Keeping Facilities Projects Within Budget

Health Futures Center
Arizona State University

2019 SCUP CONFERENCE

Presenters

Joe Lisiewski

Director
University Architect Office

Cassie Robertson

Pre-Construction
Manager

Tanner Clapham

Project
Architect

Learning Objectives

1) Describe a successful design process that eliminates costly re-design.

2) Package cost information by program typology, massing, building performance, and site.

3) Inform stakeholders of challenging budget issues that require prioritization and help them make informed decisions before design begins.

4) Prescribe specific costs accompanied by detailed options for design teams use during the design process.

Align the realities of budget constraints with project stakeholder's expectations through transparent **team based design** and **costing models.**

WHOS IN THE ROOM?

Agenda

ASU: Institution + Vision
HFC: Project Background
Process: Disruption
Cost Modeling & Estimating Tools
Lessons Learned

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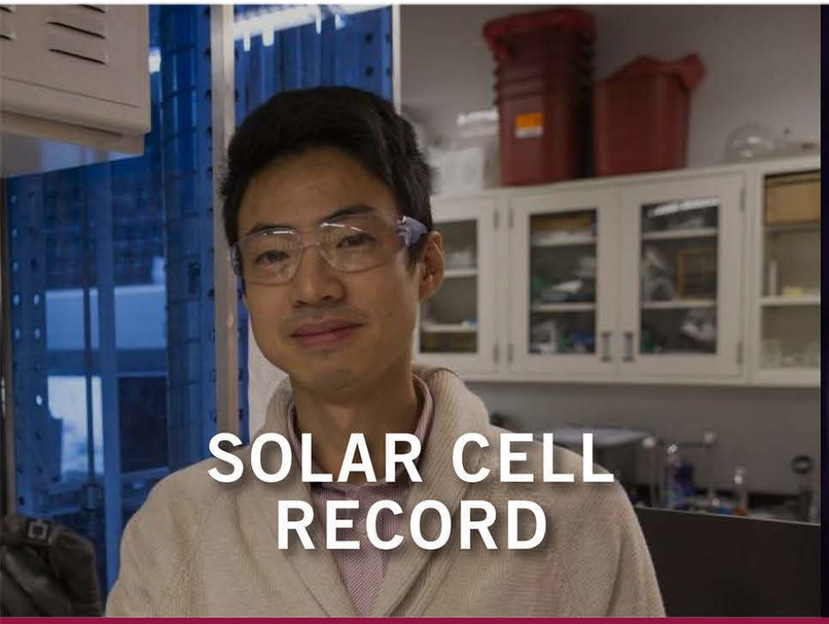
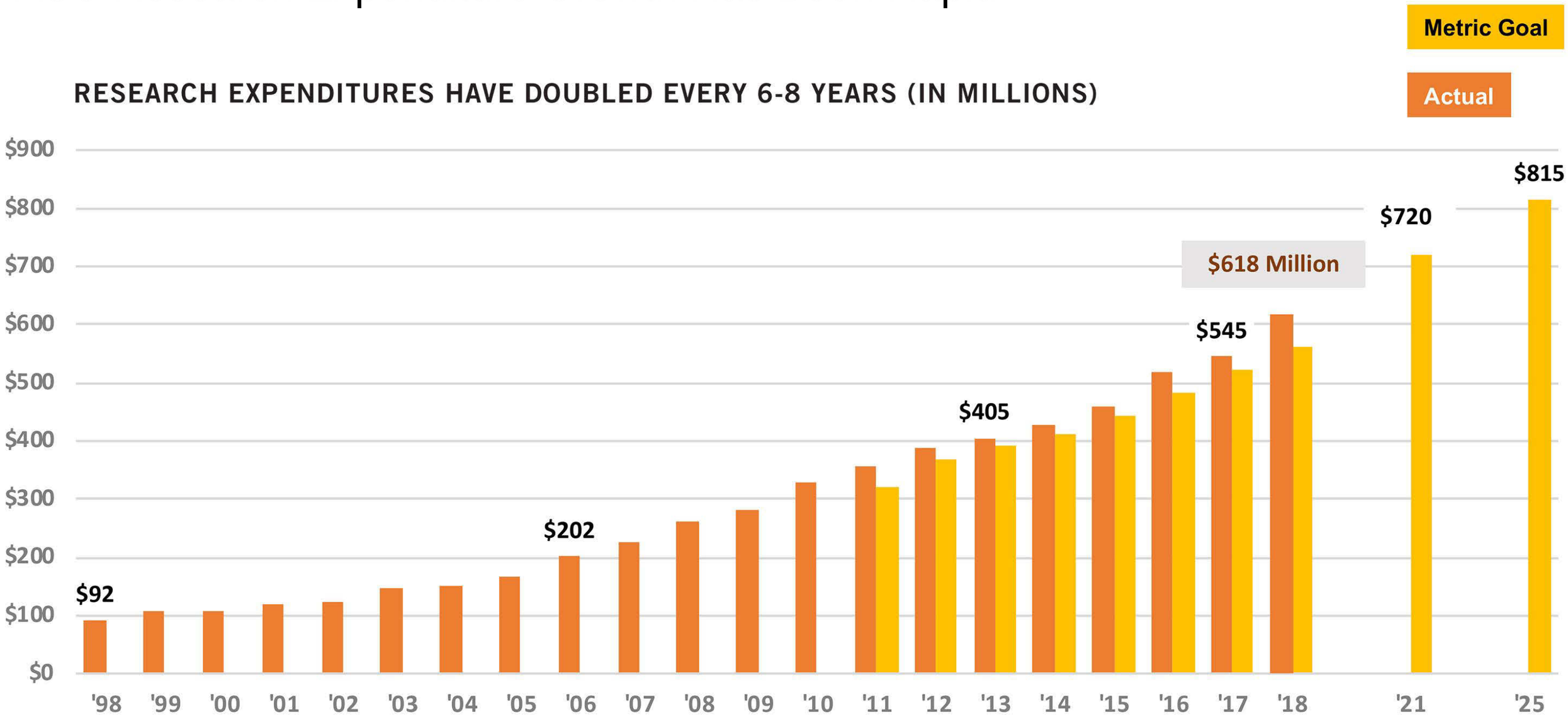
Lessons Learned

ASU Produces Groundbreaking Research

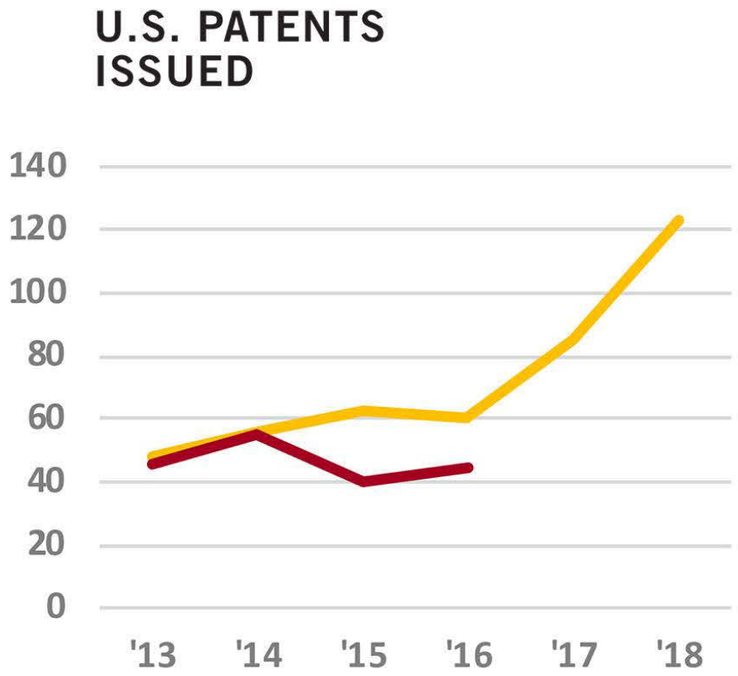


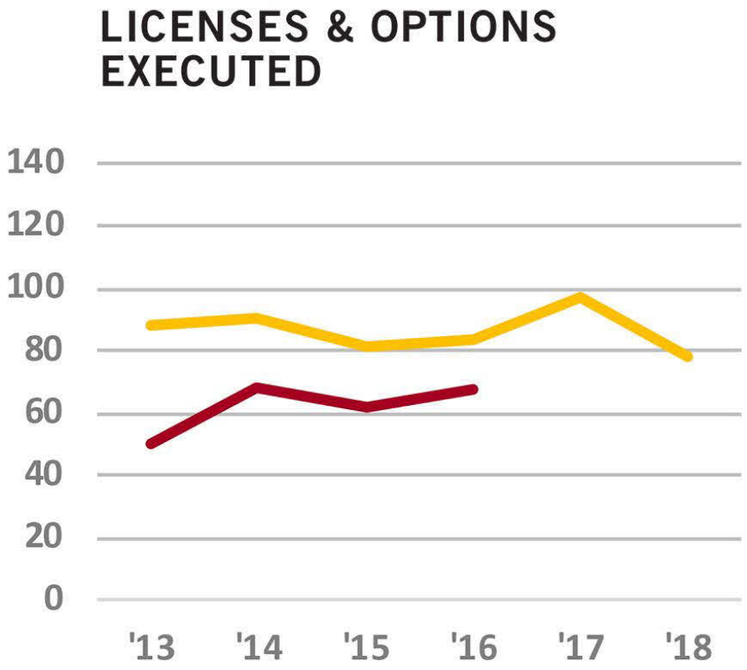
Game-Changing, Use-Inspired Discovery Happens Here.

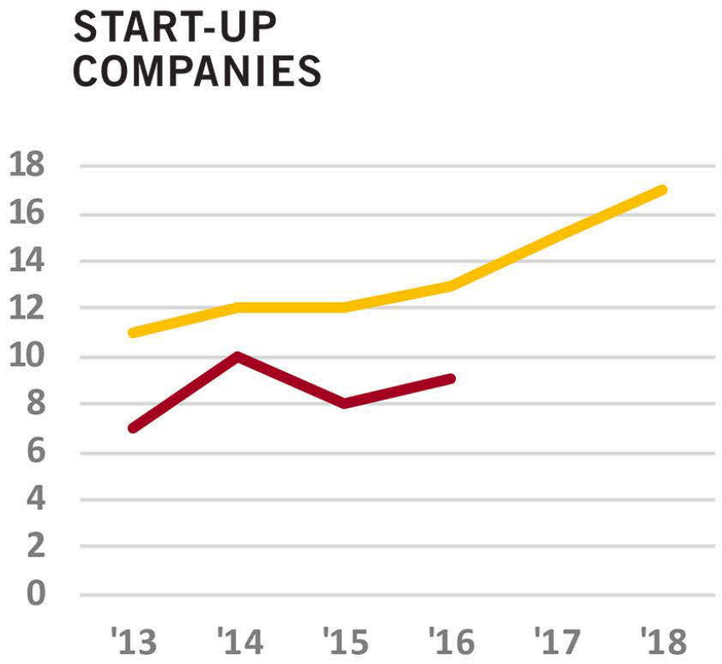
ASU Research Expenditure Growth Has Been Rapid



ASU Outperforms The Median of Its Peers in Tech Transfer



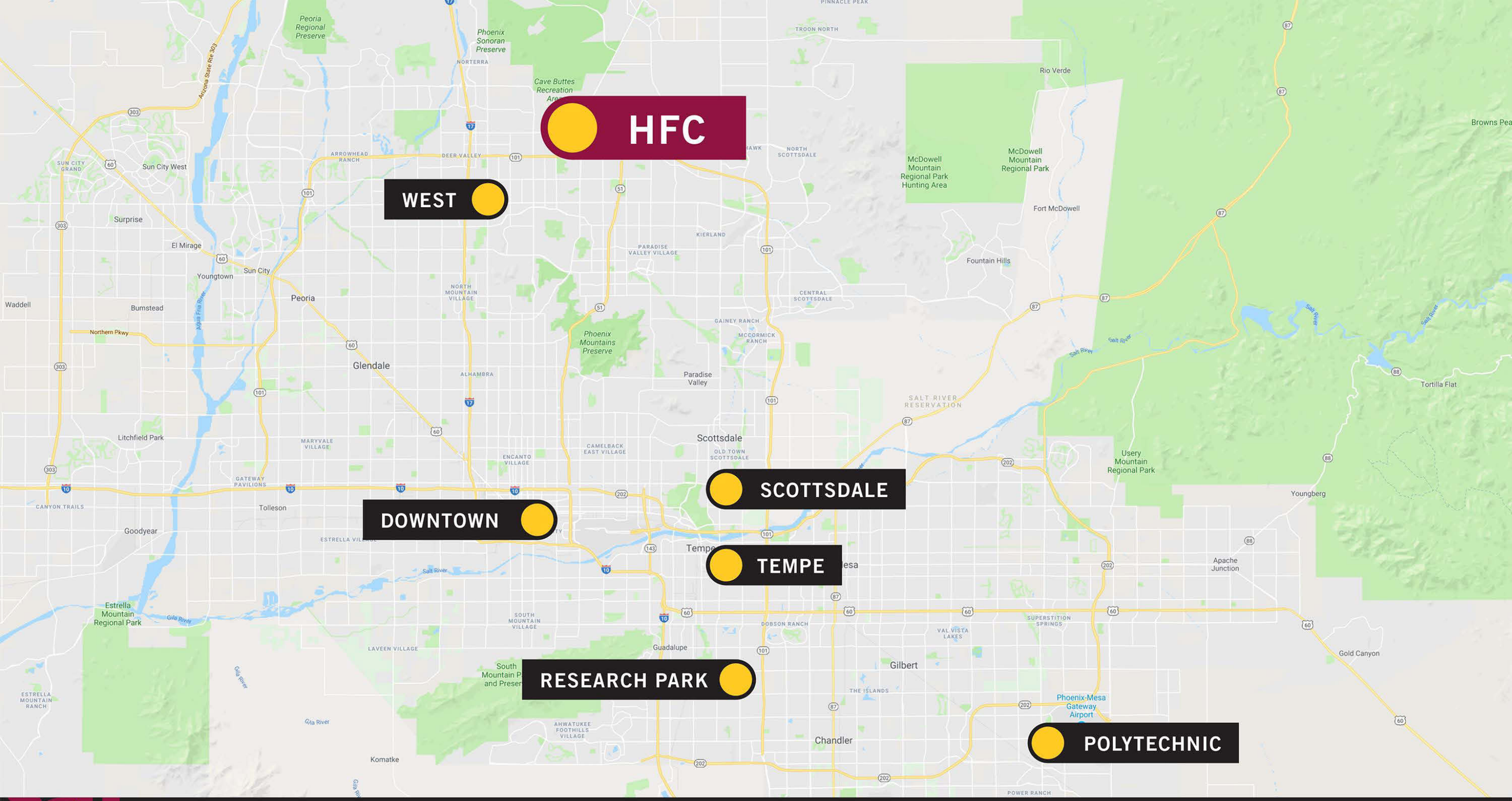




ASU

Median

“One University In Many Places”


HFC
WEST
SCOTTSDALE
DOWNTOWN
TEMPE
RESEARCH PARK
POLYTECHNIC

Enterprise-wide alliance transforming medical education, accelerating cutting-edge research & improving patient care through innovations.

ALLIANCE FOR HEALTH CARE

ASU

MAYO CLINIC

Agenda

ASU: Institution + Vision
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Cost Modeling & Estimating Tools
Lessons Learned

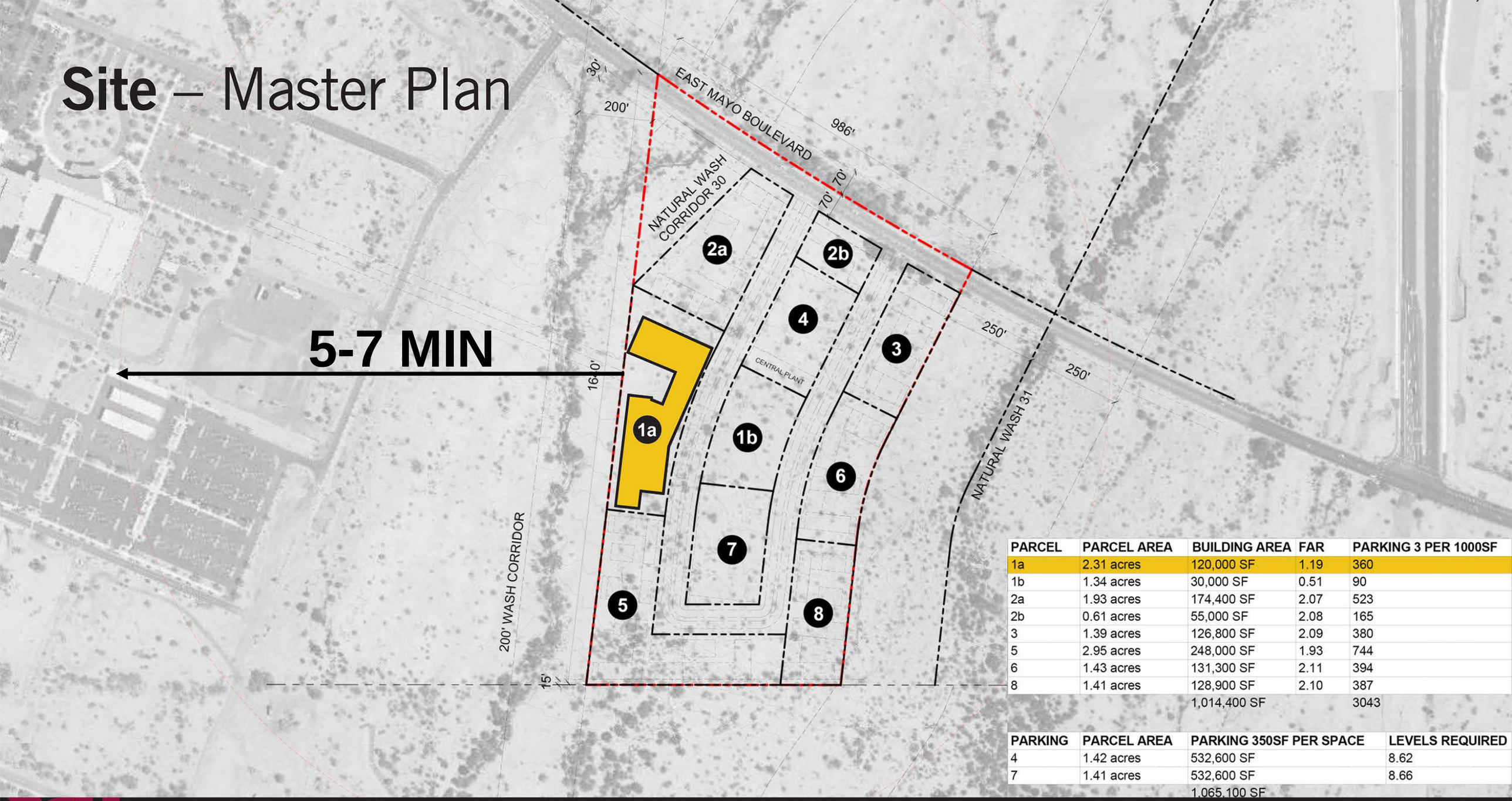
Site – Regional

HEALTH FUTURES CENTER

2019 SCUP CONFERENCE

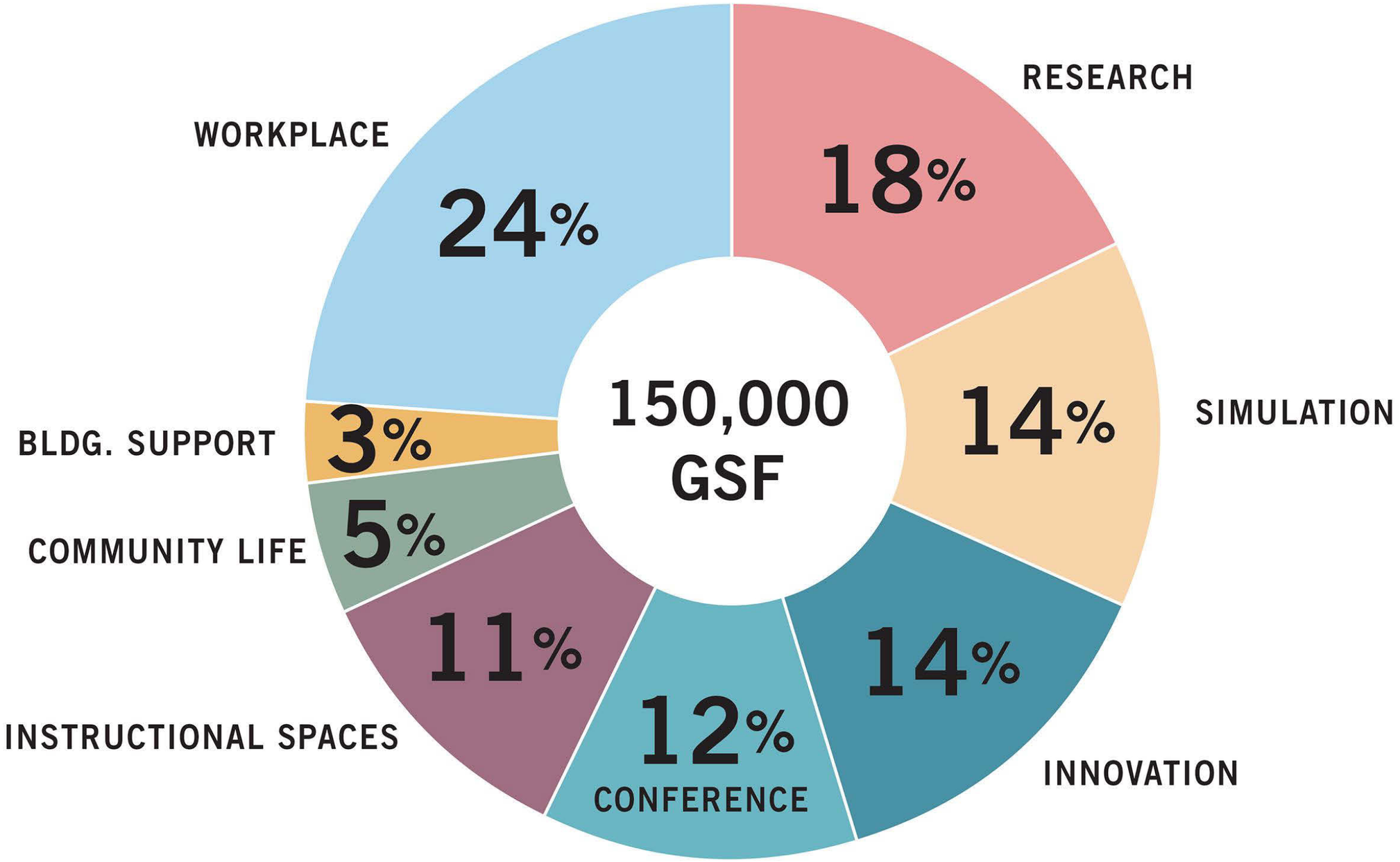
Site – Aerial

Site – Master Plan

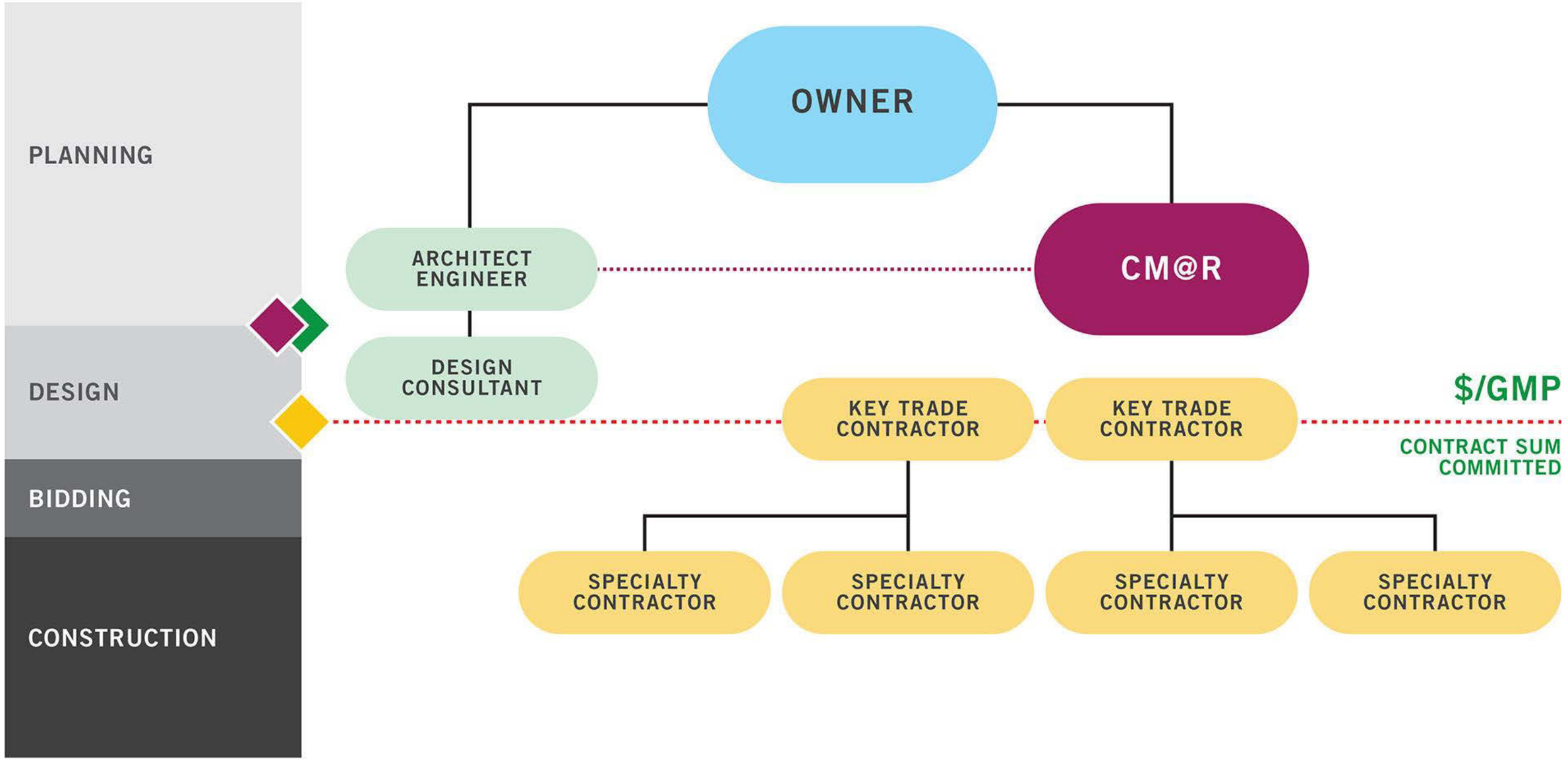


PARCEL	PARCEL AREA	BUILDING AREA	FAR	PARKING 3 PER 1000SF
1a	2.31 acres	120,000 SF	1.19	360
1b	1.34 acres	30,000 SF	0.51	90
2a	1.93 acres	174,400 SF	2.07	523
2b	0.61 acres	55,000 SF	2.08	165
3	1.39 acres	126,800 SF	2.09	380
5	2.95 acres	248,000 SF	1.93	744
6	1.43 acres	131,300 SF	2.11	394
8	1.41 acres	128,900 SF	2.10	387
		1,014,400 SF		3043

PARKING	PARCEL AREA	PARKING 350SF PER SPACE	LEVELS REQUIRED
4	1.42 acres	532,600 SF	8.62
7	1.41 acres	532,600 SF	8.66
		1,065,100 SF	


RESEARCH
18%
SIMULATION
14%
INNOVATION
14%
CONFERENCE
12%
INSTRUCTIONAL SPACES
11%
COMMUNITY LIFE
5%
BLDG. SUPPORT
3%
WORKPLACE
24%
150,000
GSF

CMAR Delivery Method



HFC Budget Framework

3

FUNDING SOURCES & CONTRACTS

ARIZONA BOARD OF REGENTS

HFC Building

$60 M
Construction

100%
DD GMP

CITY OF PHOENIX

Site Make Ready

$8 M
Construction

100%
SD GMP

ASU PARKING & TRANSIT

Parking Lots

$2.3 M
Construction

100%
DD GMP

Live Polling question

1. Project budgets are established:

A. On the back of a napkin after dinner
B. Through constraints of available funding
C. Through historical data of comparable projects
D. After the design and construction team verify detailed space program and basis-of-design for core/shell &MEPS

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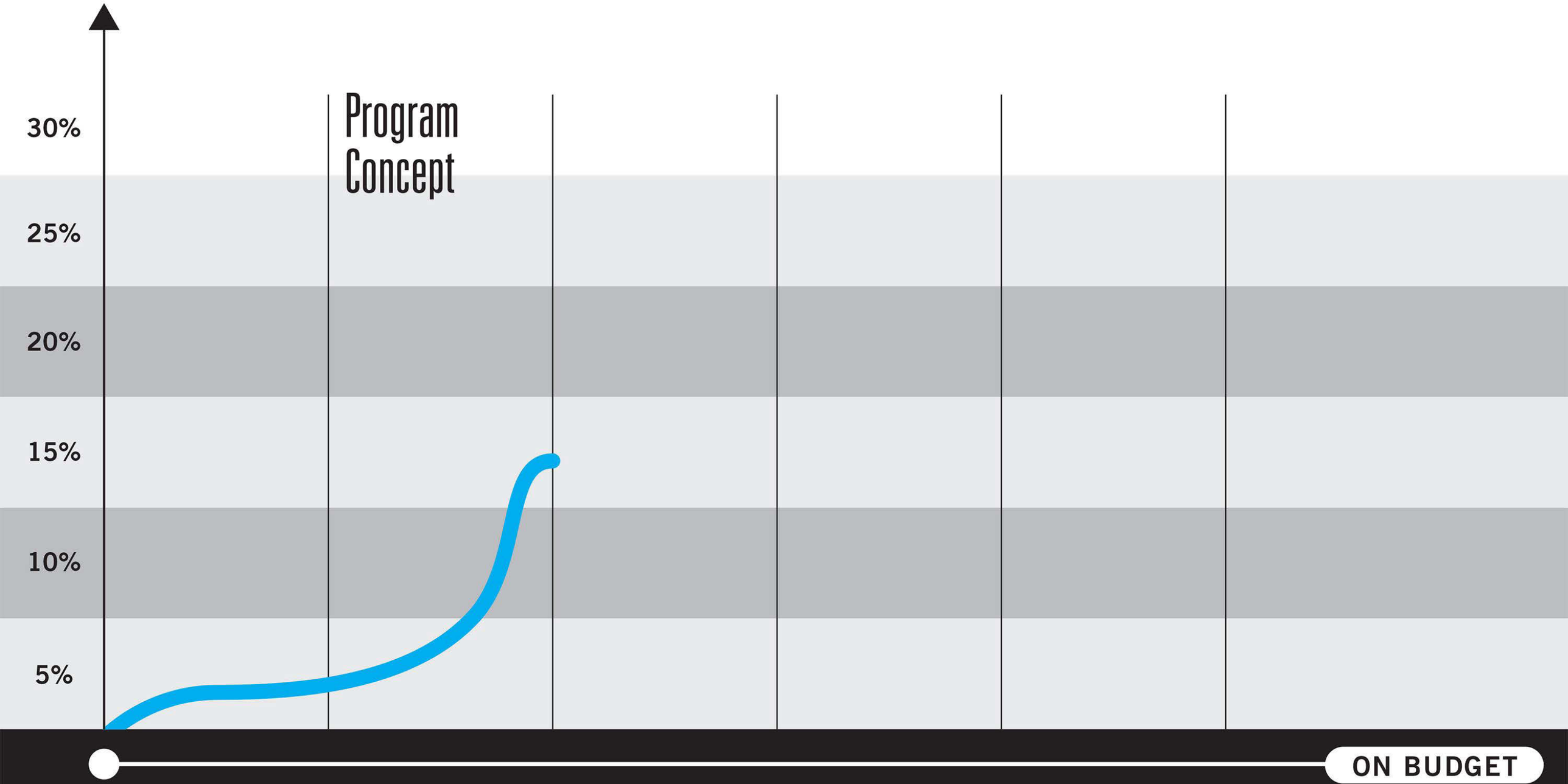
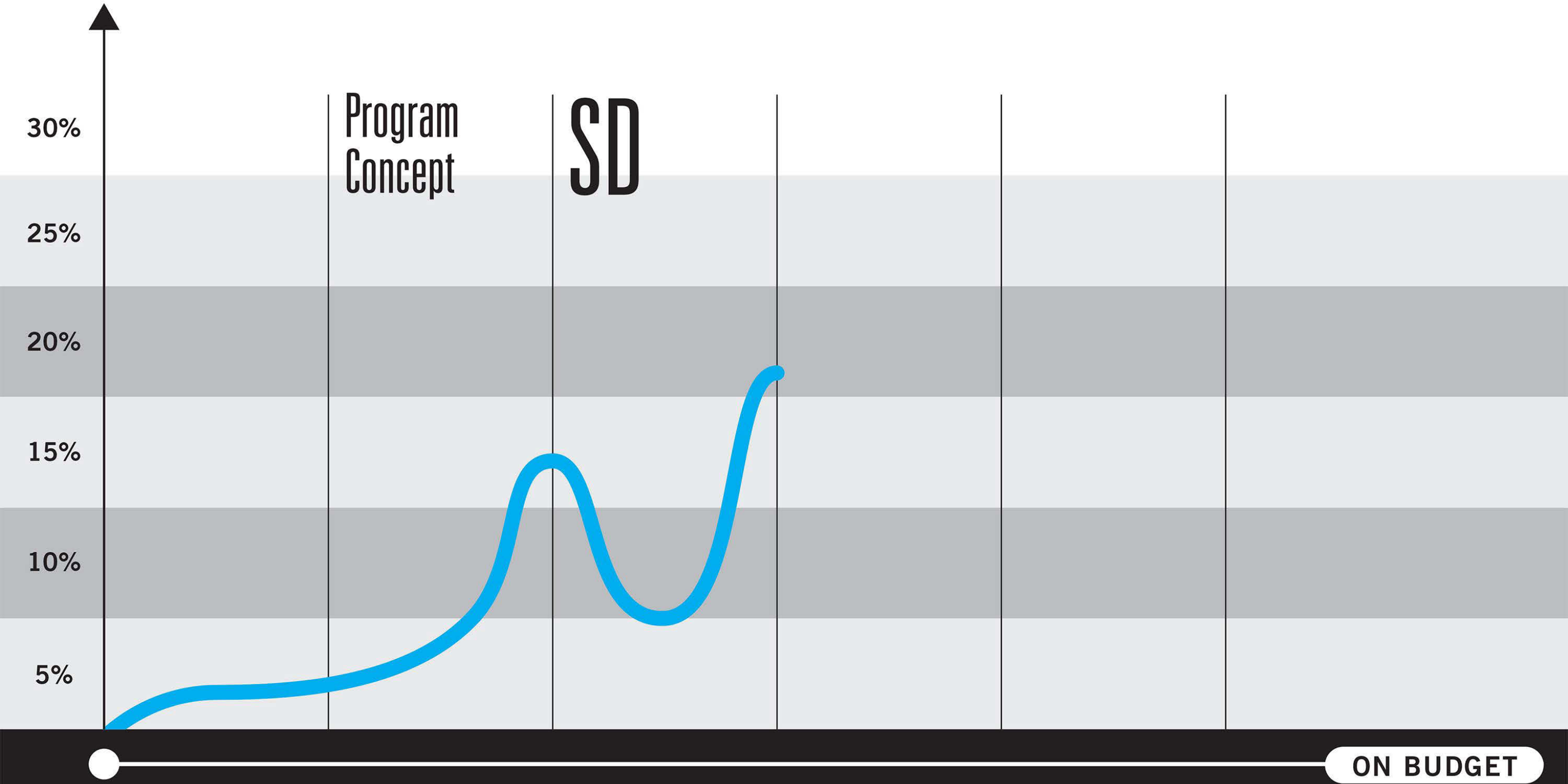
Cost Modeling & Estimating Tools
Lessons Learned

Align the realities of budget constraints with project stakeholder's expectations through transparent **team based design** and **costing models.**


Program
Concept
30%
25%
20%
15%
10%
5%
ON BUDGET


30%
25%
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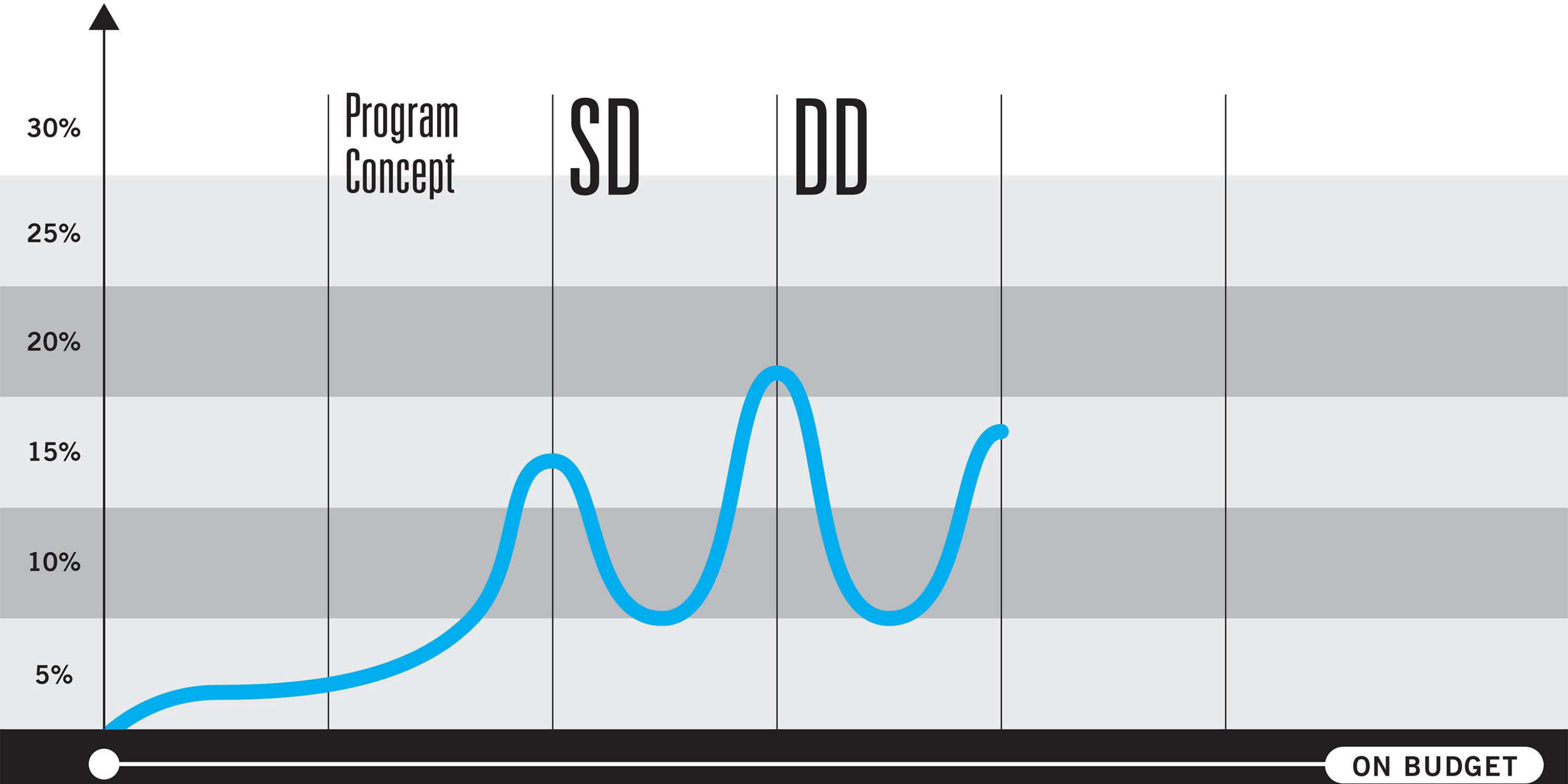
15%
10%
5%
Program
Concept
SD
ON BUDGET


30%
25%
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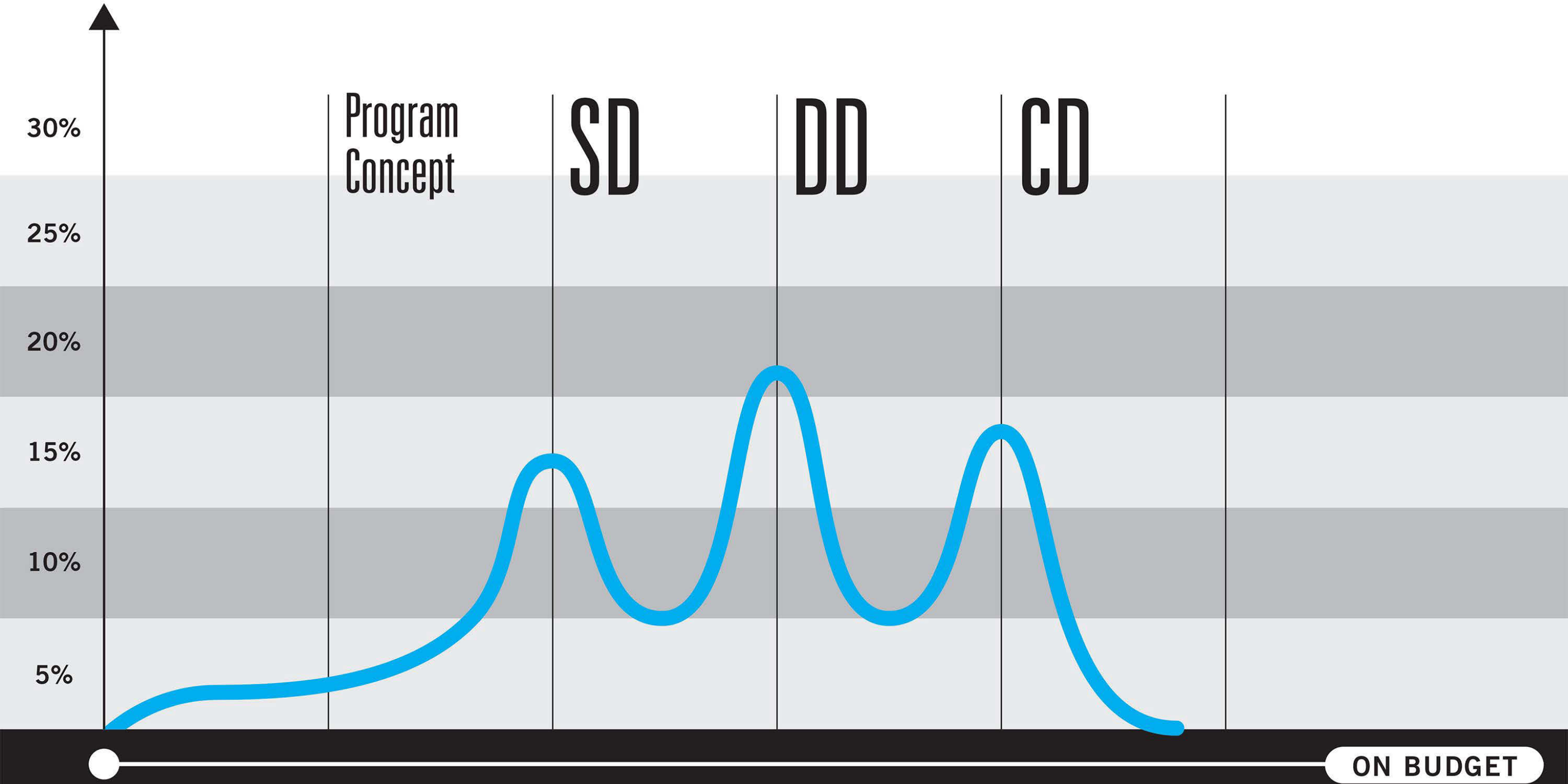
Program Concept
SD
DD
ON BUDGET


30%
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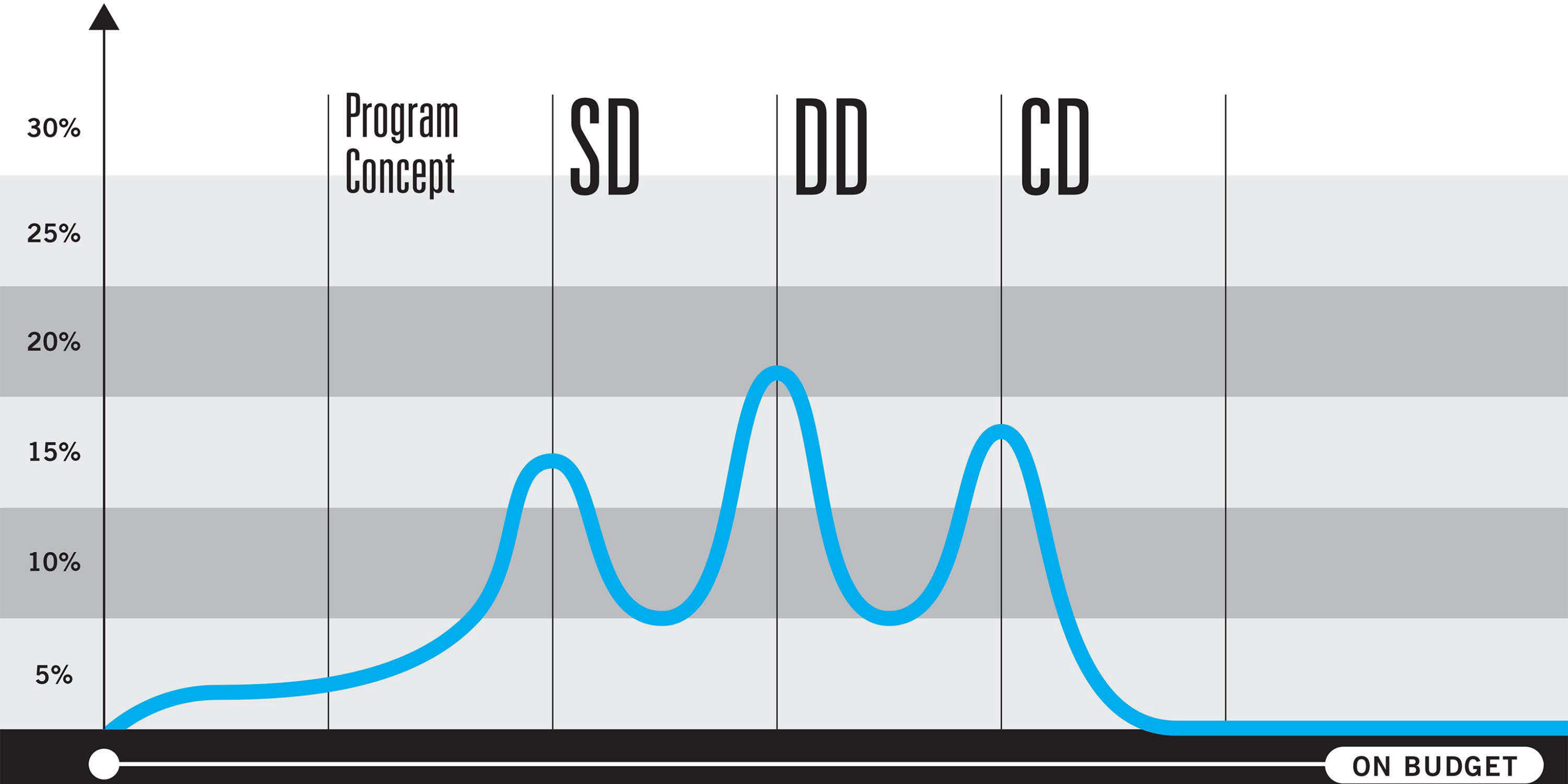
Program Concept
SD
DD
CD
ON BUDGET

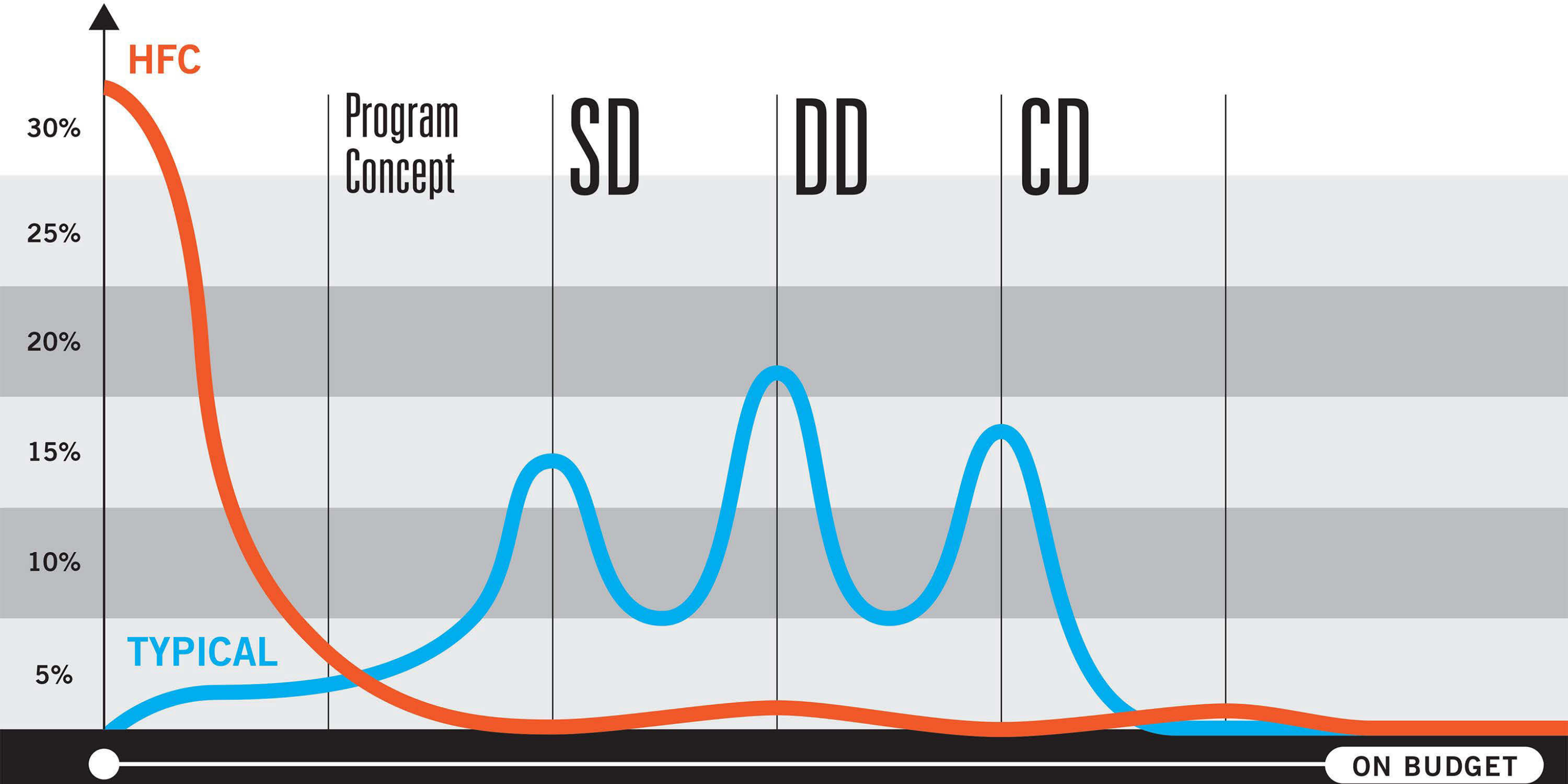

30%
25%
20%
15%
10%
5%
Program Concept
SD
DD
CD
ON BUDGET

Who Likes VE?

LIVE POLLING Q

2. Value Engineering:

A.Is the best, I love the extra effort.
B.Part of the process, we build it in to the design plan
C.A pain that stresses our resources
D.How can we stop the madness?


HFC
30%
25%
20%
15%
10%
5%
Program Concept
SD
DD
CD
TYPICAL
ON BUDGET

Agenda

ASU: Institution + Vision
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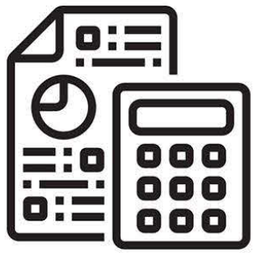
Lessons Learned

THE HFC APPROACH:

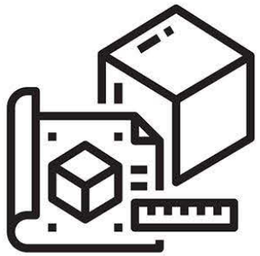
Target value design that establishes prioritization of scope and framework for design before beginning schematic design phase.

HOW WE DID IT:

BENCHMARK AGAINST RELEVAN PROJECTS



ESTIMATE PROGRAM SPACE TYPES AND CORE/SHELL



PHENOTYPE BASED PROGRAMMATIC ESTIMATION W/ ITERATIONS OF MASSING & ENVELOPE

ESTABLISH TARGET BUDGETS

BIOMEDICAL SCIENCES PARTNERSHIP BUILDING

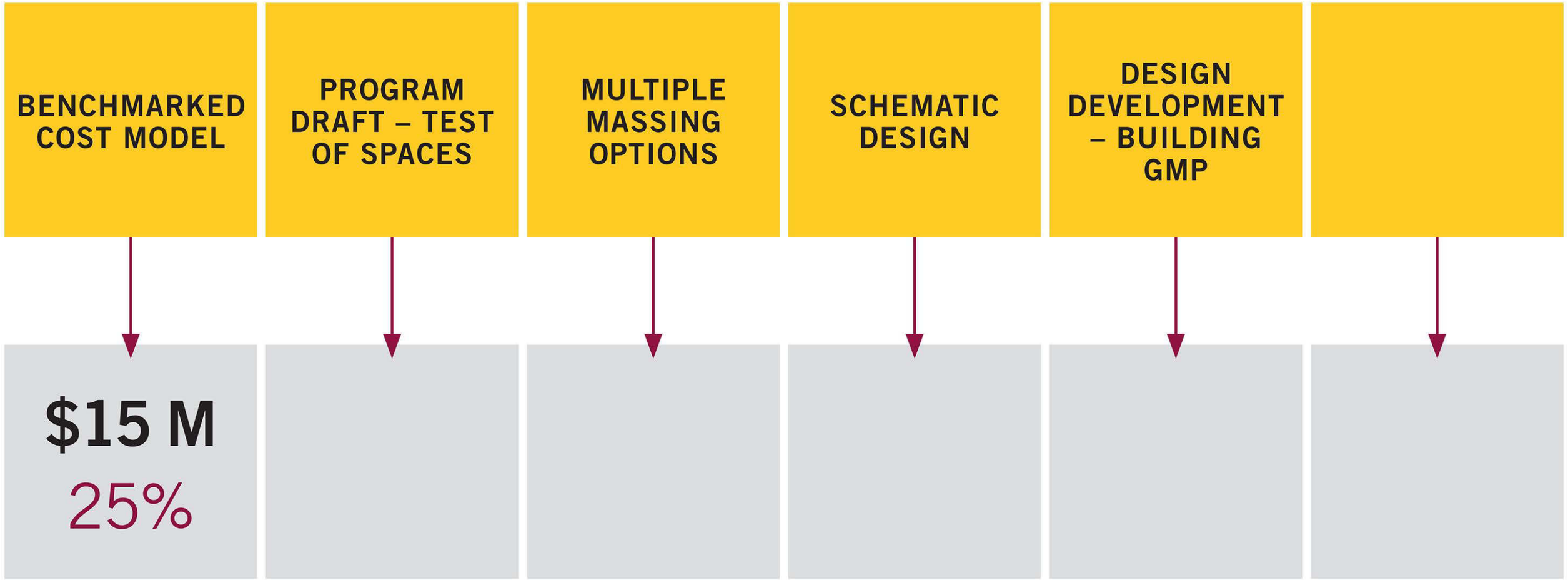
UNIVERSITY OF ARIZONA

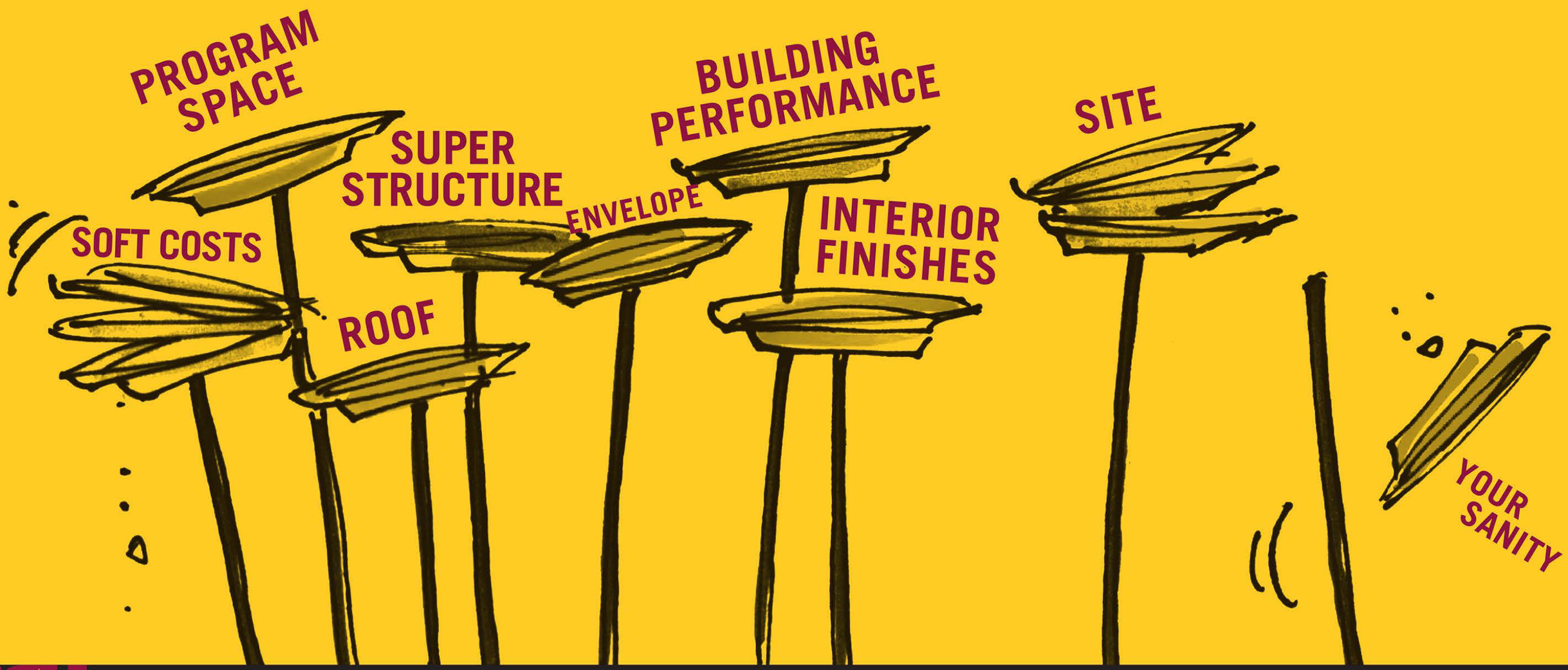
BEUS CENTER FOR LAW AND SOCIETY

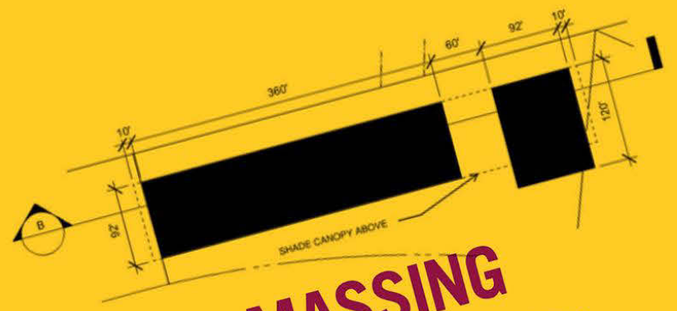
ARIZONA STATE UNIVERSITY

=

modelogix


BENCHMARKED COST MODEL
PROGRAM DRAFT – TEST OF SPACES
MULTIPLE MASSING OPTIONS
SCHEMATIC DESIGN
DESIGN DEVELOPMENT – BUILDING GMP
$15 M
25%


PROGRAM SPACE
SOFT COSTS
SUPER STRUCTURE
ROOF
ENVELOPE
BUILDING PERFORMANCE
INTERIOR FINISHES
SITE
YOUR SANITY

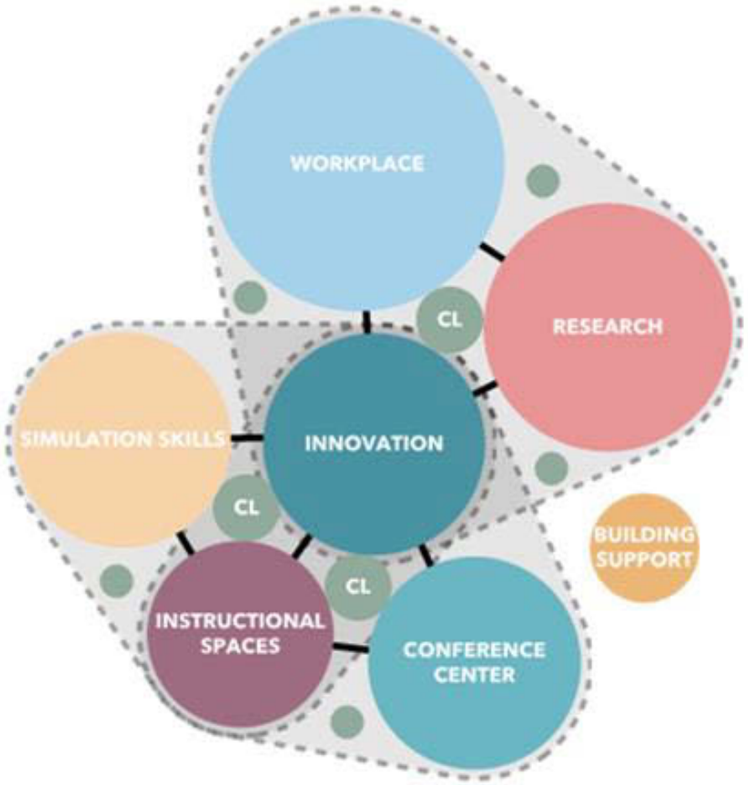


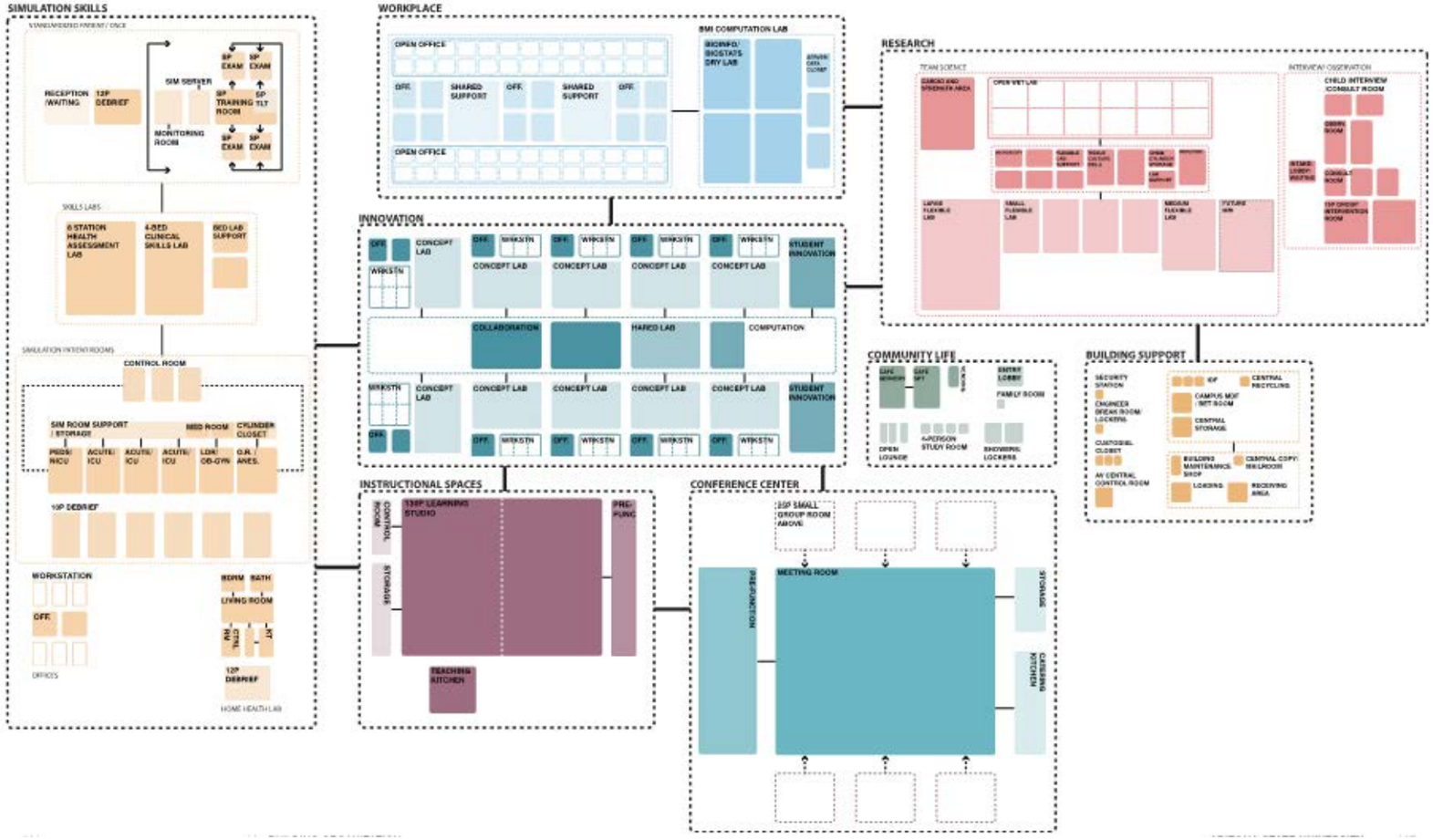
MASSING

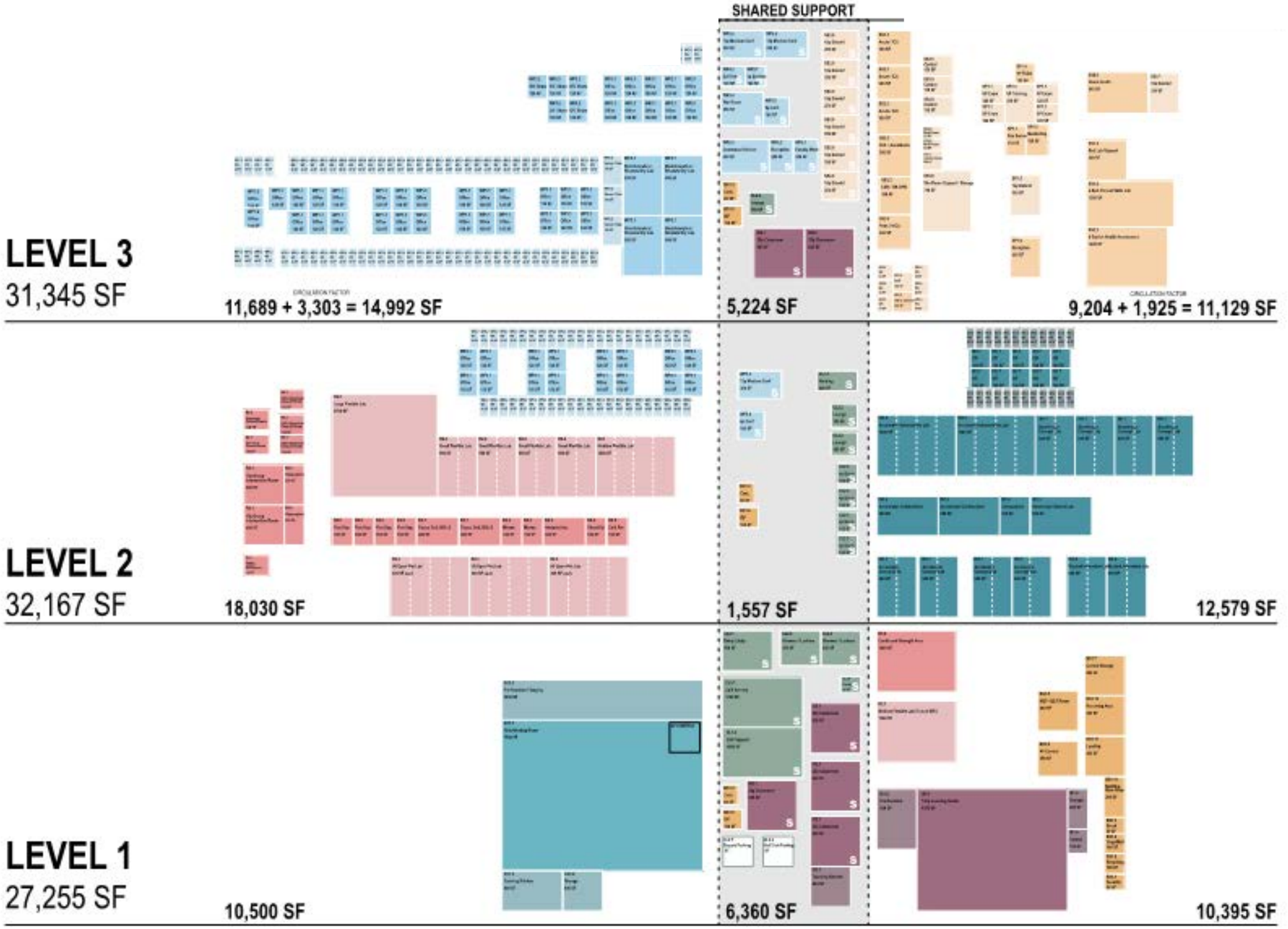
PROGRAM TYPOLOGY

BUILDING SYSTEMS

4 SITE


WORKPLACE
CL
RESEARCH
SIMULATION SKILLS
INNOVATION
CL
BUILDING SUPPORT
CL
INSTRUCTIONAL SPACES
CONFERENCE CENTER


SIMULATION SKILLS
WORKPLACE
RESEARCH
INNOVATION
COMMUNITY LIFE
BUILDING SUPPORT
INSTRUCTIONAL SPACES
CONFERENCE CENTER


SHARED SUPPORT
LEVEL 3
31,345 SF
11,689 + 3,303 = 14,992 SF
5,224 SF
9,204 + 1,925 = 11,129 SF
LEVEL 2
32,167 SF
18,030 SF
1,557 SF
12,579 SF
LEVEL 1
27,255 SF
10,500 SF
6,360 SF
10,395 SF

XXXXXX

RESEARCH	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
INNOVATION	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
WORKPLACE	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
COMMUNITY LIFE	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
CONFERENCE	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
INSTRUCTIONAL/MEETING	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
SIMULATION	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
SUPPORT	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
CORE AND SHELL	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
SITE	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
XXXX	$XXX.XX/S @ XX,XXX SF	$XXX.XX/S @ XX,XXX SF
TOTAL	**$XXX.XX/S @ XX,XXX SF**	**$XXX.XX/S @ XX,XXX SF**

BENCHMARKED COST MODEL	PROGRAM DRAFT – TEST OF SPACES	MULTIPLE MASSING OPTIONS	SCHEMATIC DESIGN	DESIGN DEVELOPMENT – BUILDING GMP	
$15 M 25%	$15.4 M 26%				

LIVE POLLING Q.

1. Being on budget at programming happens:

A. Every time, geez, what's your problem?

B. Often, duh.

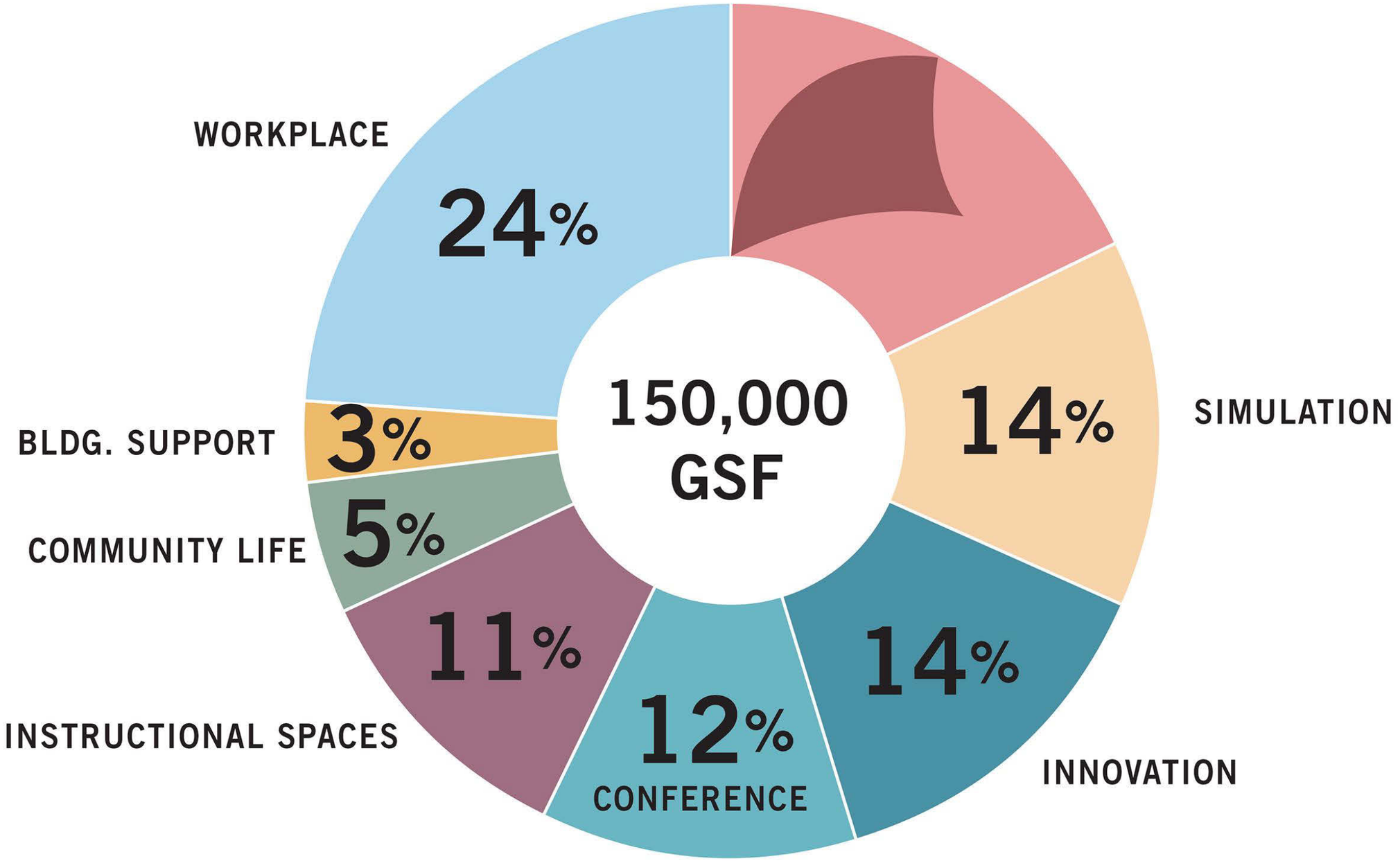
C. It's happened but it's like a unicorn – rare.

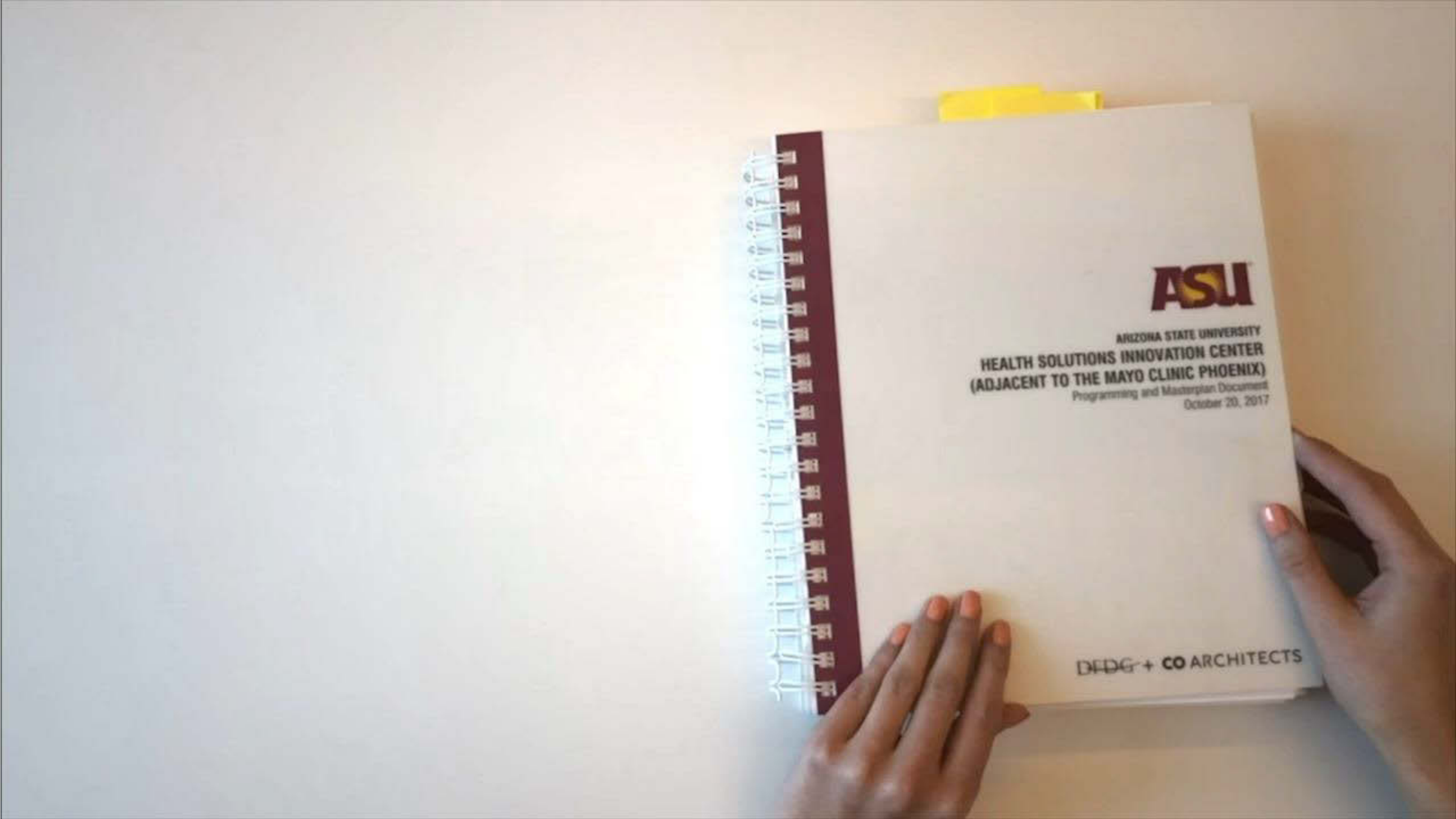
D. NEVER! Teach me how!

LIVE POLLING Q.

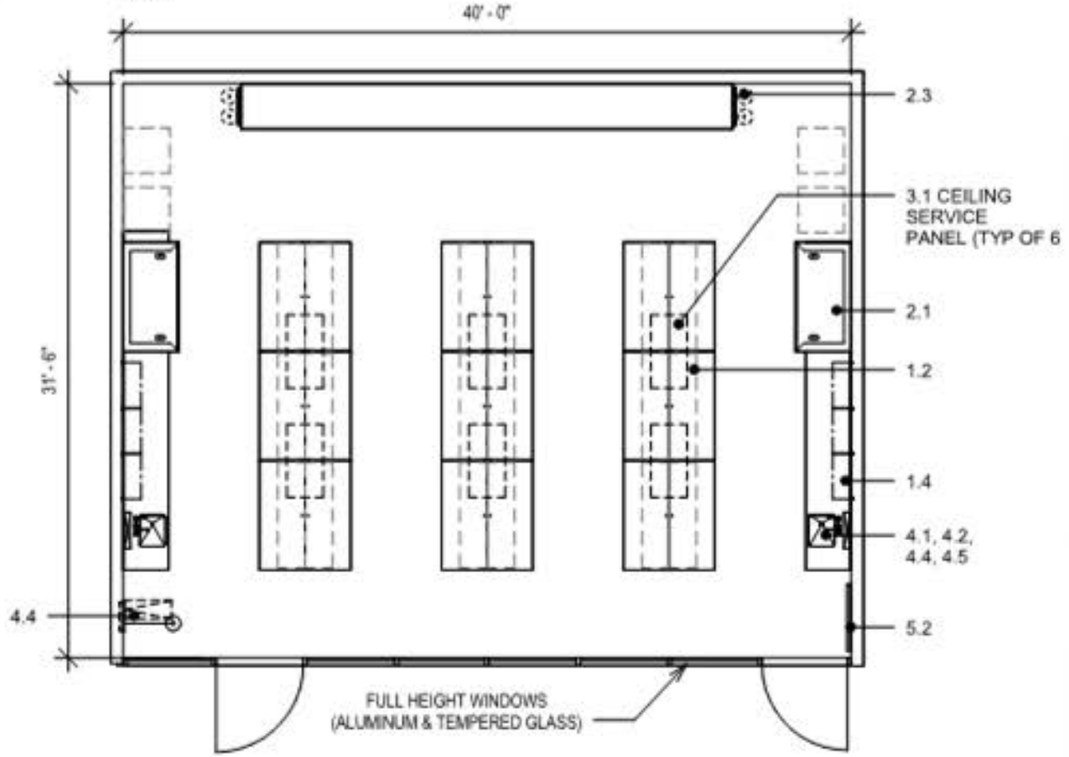
3. Have you heard of Target Value Design?

A. Yes, we use this method all the time
B. Yes, have tried it but not part of the workflow yet
C. Yes, but haven't tried it
D. No, tell me more!


WORKPLACE
24%
SIMULATION
14%
BLDG. SUPPORT
3%
COMMUNITY LIFE
5%
INSTRUCTIONAL SPACES
11%
CONFERENCE
12%
INNOVATION
14%
150,000
GSF


ASU
ARIZONA STATE UNIVERSITY
HEALTH SOLUTIONS INNOVATION CENTER
(ADJACENT TO THE MAYO CLINIC PHOENIX)
Programming and Masterplan Document
October 20, 2017
DLR Group + CO ARCHITECTS

INDEX NUMBER: R2.3
DEPARTMENT: RESEARCH & INNOVATION
SPACE NAME: OPEN WET LAB
STATIONS: 12 MODULES 300SF
AREA: 3600 SF



CASEWORK/STORAGE
1.1 Moveable, Adjustable Height Table - Ptd. Metal
1.2 Mobile Work Bench w/shelving - Ptd. Metal
1.3 Countertop - Epoxy U.N.O.
1.4 Wall-mounted Adjustable Shelving - P.Lam
1.5 Tall Storage Cabinet - Ptd. Metal
1.6 Upper Cabinets - Ptd. Metal
1.7 Base Cabinets - Ptd. Metal
1.8 Knee Opening - Ptd. Metal
1.9 Vented Storage Cabinet - Metal
1.10 Moveable Storage - Ptd. Metal
1.11 Not Used
1.12 Not Used
1.13 Moveable Demonstration Bench - Ptd. Metal
1.14 Steel Storage Rack - Stainless Steel
1.15 Equipment Space/Carts (OFOI)
1.16 UL Listed Chem Storage Cabinet - Ptd. Metal
1.17 Book shelves - Ptd. Metal
1.18 Not Used

LABORATORY EQUIPMENT
2.1 Fume Hood - Ptd. Metal
2.2 Snorkel - Aluminum and Polypro
2.3 Gas Cylinder Restraint - Ptd. Metal
2.4 Biosafety Cabinet - Ptd. Metal, recirculating

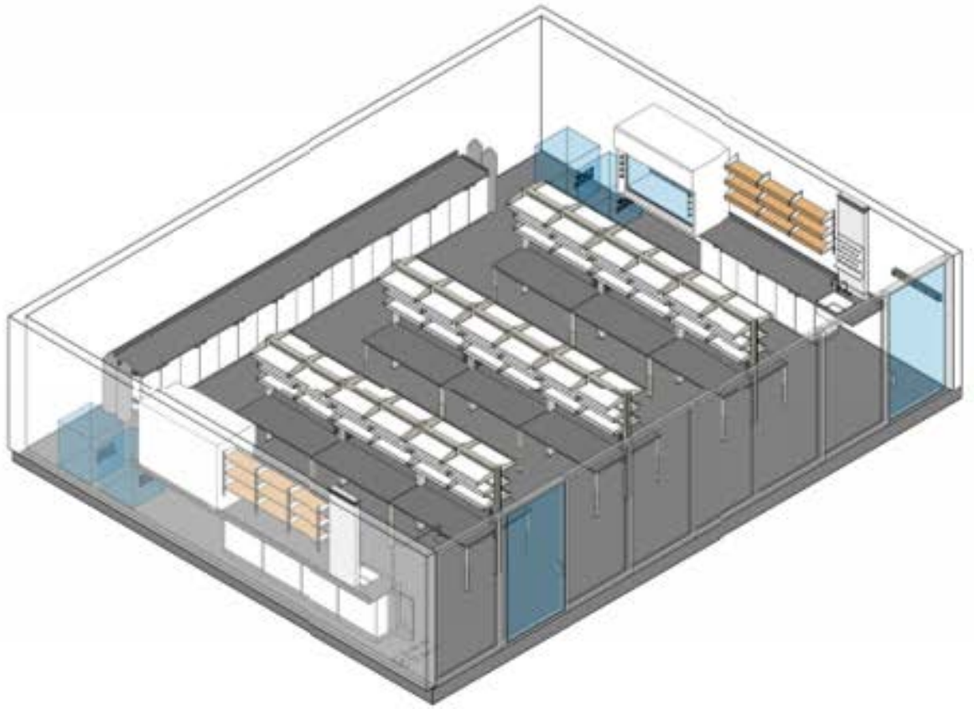
ELECTRICAL/DATA
3.1 Overhead Power and Data
3.2 Video Projector (Ceiling-Mounted)
3.3 Projection Screen (Recessed Drop-down)
3.4 Power and Data Wire Mold - 2 channel alum.
3.4-E Emergency Power Outlet
3.5 Floor Outlets (Power and Data)
3.6 Task Lighting
3.7 Flat Panel Monitor
3.8 Card Reader
3.9 AV Cart

PLUMBING
4.1 Laboratory Sink - Epoxy
4.2 Industrial Hot and Cold Water
4.3 Laboratory Gasses
- Air, Vac, Nat Gas
4.4 Safety Shower/Eyewash - SI, SI
4.5 Pipe Drop Enclosure with Drying rack
4.6 Overhead Service Piping
- Air, Vac, Nat Gas
4.7 Pure Water
4.8 Drench Hose

OTHER
5.1 Marker Board - Glass
5.2 Coat Hooks - SI, SI
5.3 Chalkboard
5.4 Laser Curtains
5.5 Blackout Curtains

FINISHES
Ceilings:
Walls:
Floor:
Windowcovering:

INDEX NUMBER: R2.3A
DEPARTMENT: RESEARCH & INNOVATION
SPACE NAME: OPEN WET LAB
STATIONS: 12 MODULES 300SF
AREA: 3600 SF

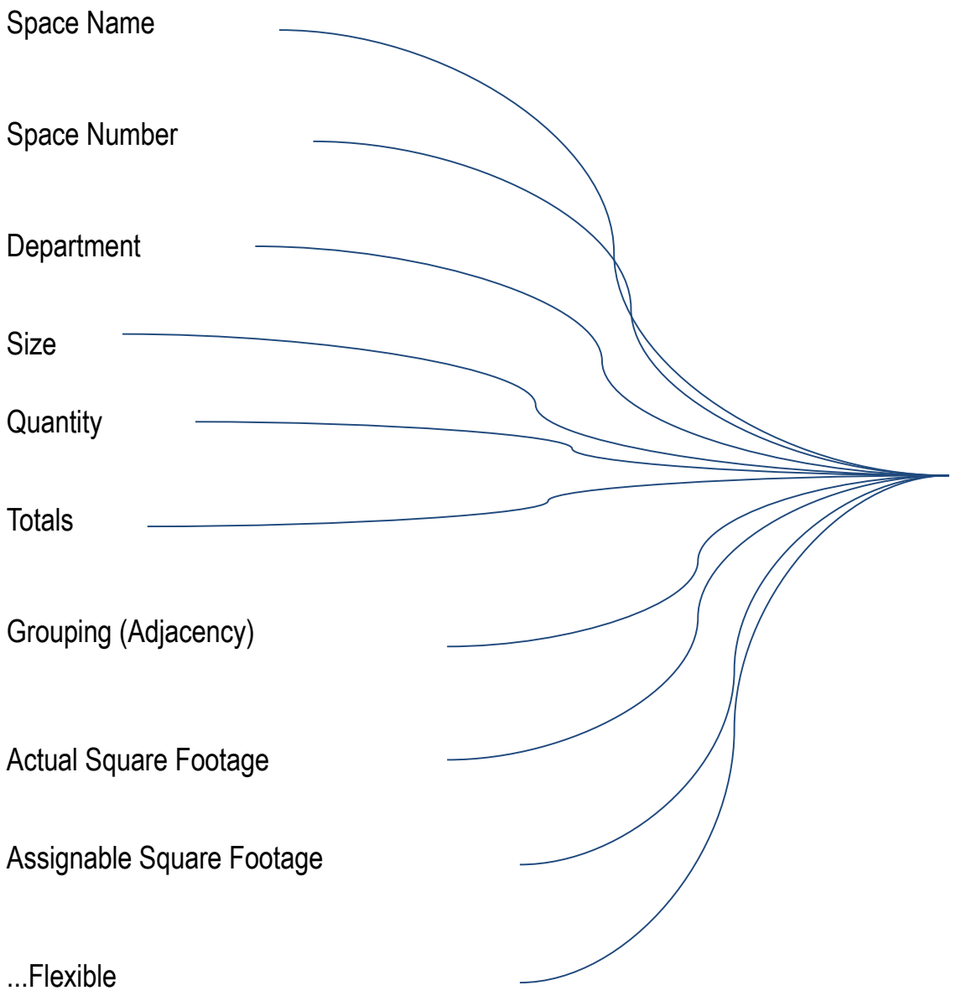


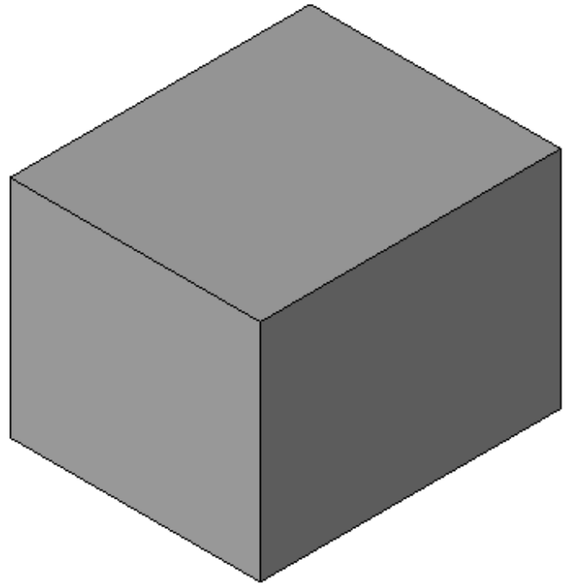
92 pages of
estimate detail –
at programming

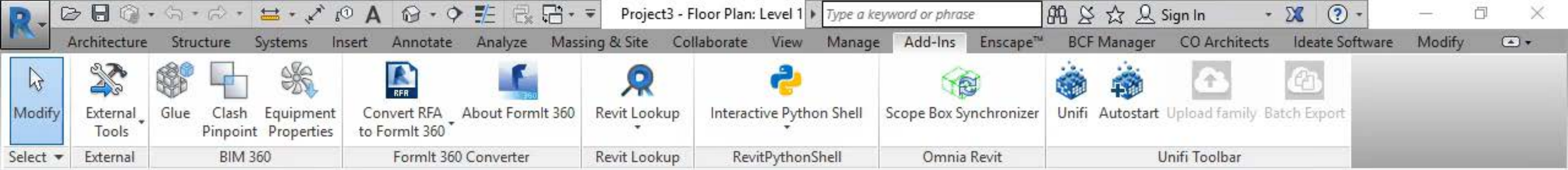
DESCRIPTION	COMMENTS	QUANTITY	UNIT	UNIT COST	TOTAL
Subtotal: Electrical System					**$27,755**
Lighting					
Lighting & Lighting Controls Allowance		3,050	sf	$17.00	$51,850
Subtotal: Lighting					**$51,850**
Low Voltage Systems					
AV Systems / Security / Structured Cabling		-	nic	-	$0
Subtotal: Low Voltage Systems					**$0**
Subtotal: 14-ELECTRICAL					**$79,605**
Subtotal: (none)					**$344,000**
Subtotal: (none)					**$344,000**
Subtotal: BS - Building Support					**$344,000**
CC - Conference Center					
CC - MEP,FP&LV					
CC - MEP,FP&LV					
08-INTERIOR CONSTRUCTION					
Interior Items					
Misc. Accessories		1	ls	$3,500.00	$3,500
Subtotal: Interior Items					**$3,500**
Subtotal: 08-INTERIOR CONSTRUCTION					**$3,500**
11-PLUMBING/PROCESS PIPING					
Plumbing System					
Domestic Cold / Hot Water Return/Supply		10,500	sf	$3.33	$35,000
Sanitary Waste / Vent		10,500	sf	$2.38	$25,000
Plumbing Fixtures Allowance		10,500	sf	$4.00	$42,000
Subtotal: Plumbing System					**$102,000**
Subtotal: 11-PLUMBING/PROCESS PIPING					**$102,000**
12-FIRE PROTECTION					
Fire Protection System					
Fire Protection		10,500	sf	$3.25	$34,125
Subtotal: Fire Protection System					**$34,125**

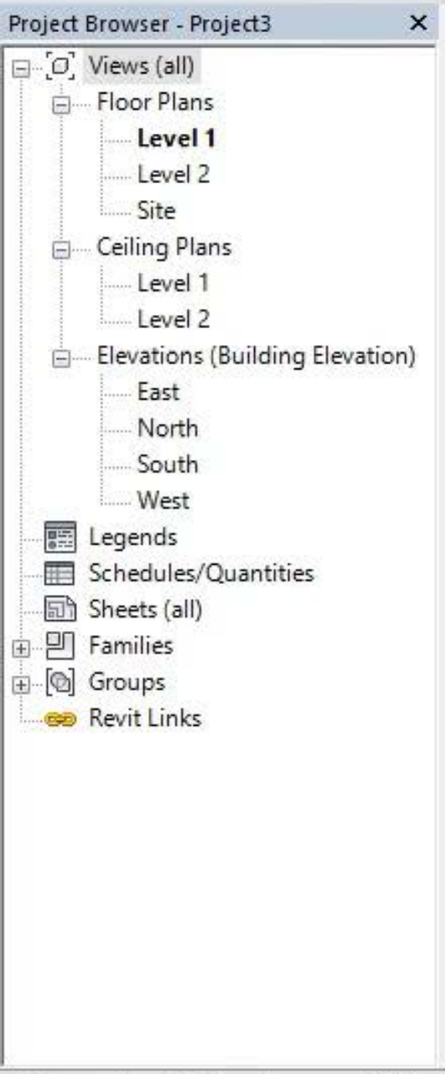
Programming Blocks

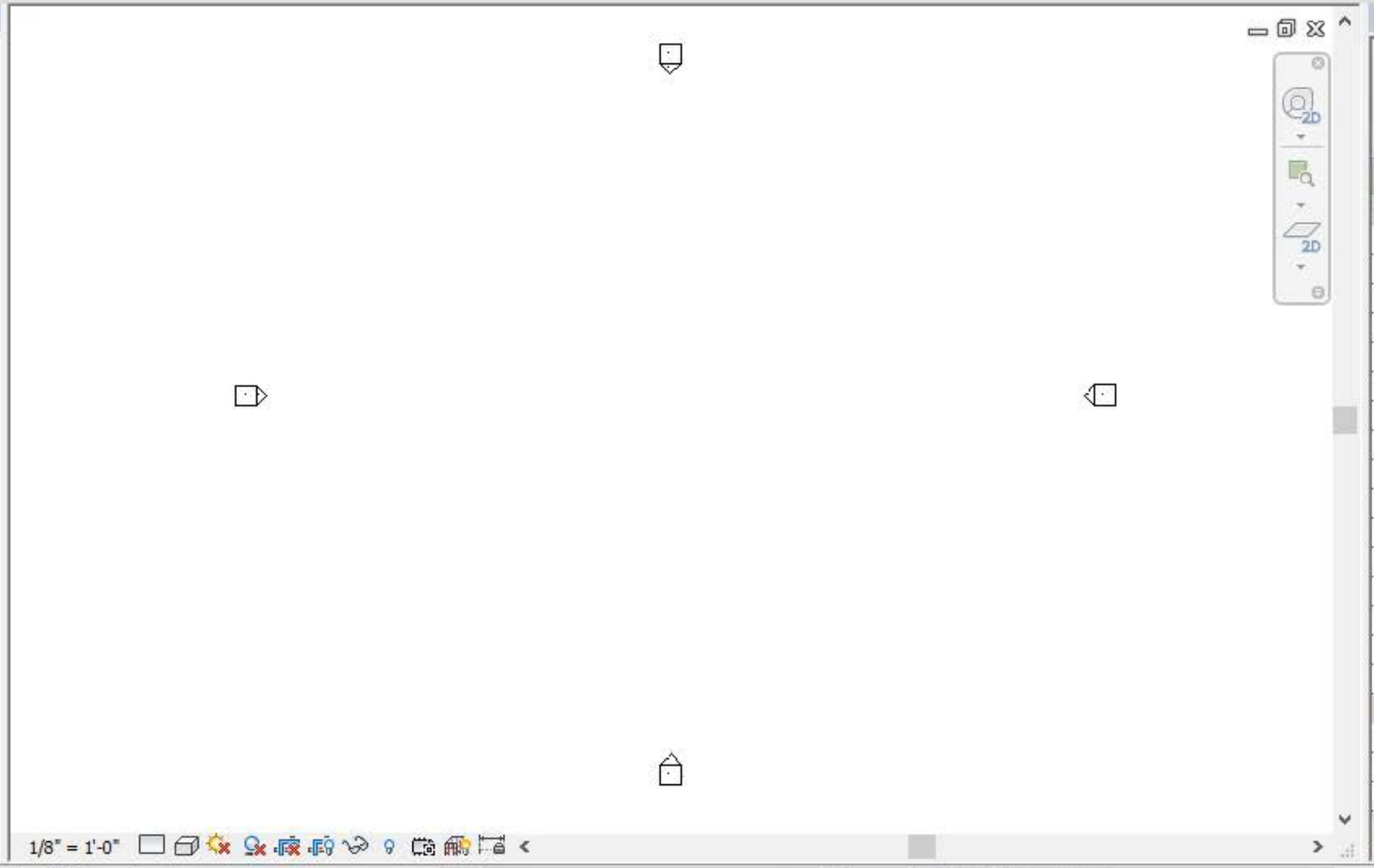
REVIT FAMILY
Generic Model

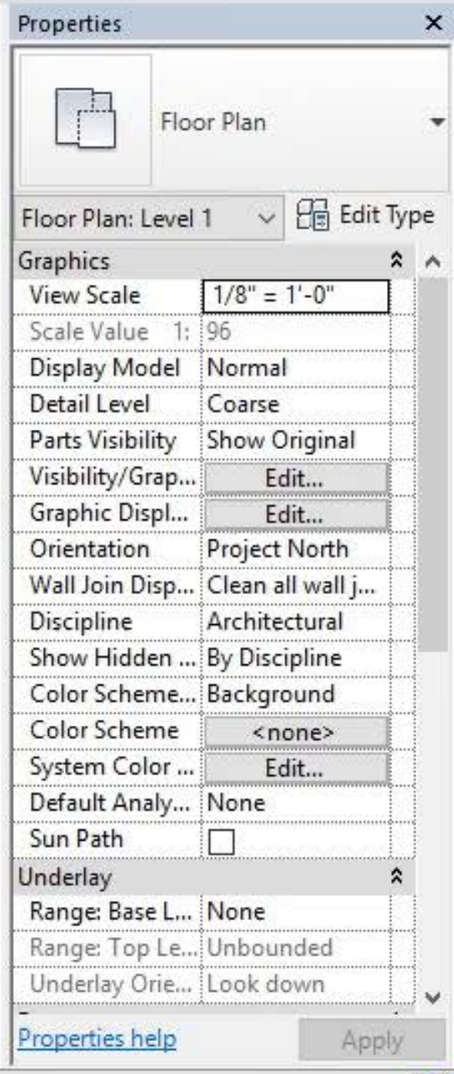





Project3 - Floor Plan: Level 1
Type a keyword or phrase
Sign In
Architecture
Structure
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Enscape™
BCF Manager
CO Architects
Ideate Software
Modify
Modify
External Tools
Glue
Clash Pinpoint
Equipment Properties
Convert RFA to FormIt 360
About FormIt 360
Revit Lookup
Interactive Python Shell
Scope Box Synchronizer
Unifi
Autostart
Upload family
Batch Export
Select
External
BIM 360
FormIt 360 Converter
Revit Lookup
RevitPythonShell
Omnia Revit
Unifi Toolbar


Project Browser - Project3
Views (all)
Floor Plans
Level 1
Level 2
Site
Ceiling Plans
Level 1
Level 2
Elevations (Building Elevation)
East
North
South
West
Legends
Schedules/Quantities
Sheets (all)
Families
Groups
Revit Links


1/8" = 1'-0"


Properties
Floor Plan
Floor Plan: Level 1
Edit Type
Graphics
View Scale
1/8" = 1'-0"
Scale Value 1:
96
Display Model
Normal
Detail Level
Coarse
Parts Visibility
Show Original
Visibility/Grap...
Edit...
Graphic Displ...
Edit...
Orientation
Project North
Wall Join Disp...
Clean all wall j...
Discipline
Architectural
Show Hidden ...
By Discipline
Color Scheme...
Background
Color Scheme
<none>
System Color ...
Edit...
Default Analy...
None
Sun Path
Underlay
Range: Base L...
None
Range: Top Le...
Unbounded
Underlay Orie...
Look down
Properties help
Apply


Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
:0
Main Model

Architecture | Structure | Systems | Insert | Annotate | Analyze | Massing & Site | Collaborate | View | Manage | Add-Ins | Enscape™ | Site Designer | BIM Track™ | CO Architects | BIM One | JOTools | Flux | Hot Gear | Ideate Software | Modify

Modify | Show Mass by View Settings | In-Place Mass | Place Mass | Curtain System | Roof | Wall | Floor | Toposurface | Site Component | Parking Component | Building Pad | Split Surface | Merge Surfaces | Subregion | Property Line | Graded Region | Label Contours

Select | Conceptual Mass | Model by Face | Model Site | Modify Site

Properties

3D View

3D View: EXPLODED AXON PROGRAM Copy 1 | Edit Type

Graphics	
View Scale	3/64" = 1'-0"
Scale Value 1:	256
Detail Level	Medium
Parts Visibility	Show Original
Visibility/Graphics Overrides	Edit...
Graphic Display Options	Edit...
Discipline	Coordination
Show Hidden Lines	By Discipline
Default Analysis Display Style	None
Visible In Option	all
Sun Path	☐
Extents	
Crop View	☐
Crop Region Visible	☐
Annotation Crop	☐

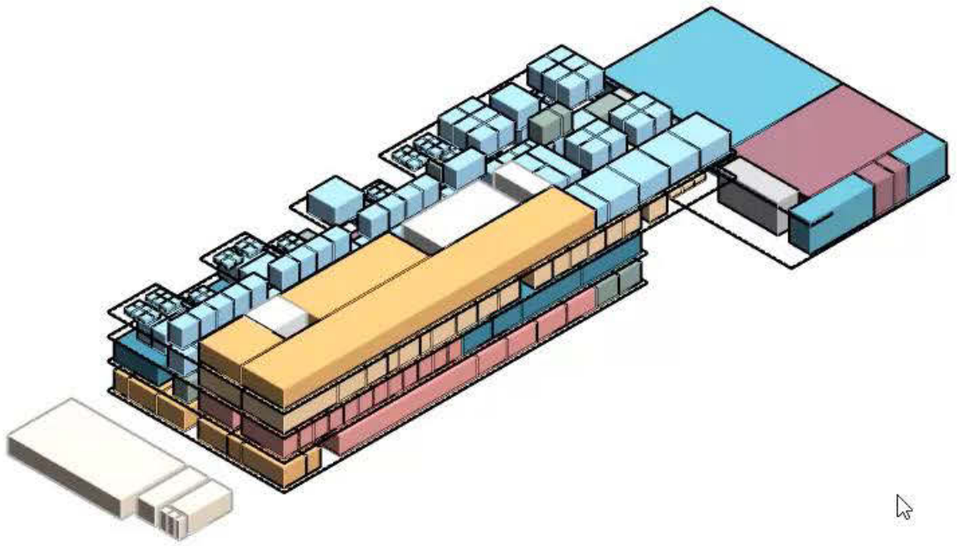
Properties help | Apply

Project Browser - ASU HSIC MASSING SCHEME I_zhangchi907.rvt

- ???
  - 3D View_From Bridge
  - 3D View_From Road
  - 3D View_From Wash
  - 3D View_From Wash_North
  - 3D View_Straight on West
  - 3D View_Straight on West BW
  - 3D View_Straight on West on bridge
  - 3D View_Straight on West on bridge 2
  - 3D View_Straight on West Topo Only
  - 3D View_Through Portal
  - 111
  - Axon_Skin Module
  - EXPLODED AXON PROGRAM
  - EXPLODED AXON PROGRAM - ALT
  - **EXPLODED AXON PROGRAM Copy 1**
  - SPATIAL IDEA
  - {3D - ejchao}
  - {3D - zhangchi907}
- WORKING
  - AXON- SCHEME E

Project Browser - ASU HSIC ... | Manage Flux Connections | BIM Track™

3D View: EXPLODED AXON PROGRAM Copy 1 - ASU HSIC MASSING SCHEME I_zhangchi907.rvt



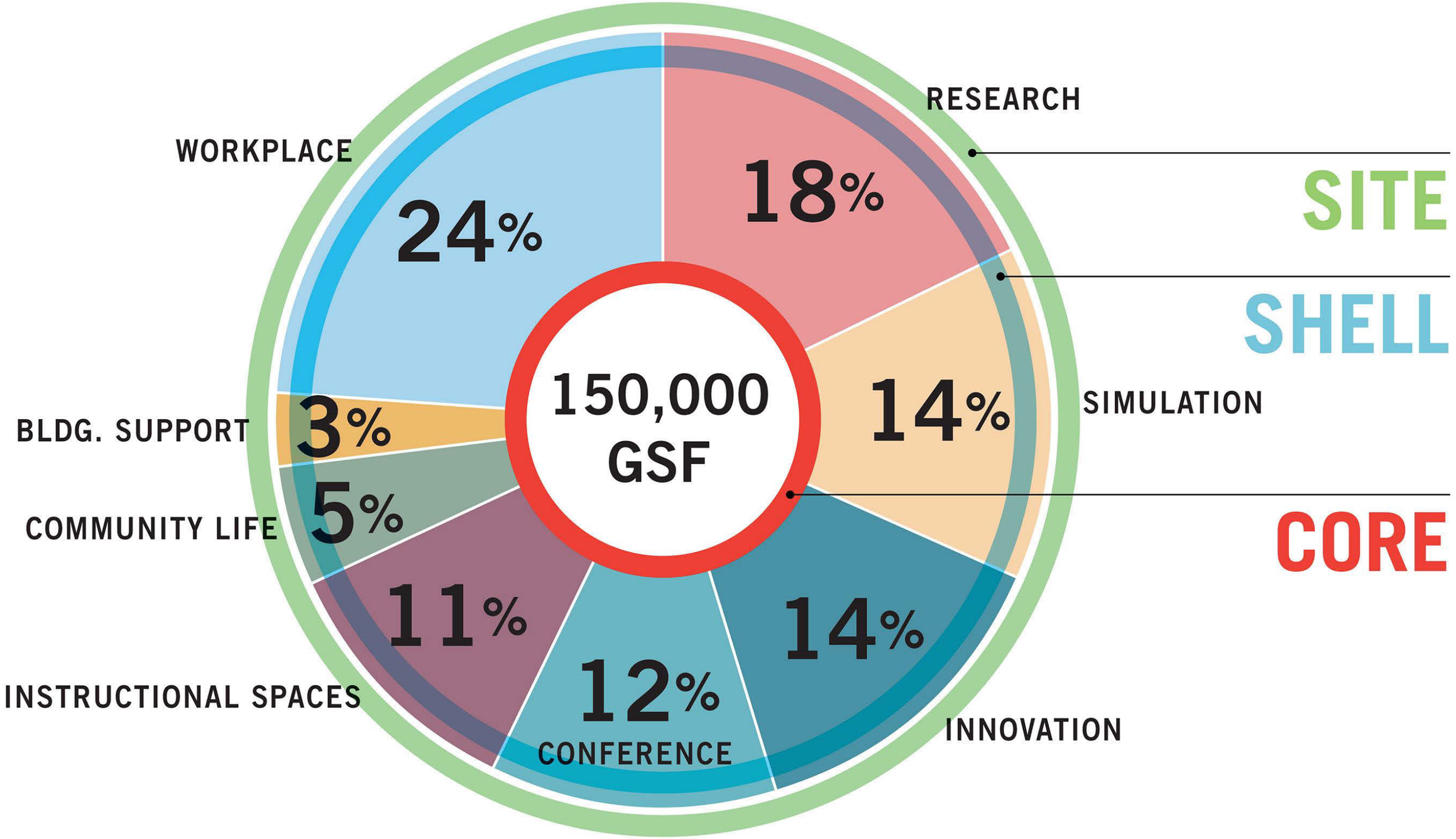
3/64" = 1'-0"

Click to select, TAB for alternates, CTRL adds, SHIFT unselects.

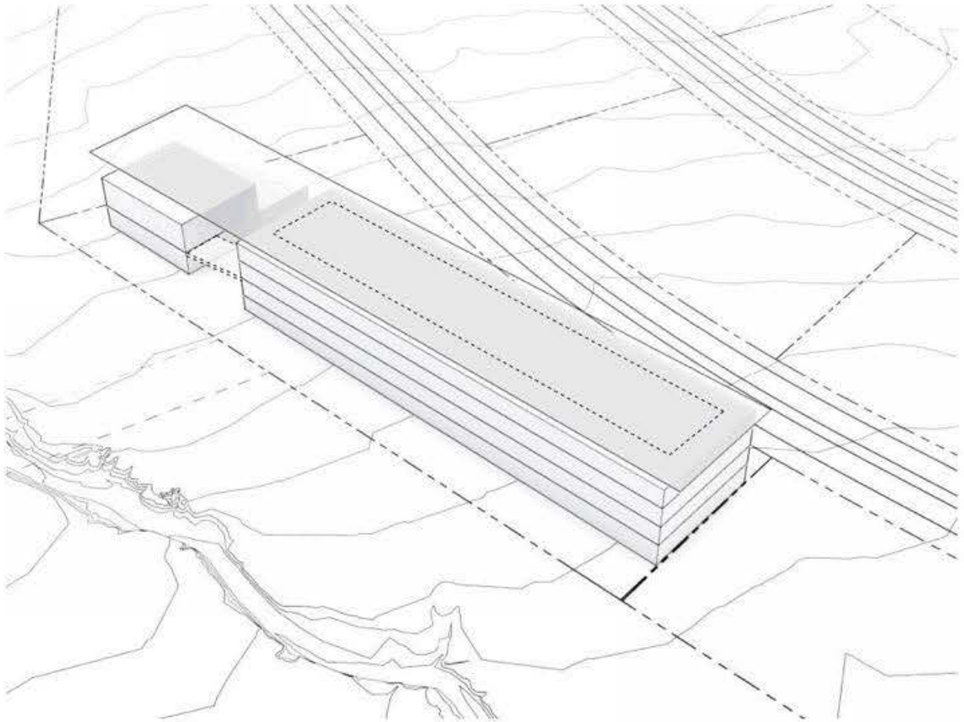
Workset1 (Not Editable) | :0 | 180130_RDS_Research Innovation | Active Only | Editable Only | :0

Room Level Cost Information

BS - Building Support	3,050.00	sf	112.79	344,000	
CC - Conference Center	10,500.00	sf	152.18	1,597,856	
CC - MEP,FP&LV	10,500.00	sf	78.38	823,025	
CC - MEP,FP&LV	10,500.00	sf	78.38	823,025	
CC1 - Conference Center	10,500.00	sf	73.79	774,831	
CC1.1 - 300p Meeting Room	7,500.00	sf	68.67	514,996	75' x 100' room
CC1.2 - Storage	400.00		107.35	42,940	20' x 20' room
CC1.3 - Prefunction/Staging	2,000.00		80.41	160,820	20' x 100' room
CC1.4 - Catering Kitchen	600.00	sf	93.46	56,075	20' x 30' room
CL - Community Life	4,763.00	sf	188.79	899,224	
CL - Circulation Factor	433.00	sf	20.00	8,660	
CL - Circulation Factor	433.00	sf	20.00	8,660	
CL - MEP,FP&LV	4,763.00	sf	88.10	419,616	
CL - MEP,FP&LV	4,763.00	sf	88.10	419,616	
CL1 - Food Service	2,200.00	sf	77.27	169,997	
CL1.1 - Cafe Servery	1,000.00	sf	88.92	88,916	
CL1.2 - Cafe Support	1,000.00	sf	75.08	75,081	
CL1.4 - Vending	200.00	sf	30.00	6,000	
CL2 - Support	2,130.00	sf	141.29	300,950	
CL2.1 - Entry Lobby	500.00	sf	233.59	116,795	25' x 20' room
CL2.2 - Open Lounge	450.00	sf	25.00	11,250	3 rooms @ 150 sf
CL2.3 - 4p Small Group Study	400.00	sf	356.26	142,505	4 rooms @ 100 sf; 13' x 11
CL2.4 - Showers/Lockers	700.00	sf	40.00	28,000	2 rooms @ 350 sf
CL2.5 - Family Room	80.00	sf	30.00	2,400	
Core/Shell	157,133.00	sf	299.88	47,121,712	
Gross Factor	65,996.00	sf	91.37	6,029,980	
IN - Innovation	12,580.00	sf	192.96	2,427,411	
IN - MEP,FP&LV	12,580.00		94.76	1,192,104	
IN - MEP,FP&LV	12,580.00	sf	94.76	1,192,104	
IN1 - Innovation	12,580.00	sf	98.20	1,235,306	
IN1.0 - Accelerator Intermediate Lab	2,400.00		115.14	276,332	2 rooms @ 1200 sf
IN1.1 - Accelerator Concept Lab	4,800.00		123.42	592,408	8 rooms @ 600 sf
IN1.2 - Student Innovation Lab	1,200.00		141.19	169,429	2 rooms @ 600 sf
IN1.3 - Accelerator Shared Lab	600.00		176.90	106,138	
IN1.4 - Accelerator Computation	300.00		30.00	9,000	
IN1.5 - Accelerator Collaboration	1,200.00		25.00	30,000	2 rooms @ 600 sf
IN1.6 - Accelerator Workstations	1,080.00		25.00	27,000	24 stations @ 45 sf
IN1.7 - Accelerator Offices	1,000.00	sf	25.00	25,000	10 rooms @ 100 sf
IS - Instructional Spaces	9,620.00	sf	227.83	2,191,729	
IS - MEP,FP&LV	9,620.00	sf	85.86	825,952	
IS - MEP,FP&LV	9,620.00	sf	85.86	825,952	
IS1 - Learning Studios	5,470.00	sf	125.84	688,353	
IS1.1 - 130p Learning Studio	4,550.00	sf	113.17	514,924	
IS1.2 - Pre-function	600.00	sf	165.29	99,175	30' x 20' room
IS1.3 - Storage - Learning Studio	200.00	sf	195.78	39,156	10' x 20' room
IS1.4 - Control Room - Learning Studio	120.00	sf	292.49	35,099	10' x 12' room
IS2 - Classrooms	3,750.00	sf	160.91	603,424	6 rooms @ 625 sf; 30' x
IS2.1 - 25p Classroom	3,750.00	sf	160.91	603,424	
IS3 - Teaching Kitchen	400.00	sf	185.00	74,000	

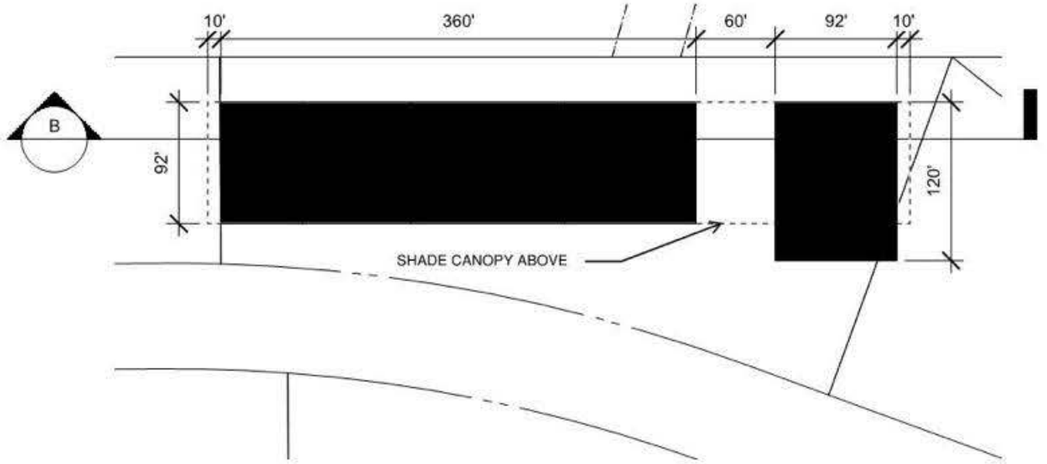

RESEARCH
18%
SITE
SHELL
SIMULATION
14%
CORE
INNOVATION
14%
CONFERENCE
12%
INSTRUCTIONAL SPACES
11%
COMMUNITY LIFE
5%
BLDG. SUPPORT
3%
WORKPLACE
24%
150,000
GSF

OPTION 1
BAR BUILDING 4-STORY

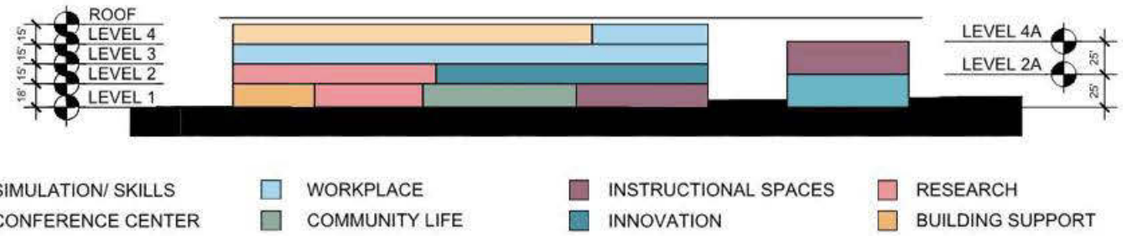


AXONOMETRIC

VERTICAL SURFACE AREA = 79,950 SF
ROOF / TERRACE = 44,160 SF
SHADE CANOPY = 39,120 SF
SOFFIT = 0 SF



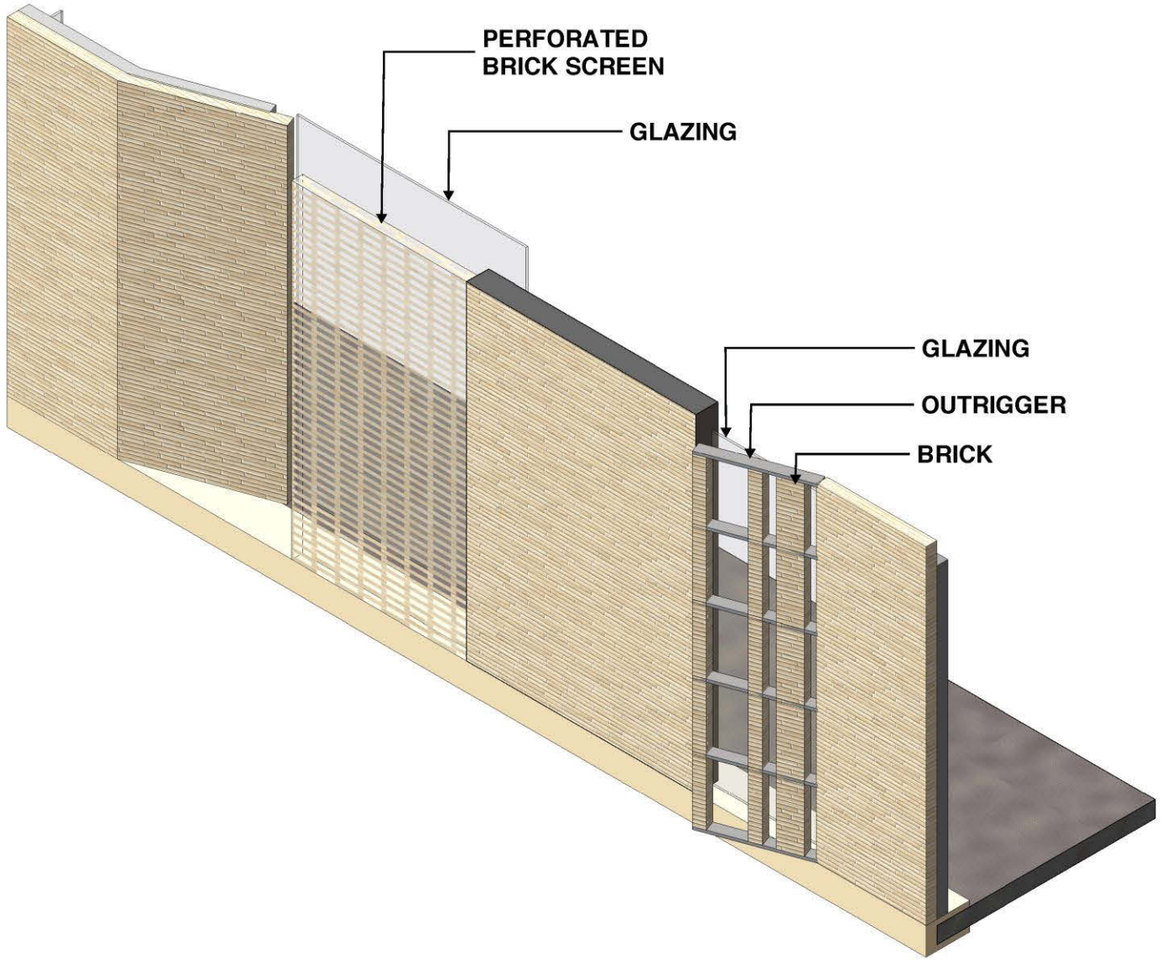
A PLAN
1" = 100'-0"



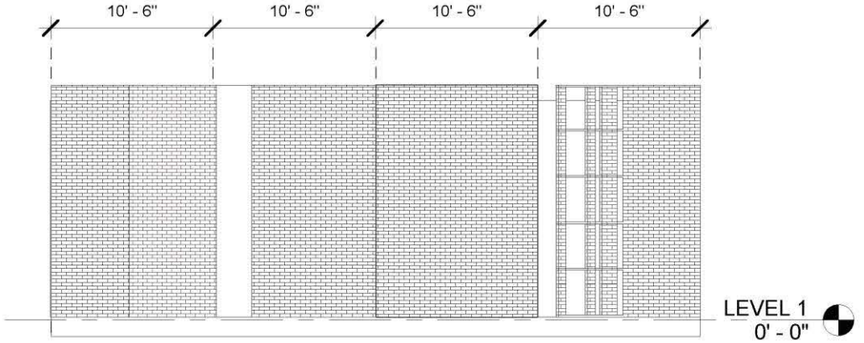
SIMULATION/ SKILLS
CONFERENCE CENTER
WORKPLACE
COMMUNITY LIFE
INSTRUCTIONAL SPACES
INNOVATION
RESEARCH
BUILDING SUPPORT

B SECTION
1" = 100'-0"

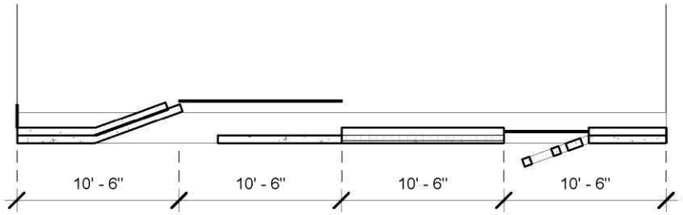
BRICK



1 AXON



2 ELEVATION
1/8" = 1'-0"



EXTERIOR

3 PLAN
1/8" = 1'-0"

	Vertical Envelope	Built Up Roofing	Pedestal Paver Roof	Shade Canopy	Exterior Soffit
DPR Estimate	124,260	82,610	18,500	19,200	57,250
Option 1	79,950	39,560	4,600	39,120	-
Option 2	80,244	50,400	17,340	-	39,600
Option 3	84,798	57,600	-	10,800	9,450
Option 4	103,587	42,740	4,600	7,200	3,600
Option 5A	84,098	29,750	17,480	-	8,036
Option 5B	74,716	39,100	17,480	-	8,917
Option 6A	60,255	50,050	-	-	-
Option 6B	64,584	49,680	-	-	-
Option 7	73,500	37,536	-	-	-
Option 8	68,333	31,200	23,060	-	-

RECTANGULAR
MASS STUDY
(11/28/17)

ASU HSIC - Schemes Comparison - Core/Shell Isolated Costs

1/22/2018

Core/Shell Costs Only	12/11/17 "SkySong" Model Mass 6A		Scheme E		Scheme G		Scheme H		Scheme I	
		cost/sf		cost/sf		cost/sf		cost/sf		cost/sf
03 Foundations	$488,780	$3.26	$583,280	$3.89	$442,790	$2.95	$689,930	$4.60	$518,750	$3.46
04 Substructure	$642,390	$4.28	$689,640	$4.60	$619,395	$4.13	$742,965	$4.95	$657,375	$4.38
05 Superstructure	$5,214,679	$34.76	$6,098,747	$40.66	$6,243,147	$41.62	$6,113,780	$40.76	$5,971,242	$39.81
06 Exterior Skin	$3,916,863	$26.11	$6,885,070	$45.90	$7,303,520	$48.69	$7,588,770	$50.59	$7,434,370	$49.56
07 Roofing	$1,017,882	$6.79	$1,354,583	$9.03	$1,070,975	$7.14	$2,021,483	$13.48	$1,233,153	$8.22
08 Interior Construction	$154,800	$1.03	$453,550	$3.02	$426,175	$2.84	$688,050	$4.59	$783,600	$5.22
09 Conveying	$694,100	$4.63	$694,100	$4.63	$814,100	$5.43	$694,100	$4.63	$739,100	$4.93
10 Special Construction	$7,500	$0.05	$7,500	$0.05	$7,500	$0.05	$7,500	$0.05	$7,500	$0.05
11 Plumbing/Process Piping	$1,163,471	$7.76	$1,163,471	$7.76	$1,163,471	$7.76	$1,163,471	$7.76	$1,163,471	$7.76
12 Fire Protection	$0	$0.00	$14,400	$0.10	$6,000	$0.04	$14,400	$0.10	$14,400	$0.10
13 Mechanical	$2,250,000	$15.00	$2,250,000	$15.00	$2,250,000	$15.00	$2,250,000	$15.00	$2,250,000	$15.00
14 Electrical	$1,545,000	$10.30	$1,545,000	$10.30	$1,545,000	$10.30	$1,545,000	$10.30	$1,545,000	$10.30
15 Jobsite Management	$1,863,883	$12.43	$1,863,883	$12.43	$1,863,883	$12.43	$1,863,883	$12.43	$1,863,883	$12.43
16 Project Requirements	$378,472	$2.52	$378,472	$2.52	$378,472	$2.52	$378,472	$2.52	$378,472	$2.52
	$19,337,820	$128.92	$23,981,696	$159.88	$24,134,428	$160.90	$25,761,803	$171.75	$24,560,316	$163.74
5% Construction Contingency	$966,891	$6.45	$1,199,085	$7.99	$1,206,721	$8.04	$1,288,090	$8.59	$1,228,016	$8.19
Payment & Performance Bond	$203,047	$1.35	$251,808	$1.68	$253,411	$1.69	$270,499	$1.80	$257,883	$1.72
SDI Insurance	$205,078	$1.37	$254,326	$1.70	$255,946	$1.71	$273,204	$1.82	$260,462	$1.74
Builders Risk	$57,996	$0.39	$71,923	$0.48	$72,381	$0.48	$77,262	$0.52	$73,659	$0.49
Contractors Liability	$197,323	$1.32	$244,709	$1.63	$246,267	$1.64	$262,873	$1.75	$250,613	$1.67
Fee	$1,037,924	$6.92	$1,287,176	$8.58	$1,295,373	$8.64	$1,382,720	$9.22	$1,318,232	$8.79
Sales Tax	$1,232,340	$8.22	$1,528,280	$10.19	$1,538,014	$10.25	$1,641,721	$10.94	$1,565,154	$10.43
	$23,238,419	$154.92	$28,819,003	$192.13	$29,002,542	$193.35	$30,958,173	$206.39	$29,514,335	$196.76
Cost Delta			$ 5,580,584	$ 37.20	$ 5,764,123	$ 38.43	$ 7,719,754	$ 51.47	$ 6,275,916	$ 41.84
Exterior Envelope Qty Delta	60,200 VSF		69,520 VSF		64,082 VSF		68,200 VSF		64,700 VSF	
Soffits Qty Delta	0 SF		3,600 SF		1,500 SF		3,600 SF		3,800 SF	

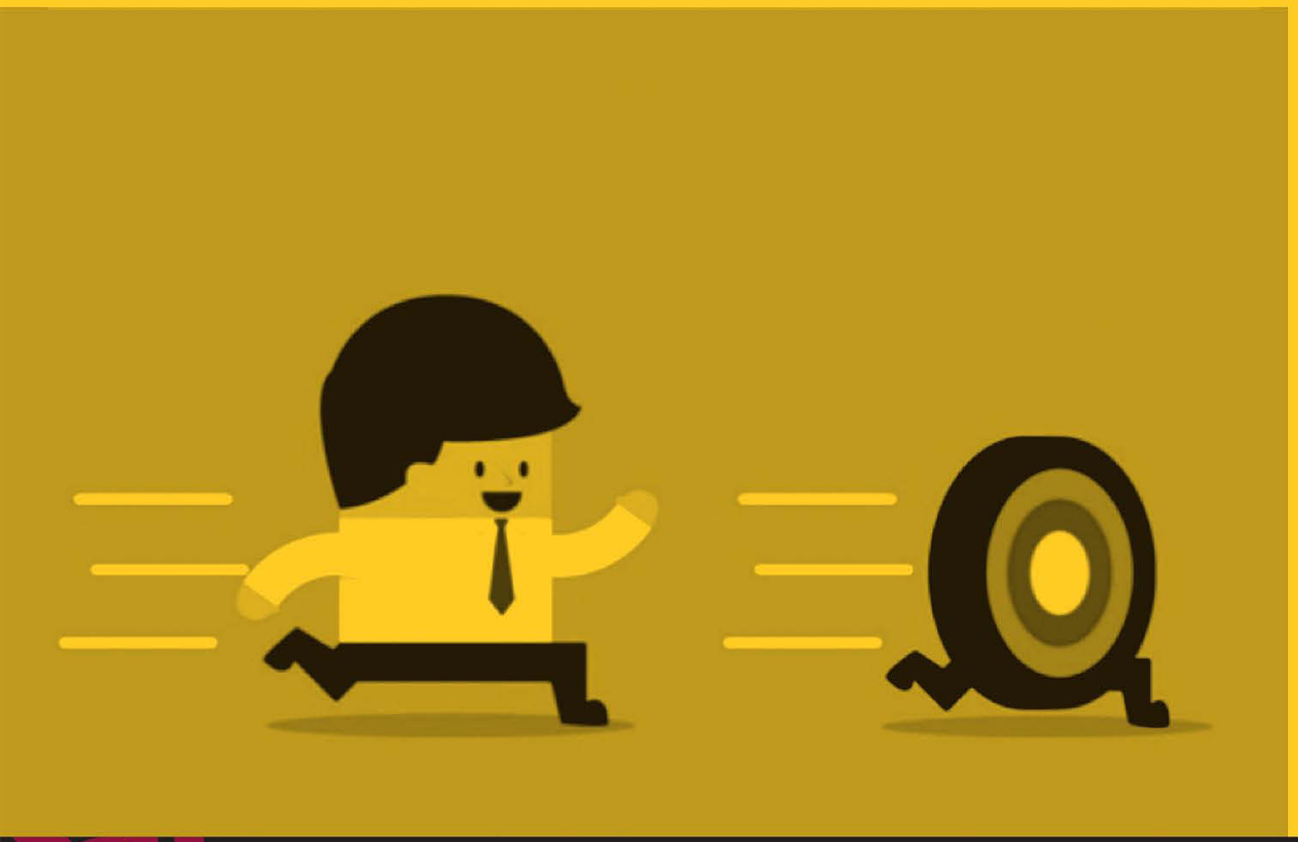
Clarifications:

1. Each Scheme is based on 150,000 GSF. (Reduction from 157, 133 taken from grossing factor)
2. Each scheme has updated structure size/articulation and façade scope and cost included
3. The stone shown in these scenarios is included as a local, handset stone.
4. Scenarios above are isolated building core/shell costs only for this study. (Sitework/TI not included)
5. Structure is a 9" Post tension concrete structure with 8" drop heads, in accordance with reduced scope estimate dated 12/11/17
6. MEPF and Elevator core/shell costs that are included are consistent with the reduced scope estimate dated 12/11/17
7. AV/IT/Structured cabling is not included. Only raceways are included

BENCHMARKED COST MODEL	PROGRAM DRAFT – TEST OF SPACES	MULTIPLE MASSING OPTIONS	SCHEMATIC DESIGN	DESIGN DEVELOPMENT – BUILDING GMP	
$15 M	$15.4 M	$0 M	$.5 M	$.6 M	
25%	26%	0%	< 1%	1%	

TANNER SUMMARY SLIDE

Keeping Track of Your Targets



Design Evolution Logs

ASU - HSIC - Building
Design Evolution Log - System Breakdown - With Mark-ups
Date of Last Revision: 11/16/2018
Based on GMP Estimate

Item #	Description	Cost Estimate	Date Decision Made	Status	Accepted	Pending	Rejected	Design Schedule Date Needed	Comments
01.1	Add cost for above grade courtyard canopy structure at the courtyard	$ -		Rejected	$ -	$ -	$ -	11/12/18	
01.2	Add cost for below grade courtyard canopy foundations/Embeds/Raceways	$ 75,000.00		Accepted	$ 75,000.00	$ -	$ -	11/12/18	
02	Provide sealed concrete ILO VCT in Research labs (see note)	$ (20,628.00)	11/1/2018	Rejected	$ -	$ -	$ (20,628.00)	11/12/18	Small flex labs (4); Medium Flex labs (2) & Lab Support areas; Excluded - Tissue culture labs + Open Wet Lab + Autoclave area
03	Delete 15 megaohm central DI water system to wet lab sinks and install just RO water at wet lab sinks	$ -	11/1/2018	Rejected	$ -	$ -	$ -	11/12/18	
04	Increased generator size for back-up power from 250 kW to 400 kW	$ 54,600.00	11/1/2018	Rejected	$ -	$ -	$ 54,600.00	11/12/18	
05.1	Change Auditorium Fixed seating to OFOI	$ (360,886.50)		Pending	$ -	$ (360,886.50)	$ -	11/12/18	
05.2	Install Sedia Mercury Chairs ILO estimated in Auditorium	$ (139,347.00)	11/15/2018	Rejected	$ -	$ -	$ (139,347.00)	11/12/18	
05.3	Install Dauphin Chairs ILO estimated in Auditorium	$ -		Pending	$ -	$ -	$ -	11/12/18	
06	Change Trash Compactors (2) each to OFOI	$ (107,640.00)		Pending	$ -	$ (107,640.00)	$ -	11/12/18	
07	Add PV/Solar Installation - COST PROVIDED BY MM	$ 565,500.00	11/1/2018	Rejected	$ -	$ -	$ 565,500.00	11/12/18	Owner provided cost for 145 KW DC
08	Add for secondary Containment of oil from APS transformer	$ 33,552.00		Pending	$ -	$ 33,552.00	$ -	11/12/18	DFDG to submit a variance to get approval
09	Utilize PVC DWV (ASU Rqmt-DWV SCH 80 is NOT AVAILABLE) Pipe & Fitgs. For the std. PVC DWV UG sanitary sewer system in lieu of Cast-Iron	$ (46,800.00)	11/15/2018	Rejected	$ -	$ -	$ (46,800.00)	11/12/18	DFDG to review with AEI and submit variance as needed.
10	Add ROM cost for CUP	$ 1,500,000.00	11/1/2018	Rejected	$ -	$ -	$ 1,500,000.00	11/12/18	Per MM's email dated 7/26/2018
11.1	Change 2' 6" x 6' 0" Epoxy Top Moveable tables w/ 3-tier wall shelf to OFOI in **ONE** Small Flex Lab (Level 1)	$ (7,862.40)		Pending	$ -	$ (7,862.40)	$ -	12/12/18	
11.2	Change 2' 6" x 6' 0" Epoxy Top Moveable tables w/ 3-tier wall shelf to OFOI in **TWO** Small Flex Labs (Level 1)	$ (15,724.80)		Pending	$ -	$ (15,724.80)	$ -	12/12/18	

HEALTH FUTURES CENTER

2019 SCUP CONFERENCE

HEALTH FUTURES CENTER

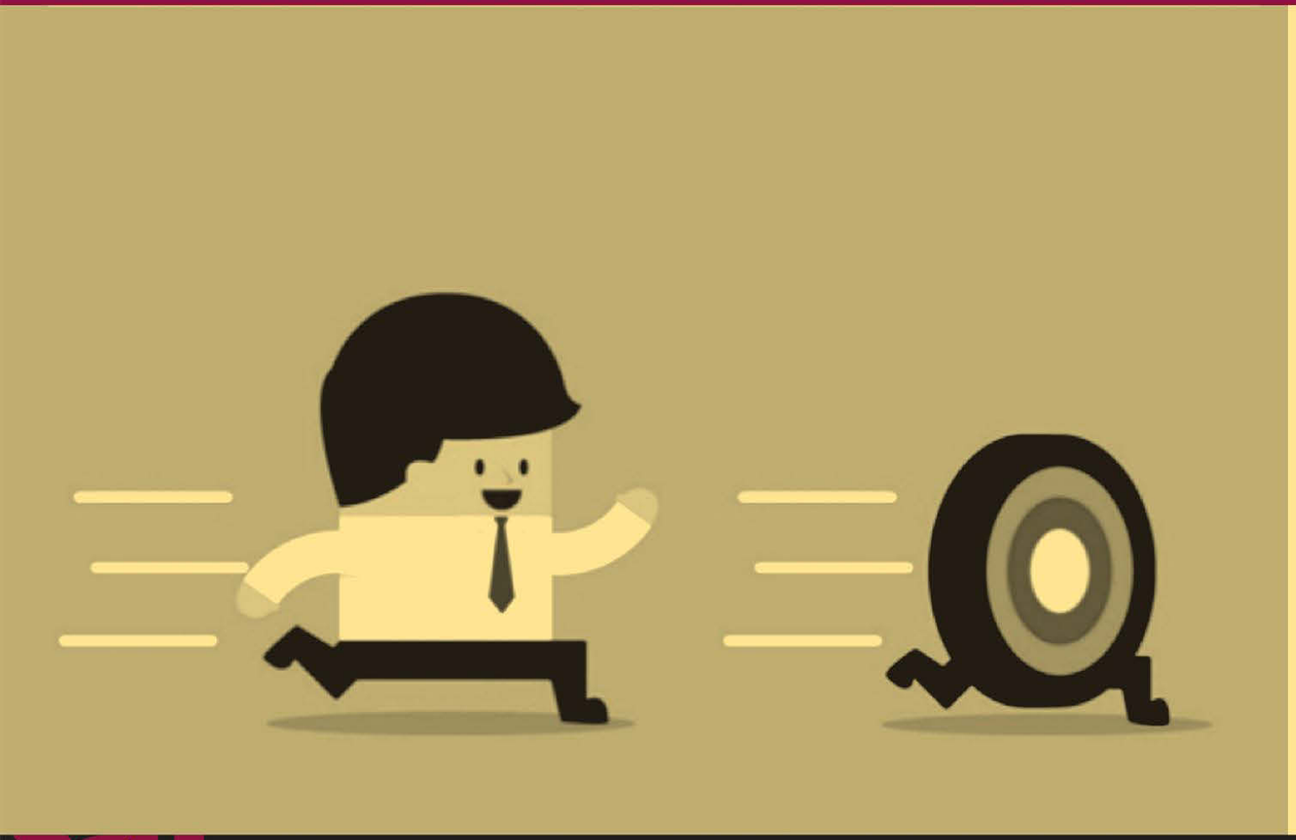
2019 SCUP CONFERENCE

Agenda

ASU: Institution + Vision
HFC: Project Background
Process: Disruption
Cost Modeling & Estimating Tools
Lessons Learned

Lessons Learned

1. **Uncover Cost Constraints Early**
2. **Acknowledge the Duration of Effort To make Informed Decisions**
3. **Establish Target Costs for Project Scopes Collaboratively**
4. **Once Target is Established – IT DOES NOT MOVE**



Questions?

Keeping Facilites Projects Within Budget

Health Futures Center

Arizona State University

2019 SCUP CONFERENCE

ASU DPR CONSTRUCTION CO ARCHITECTS