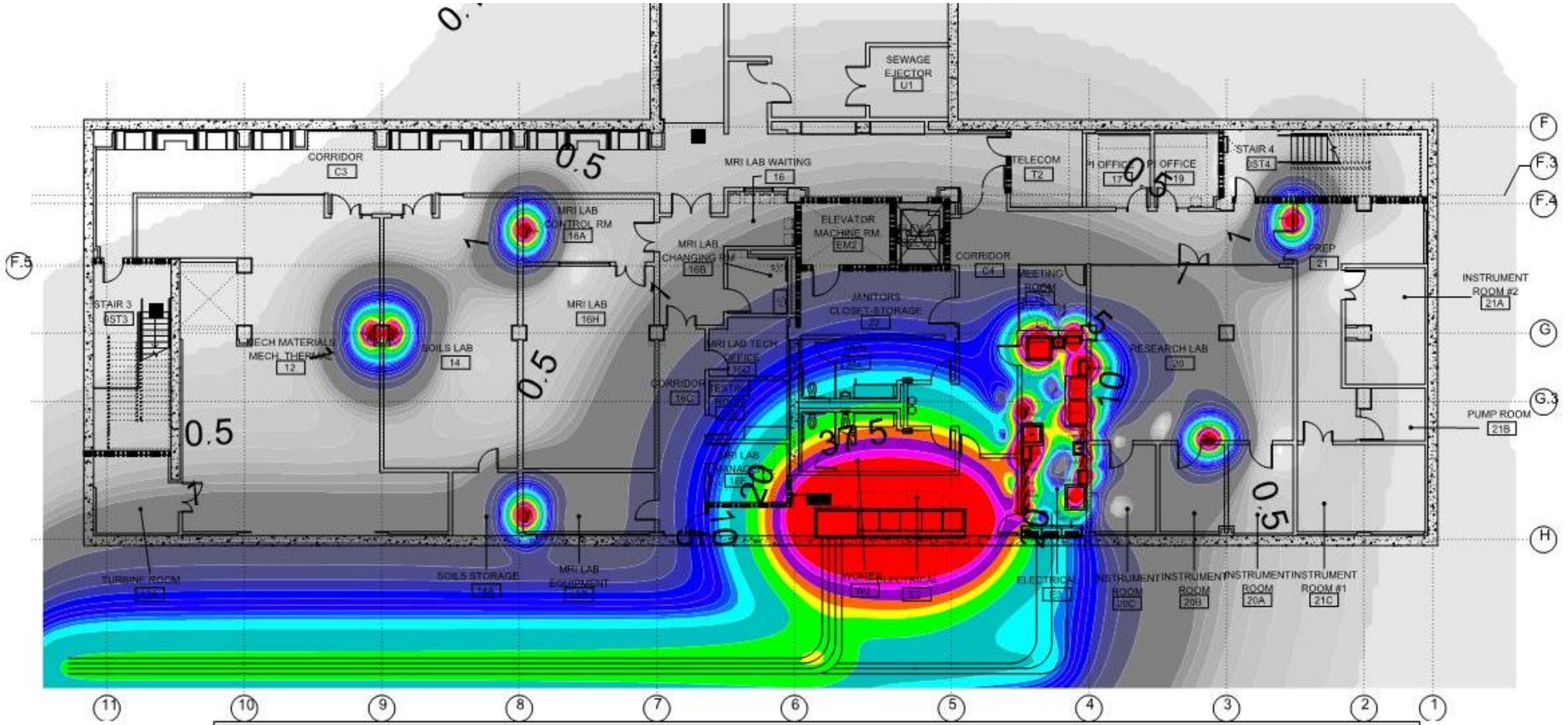
Materials Imaging Shell or build out?

- Future PI
- Vibration sensitive
- Unknown equipment



"Dr. Marty Sereno, a psychologist and cognitive neuroscientist is a pioneering figure in the world of functional MRI…his successful recruitment provides SDSU with a wonderful opportunity to synergize research strengths in the cognitive neurosciences…"

Steve Welter VP of Research @ SDSU



“Swing Space”

- EIS demolition displaced 35 faculty
- $6m budget for “Swing Space”
- 8 months to plan, design, bid, build and move into space for 35 people
- **12 different construction projects**
  - Built a new building
  - Heavy renovation in 9 buildings
  - Went over budget by $1million
- **Lessons Learned**:
  - Make the move decisions earlier
  - Start planning earlier
  - Budget with more contingency

enemy of speed

- Academics
- CSU Peer Reviewers
  - ✓ Mechanical
  - ✓ Seismic
  - ✓ Design Engineer
- Independent Plan-check
- Health Department
- DSA
- Local Fire
- State Fire Marshall

Peer Reviewers – are not built for speed

Things to consider

- Share your overall schedule w/each reviewer
- Consider number of bid packages carefully
- Possibility and cost of “in-person” reviews
- Enlist University support w/reviewers
- Consider the plus/delta of new/unfamiliar systems

State Fire Marshall – is not built for speed

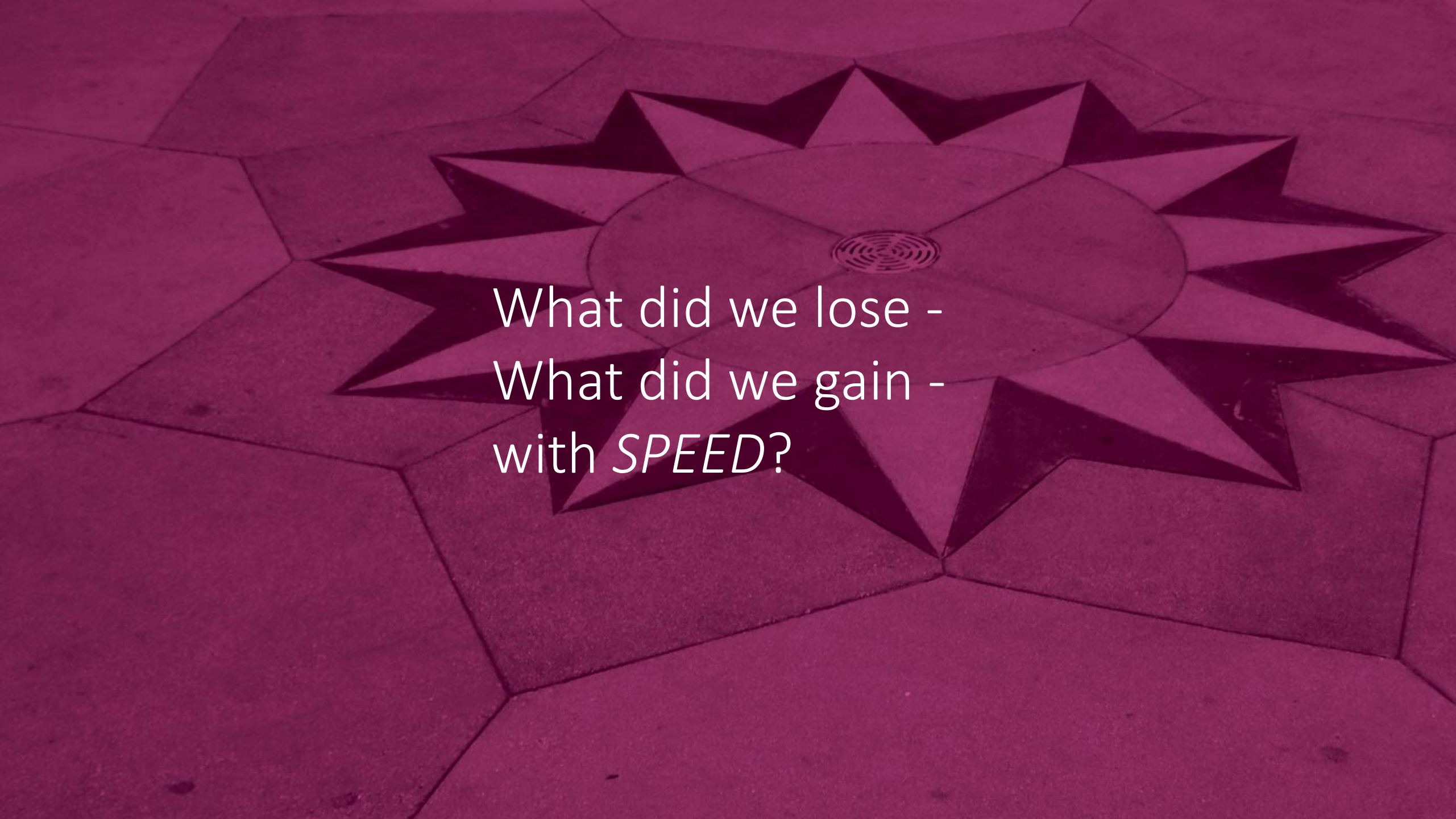
How to plan

- Review SFM process with your teams during selection
- Code consultant required, budget for this
- Schedule meetings w/SFM upfront & regular
- Consider number of packages carefully
- Consider the plus/delta of new systems

State Fire Marshal – is not built for speed

What to do when reviews are moving too slow

- SFM can change their minds
- Do not escalate, solve at the team level
- Stay calm & negotiate
- Keep the BIG PICTURE of schedule in mind
- Maintain appropriate contingencies, it will cost $$$


What did we lose -
What did we gain -
with *SPEED*?

CM @ Risk 5 Years

(+)

- Aligns with CSU procedures
- Lots of time for SFM
- Academics like more time

(–)

- Long drawn out process
- Bid after drawings are complete
- Owner responsible for changes $
- More time  better decisions

D/B Collaboration 3 years

(+)

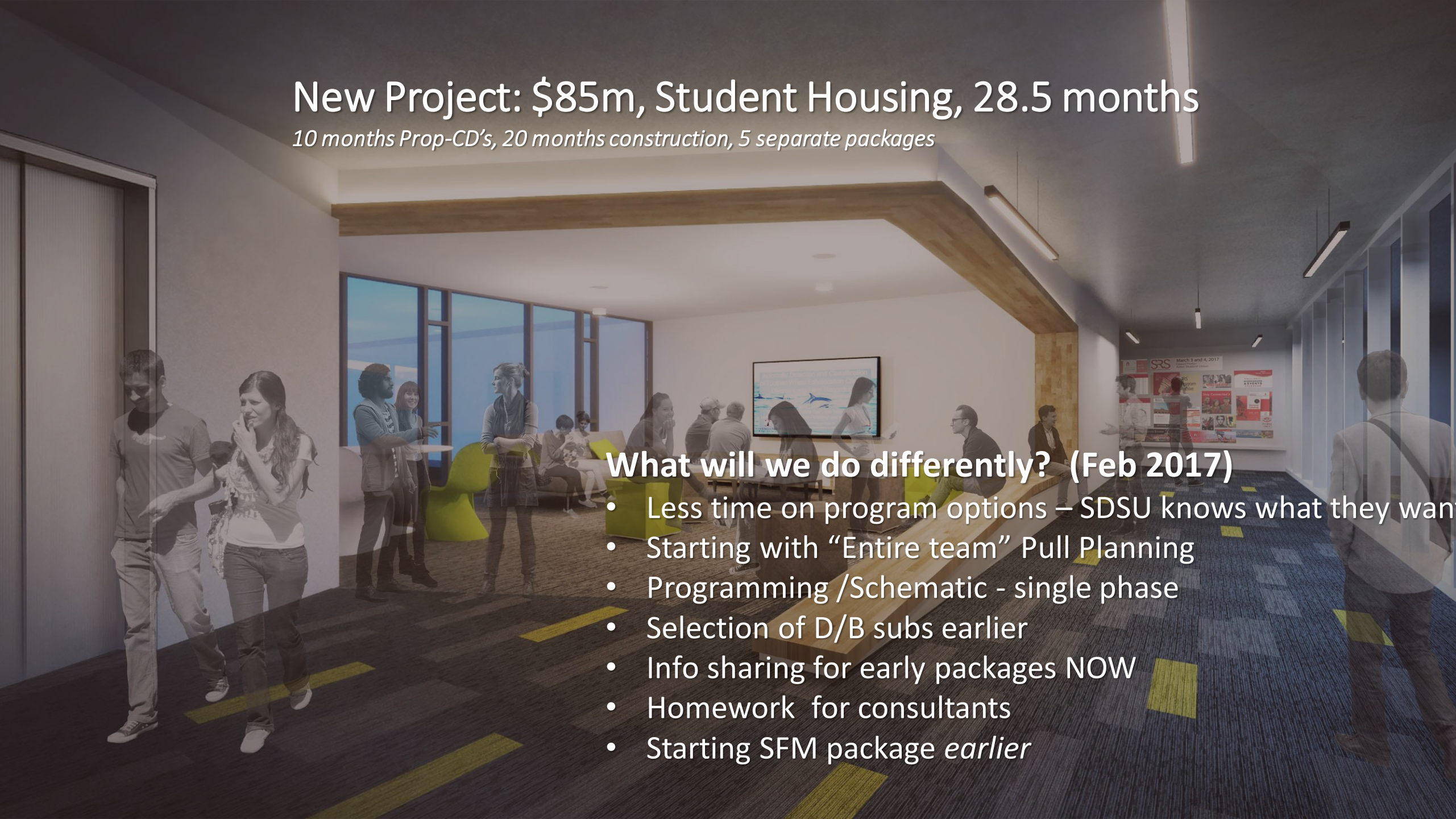
- Escalation savings
- Quick results, happy donors
- Users see immediate progress
- Subs on-board early
- Progressive GMP allowed changes
- D/B team energy remains high

(–)

- CSU Peer Review is challenging
- SFM is NOT built for speed

New Project: $85m, Student Housing, 28.5 months

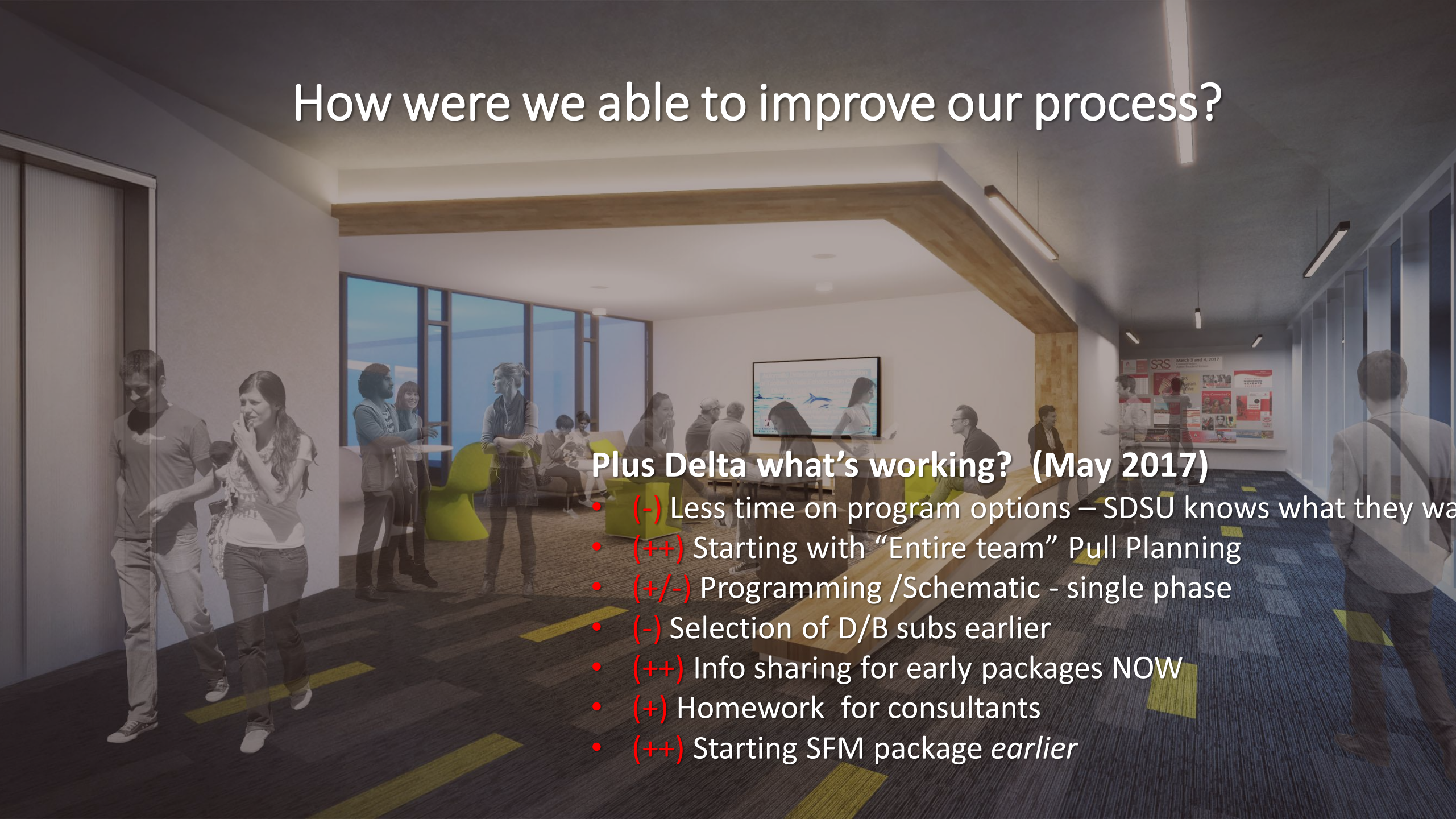
10 months Prop-CD's, 20 months construction, 5 separate packages



What will we do differently? (Feb 2017)

- Less time on program options – SDSU knows what they want
- Starting with "Entire team" Pull Planning
- Programming /Schematic - single phase
- Selection of D/B subs earlier
- Info sharing for early packages NOW
- Homework for consultants
- Starting SFM package *earlier*

How were we able to improve our process?



Plus Delta what's working? (May 2017)

- (-) Less time on program options – SDSU knows what they wa
- (++) Starting with "Entire team" Pull Planning
- (+/-) Programming /Schematic - single phase
- (-) Selection of D/B subs earlier
- (++) Info sharing for early packages NOW
- (+) Homework for consultants
- (++) Starting SFM package *earlier*

New Project: $85m, Student Housing, 28.5 months

10 months Prop-CD's, 20 months construction, 5 separate packages

- **Soils**: Poor soils + tight site = $$$$
- **EIR:** EIR is concurrent with Design – RISK
- **Utility connections:** Central Plant connection $$, City water requires major upgrade $$$
- **Food Service**: Program was not well defined, changing, team behind on this element
- **Modern to Mission Style**:
  RFP Stage – Modern architectural style $$$
  Selection – Changed to Mission Style $$$$

- **Soils** - More site investigation before issuing RFP
- **EIR** – Best to complete prior to RFP
- **Utility connections**: Study utility options and connections prior to RFP to allocate the budget
- **Food Service**: Check-in with users before work with the D/B team to solidify direction
- **Modern to Mission Style**: Change in style slows D/B team, has major effects on the budget

Questions


Wendy
Kyle
Sean
Donna
Scott
Jerrold
Matt
Suzanne
Susan
Mike
Albert