

RISE

UC BERKELEY / UNIVERSITY OF DENVER

University of California, Berkeley / University of Denver
U.S. Department of Energy Solar Decathlon 2017
Jury Narrative Submission
August 10, 2017

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Market Potential Narrative

Getting to Know a Community

When building a home, it is important to know what the inhabitant will actually benefit from, not what the builder thinks the market needs. Further, it is vital to know what the community and society as a whole want and need. Essentially, one must design for a specific inhabitant while keeping in mind the trajectory of the city. This was the constant mindset of our team constructing the RISE home, and we started delving into ways to truly understand who we were building for before even setting a pen to paper to begin the design of our house.

Richmond, California is a neighboring city of UC Berkeley that not only faces the challenges that are representative of those faced by the San Francisco Bay Area as a whole, but also some that have arisen throughout the city's rich and unique history. It is the perfect setting for a home characteristic of our region that also presented us with the opportunity to make our Solar Decathlon 2017 entry about more than the competition - we want to build a home for real people in a special community in a way that serves them well.

In our journey towards a deep understanding of this city's housing needs, we decided to start with an overview by meeting with the Mayor's Office and listening to their thoughts. Further, once we had started developing our design, we spent multiple evenings presenting it to

each of five neighborhood councils and receiving feedback from them. In an effort to hear from as many people as possible and truly delve into the community, we also started a weekly program within the engineering academy at Richmond High School where our team members walked students through their own home design processes, learning from their mindsets and design priorities along the way.

Understanding the Reality

America's cities, coast to coast, are experiencing the housing crisis as demand grows and supplies dwindle. The San Francisco Bay Area is no exception to this phenomenon which is particularly exacerbated in the region due to the startup and tech boom that has drawn a huge amount of people in to live in the area. The Bay Area added close to 500,000 new jobs over the last decade, yet only 54,000 new housing units were constructed during this period.¹ Richmond, traditionally a suburb of San Francisco, has been hit particularly hard, and in Mayor Tom Butt's words:

"A mix of challenging economics and a lack of a concerted effort to address housing needs have left us in a crisis. The availability and affordability of housing throughout the San Francisco Bay Area is a major challenge that is threatening the region's economic health, exacerbating the requirement for

¹ Mayor's Housing Strategy, City of Richmond, Version 1.0

many people to endure long commutes to work and thwarting sustainability and greenhouse gas reduction efforts.”²

In short, Richmond needs more housing, and according to their housing plan³ it needs this particularly in and around the city’s key activity centers in urban “infill” lots that are often tight, inconvenient, empty or dilapidated spaces between existing buildings. Constructing new housing in such spaces not only revives them, but it also helps provide more constituents access to amenities such as public transportation and parks which help achieve a better community and quality of life. Moving to higher density city-centers is one of the indicators that Richmond is transitioning out of its role as a San Francisco suburb and more into an urban setting of its own.

Home to an oil refinery, air quality is also a truly current issue in Richmond, with a report of high levels of toxic fumes that were measured near the facility occurring just in the beginning of 2017.⁴ Additionally, when talking to residents at the Richmond Community Council Meeting, we received some insight that we were not expecting. Here, we both learned of and were able to implement a suggestion for ensuring safety in our design, particularly regarding the security of the glass doors. This is a direct indicator of the relatively high crime rates that this city has been working to address.

² Tom Butt, Mayor of Richmond

³ Richmond General Plan 2030

RISE-ing to the Occasion II Addressing a Local and National Crisis

In the same address as mentioned above, the mayor also stated that “Richmond, as a pivotal city in the Inner Bay Area, needs to work hard to address housing needs and set an example for cities across the state.” We decided that we wanted to use this competition as an opportunity to serve our neighboring city by doing just that. The RISE home models an achievable solution to the growing housing crisis in the San Francisco Bay Area. The comfort of a transformable interior living space is balanced by an inclusive 816 sf front porch. Our thoughtful holistic design is a modular concept that is specifically built to be able to be stacked on infill lots and commercial concrete structures. The RISE standalone unit for the competition provides a home, yet our concept offers a solution to the national housing crisis with a high-density design while satisfying the need for energy efficiency, affordability, and sustainability.

The letters of our project name, RISE, are indicative of our approach:

⁴ <https://ww2.kqed.org/news/2017/01/06/air-district-says-chevron-refinery-in-richmond-probably-caused-mysterious-s-f-odors/>

Residential Solution - This is the core of our design. We designed our home specifically for tight infill lots that are hard to build on. In fact, for our initial design we chose a number of real lots in Richmond and picked the one with the “toughest” long-and-skinny dimensions and constrained our home to have to fit onto that. Our moss wall on the North facade helps combat the air quality problem, and the large deck areas allow for the open feel of a suburban outdoor area within a denser city-like building complex.

Inviting - The RISE home is inviting and interactive, allowing residents to transform the space to one’s personal needs. Our moveable wall system allows for the customization of personal space and the opportunity to literally open your home up to family and friends. The walls that frame the two bedrooms in the RISE home may be moved outward to allow for greater shared space. Our high-ceilings and large front glass doors seamlessly coalesce the indoor and outdoor spaces.

Stackable - Rather than going the traditional Solar Decathlon route of a single-family suburban home, our team is constructing the penthouse unit of a five unit, three story multi-family complex made of our modules. This allows for a more realistic setup of placing more than one home onto one infill lot, and also creates a customizable aspect to the design as the number of units can be adjusted based on the needs of the intended residents. **Efficient** - As noted above, the lack in availability and

affordability in housing is thwarting the City of Richmond’s efforts towards sustainability. Building multi-family, affordable housing that is sustainable is a tough task, yet RISE addresses this need by approaching every aspect of the house with a mindset of efficiency. Energy efficiency is at the forefront of this, and we stretched the concept of creating a low-energy net-zero home further to use extra energy that our panels produce to power up to 3 units within the multi-family concept. However, this is only one aspect of efficiency in the RISE home. We achieve water efficiency with our greywater reuse system, low-flow fixtures, and minimal piping confined to one planned-out direct line between units, which also helps residents save money on water, a precious commodity in California. Also, our multi-point locking feature on the front glass doors not only serves a dual purpose by providing that extra security that the citizens themselves wanted, but seals up the glazing to provide higher thermal efficiency. By implementing simple adjustments that can render a multi-family home sustainable, we are able to keep our costs down yet move the affordable multifamily housing sector in a more sustainable direction.

A Solution for More than One Location

The housing crisis is no doubt a national concern; the RISE team has modeled a home that we know is a viable solution nationwide, yet has been specifically designed to meet the needs of the booming Richmond community in the San Francisco Bay Area. Priced at approximately \$200,000 to construct in Richmond, this home as a single unit is less expensive than 72% of those currently in the city.⁵ However, although this price point is still significant, what increases the affordability of this home is that five units can fit onto a single lot that traditionally would host one home. Given that Richmond has a median home value of \$408,200, if property cost is assumed to be \$200,000, five RISE units would cost about 1.2 million, whereas five equivalent single homes on separate lots would be upwards of 2 million dollars. The RISE home's stacked design with the large open roof-deck spaces allows for prices to be driven down due to density without losing that

open feel of a neighborhood home that residents both desire and need to build community.

This phenomenon can be applied to various markets facing a growing housing crisis as a high-density sustainable housing solution. As RISE is a partnership between the University of California, Berkeley and the University of Denver, it has been of interest to note that this concept, although tailored to Richmond, could theoretically also be implemented in Denver, a city that is experiencing huge influx of new inhabitants and therefore increased density of living.



Our house is about \$ 184.92 /sqft

Source - <http://www.estately.com/bay-area-home-affordability-transit-stop>

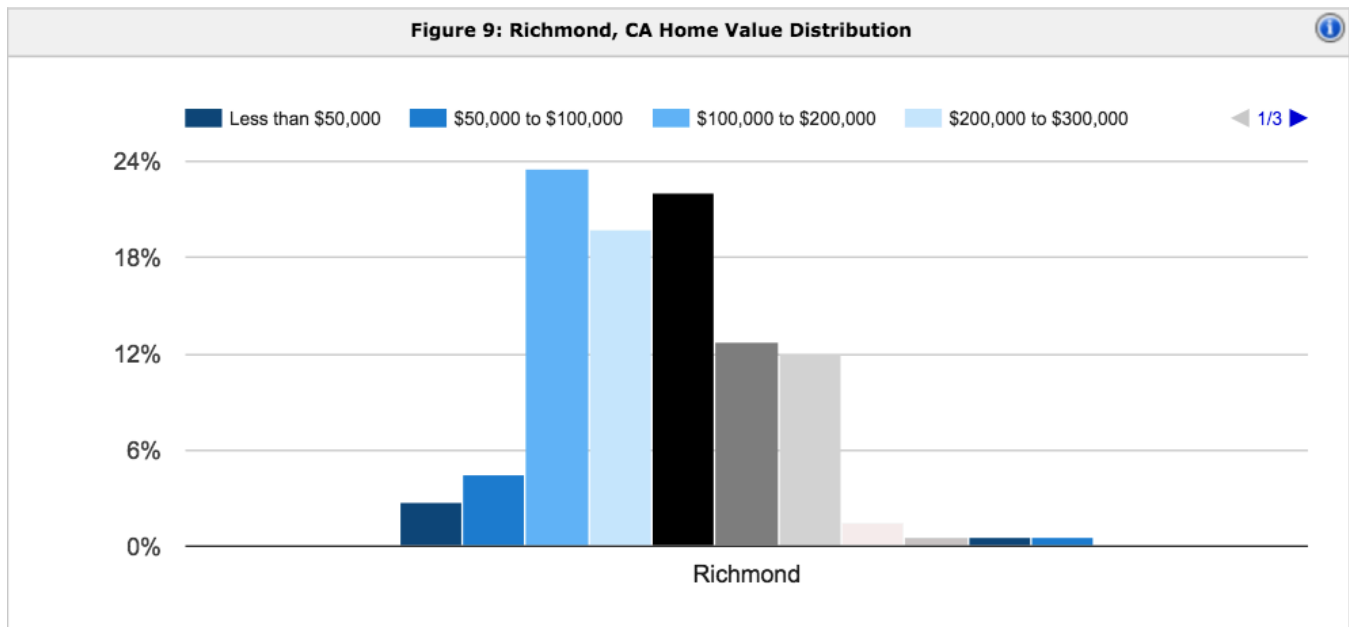
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<http://www.towncharts.com/California/Housing/Richmond-city-CA-Housing-data.html>

Creating a Lasting Impact

Being able to build a concept for Richmond is one thing, but this concept was truly affirmed as a viable solution through our partnership with the Richmond Community Foundation. Further emphasizing our commitment to a practical design solution that pervades ALL aspects of our project, this organization wants to place our home onto a plot of land in Richmond through their established Housing Renovation

Program. This one-of-a-kind program was initiated in 2015 to address blighted residential properties.⁶ “Zombie properties” are acquired, rehabilitated and sold at a reduced rate to first-time homebuyers who have participated in SparkPoint, which is a financial counseling program for low-income individuals in the Richmond area. Our home has the exciting opportunity to be more than a concept or model - it will be lived in at 390 S 34th St., Richmond, CA after the competition.

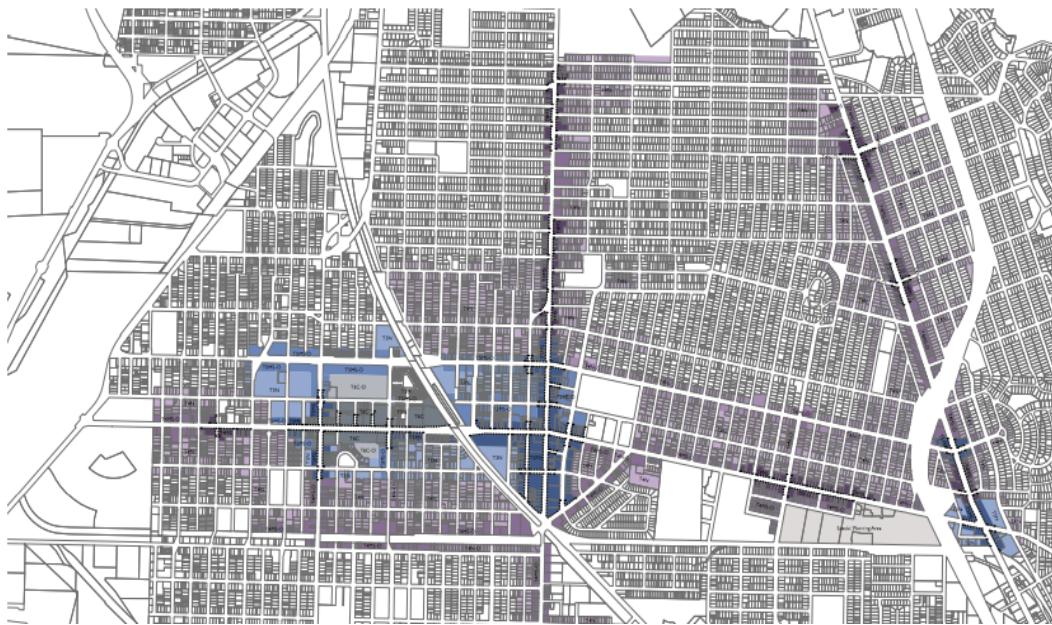


⁶ <https://richmondcf.org/community-initiatives/community-development/richmond-housing-renovation-program/>



Appendix

Designed for T3, T4, or T5 Zones in Richmond



15.05.110.030 Regulating Plan.

- T4 Neighborhood (T4N)
- T4 Neighborhood-Open (T4N-O)
- T4 Main Street-Open (T4MS-O)
- T4 Main Street (T4MS)
- T5 Neighborhood (T5N)
- T5 Main Street-Open (T5MS-O)
- T5 Main Street (T5MS)
- T6 Core-Open (T6C-O)
- T6 Core (T6C)
- Civic Space
- Special Planning Area (Traditional Neighborhood Community Plan Required)
- 0' Build-to-Line (BTL) and Shopfront Frontage Type or Shopfront used in combination with another Frontage Type required

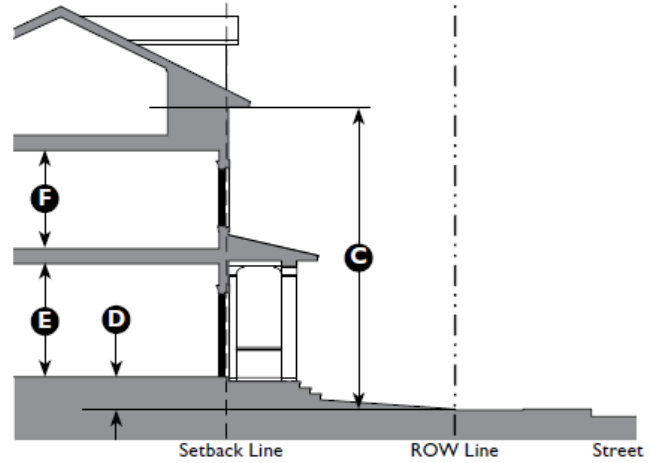
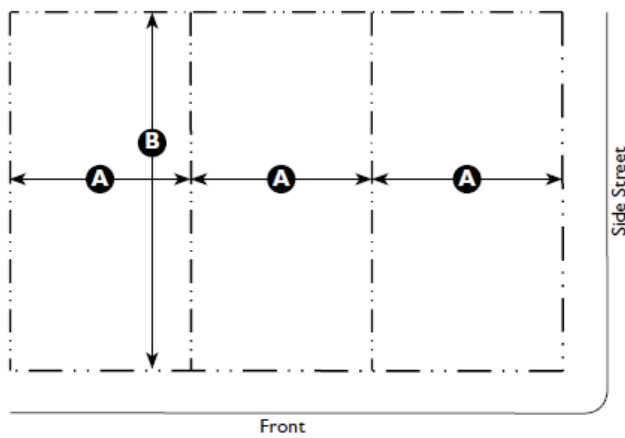
NOTES:

1. The T1, T2, T3NE, and T3N Transect Zones are not mapped on this regulating plan at this time. It is intended that these zones will be mapped at a later date should the Form-Based Code be expanded to include a larger area within the City of Richmond.
2. The "Open" Sub Zones (T4N-O, T4MS-O, T5MS-O, and T6C-O) provides the same building form as the base transect zone (T4N, T4MS, T5MS, and T6C, respectively) but allow for a more diverse mix of uses.

Table: 15.05.120.030.A The Richmond Transect Overview (continued)

T3 Neighborhood T3N	T4 Neighborhood T4N Sub-zones: T4N-Open	T4 Main Street T4MS Sub-zones: T4MS-Open	T5 Neighborhood T5N	T5 Main Street T5MS Sub-zones: T5MS-Open
Intent To build upon the historic characteristics of the existing single-family neighborhoods while allowing them to evolve with smaller scale medium-density building types such as bungalow courts, duplexes, and mansion apartments that are compatible to their context.	Intent To provide a walkable, predominantly single-family neighborhood that integrates appropriate medium-density building types such as duplexes, mansion apartments, and bungalow courts within walking distance to transit and commercial areas. The open sub-zone provides the same building form but allows for a more diverse mix of uses.	Intent To provide a vibrant main-street commercial environment that serves as the focal point for the surrounding neighborhood and provides access to day-to-day amenities within walking distance. The open sub-zone provides the same building form but allows for a more diverse mix of uses.	Intent To provide medium- to high-density housing in building types such as apartment houses, courtyard apartments, and mid-rise buildings that transition from the surrounding lower-density neighborhoods to the higher-density mixed-use neighborhoods.	Intent To provide a vibrant, walkable urban main street commercial area that provides locally- and regionally-serving commercial, retail, entertainment uses, and civic and public uses, as well as a variety of urban housing choices. The open sub-zone provides the same building form but allows for a more diverse mix of uses.
Desired Form Detached Narrow-to-Medium Lot Width Small-to-Medium Footprint Large Front Setback Small-to-Medium Side Setback Up to 2 Stories Elevated Ground Floor Primarily with Stoops or Porches	Desired Form Detached or Attached Narrow-to-Medium Lot Width Small-to-Medium Footprint Small-to-Medium Front Setback Small-to-No Side Setback Up to 2½ Stories Elevated Ground Floor Diverse Mix of Residential Frontages	Desired Form Attached Simple Wall Plane along Street Small-to-Large Footprint Buildings at or close to ROW Small-to-No Side Setback Up to 3 Stories Flush Ground Floor Primarily with Shopfronts	Desired Form Detached or Attached Simple Wall Plane along Street Small-to-Large Footprint Buildings at or close to ROW Small-to-No Side Setback Up to 55' Elevated Ground Floor Stoops, Forecourts, and Dooryards	Desired Form Attached Simple Wall Plane along Street Small-to-Large Footprint Buildings at or close to ROW No Side Setback Up to 55' (85' in some areas) Flush Ground Floor Primarily with Shopfronts
General Use Primarily residential with some home occupation uses	General Use Primarily residential with some home occupation uses and neighborhood-supporting uses in ancillary buildings	General Use Ground floor commercial that may have residential or additional commercial uses above or behind	General Use Primarily residential with home occupation uses and neighborhood-supporting uses in ancillary buildings	General Use Vertical Mixed Use: Commercial on the ground floor with residential or commercial uses on upper floors
Parking Moderate parking requirements Off- or on-street	Parking Low-to-moderate requirements Off- or on-street	Parking Low parking requirements Individual or shared off-street lots or on-street Commercial parking; part of a shared parking district	Parking No-to-low parking requirements Individual or shared off-street lots or on-street	Parking No-to-low parking requirements Individual or shared off-street lots or on-street Commercial parking; part of a shared parking district

Implemented in a T4N zone:
T4 Neighborhood (T4N).



Key

---- ROW / Lot Line --- Building Setback Line

Key

---- ROW / Lot Line --- Building Setback Line

C. Allowed Building Types			
Building Type	Lot		Standards
	Width A	Depth B	
Carriage House	n/a	n/a	15.05.210.050
Detached House: Village	50' min.; 75' max.	80' min.	15.05.210.070
Detached House: Cottage	30' min.; 50' max.	80' min.	15.05.210.080
Bungalow Court	75' min.; 150' max.	80' min.	15.05.210.090
Duplex	25' min.; 75' max. ¹	80' min.	15.05.210.100
Rowhouse	18' min.; 35' max.	80' min.	15.05.210.110
Multi-Plex: Small	50' min.; 75' max.	80' min.	15.05.210.120
Courtyard Building	75' min.; 100' max.	100' min. ²	15.05.210.150

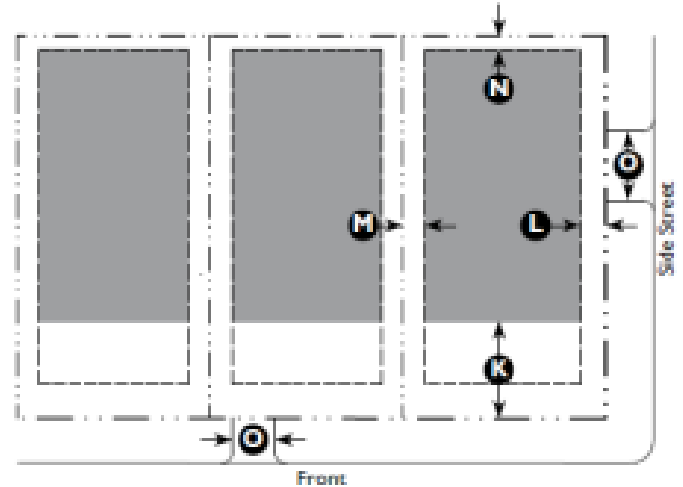
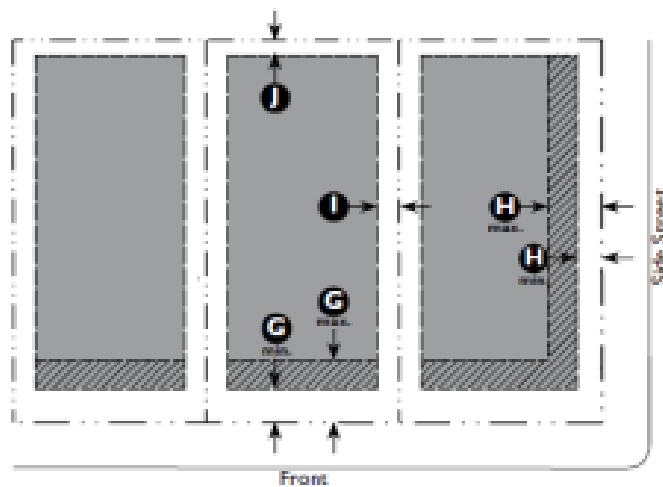
¹ Maximum combined width of two lots.

² 80' min. allowed for existing lots.

D. Building Form		
Height		
Main Building	2½ stories max.	C
Accessory Structure	2 Stories Max.	
Ground Floor Finish Level:		D
Residential, < 10' from ROW	18" min.	
Residential, ≥ 10' from ROW	0" min.	
Ceiling Height, Ground Floor	10' min. clear	E
Ceiling Height, Upper Floor(s)	8'-6" min. clear	F
Footprint		
Per Division 15.05.210 (Building Types)		
Miscellaneous		

Loading docks, overhead doors, and other service entries may not be located on street-facing facades.

T4 Neighborhood (T4N).



Key

- ROW / Lot Line
- Building Setback Line
- Building Area
- ▨ Facade Zone

E. Building Placement

Setbacks (Distance from ROW / Lot Line)

Front	10' min. ³ ; 15' max.	G
Side Street	5' min.; 10' max.	H
Side:		I
Main Building	5' ⁴	
Accessory Structure	0'	
Rear:		J
Main Building	5'	
Accessory Structure	0'	

Facade within Facade Zone:

Front	50% min.
Side Street	50% min.

³Where existing adjacent buildings are in front of the regulated setback, the building may be set to align with the facade of the front most immediately adjacent property.

⁴No side setback required along the common lot line between Townhouse or Duplex Building Types.

Key

- ROW / Lot Line
- Building Setback Line
- Parking Area

F. Parking

Required Spaces⁵

Residential Uses	1/1,000sf min. ⁶
Lodging Uses	1/room min.

Location (Distance from ROW / Lot Line)

Front Setback	30'	K
Side Street Setback	10'	L
Side Setback	5'	M
Rear Setback	5'	N

Miscellaneous

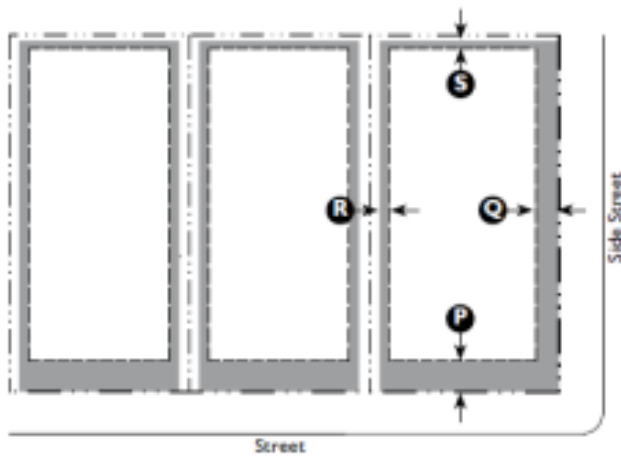
Parking Drive Width:		O
Front	12' max.	
Side Street/Alley	20' max.	

⁵See Section 15.05.320 (Parking) for uses not listed, general parking standards, adjustments, and alternatives.

⁶No parking spaces required for affordable housing developments or first 2,000sf of residential use.

⁷No side setback required along the common lot line between Townhouse or Duplex Building Types.

T4 Neighborhood (T4N).



Key

- ROW / Lot Line
- Building Setback Line
- Encroachment Area

G. Encroachments and Frontage Types		
Allowed Encroachments ^{8,9}		
Front	10' max	P
Side Street	5' max.	Q
Side	2'-6" max.	R
Rear	2'-6" max.	S
Allowed Frontage Types ^{10,11} Standards		
Porch: Projecting	15.05.220.050	
Porch: Engaged	15.05.220.060	
Stoop	15.05.220.070	
Forecourt	15.05.220.080	
Dooryard	15.05.220.090	

⁸ Maximum allowed encroachments: See Division 15.05.220 (Frontage Types) for further refinement of the allowed encroachments for frontage elements.

⁹ Encroachments into the ROW require the approval of an encroachment permit. Encroachments are not allowed in an alley ROW or across a lot line.

¹⁰ Frontage Type must be allowed for the selected building Building Type per Division 15.05.210 (Building Types).

¹¹ Building placement must accommodate Frontage Type size standards per Division 15.05.21 (Frontage Types).



Cost Estimates

RISE

U.C. Berkeley / U. of Denver

Solar Decathlon 2017

As-Built

Richmond, CA

August 10, 2017

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
A10 FOUNDATIONS						
A1020 SPECIAL FOUNDATIONS						
CP Standard Pier on 24" x 24" bearing pad	37	EA	132.27	\$4,894		
CP Seismic Pier on 24" by 24" bearing pad	3	EA	132.27	\$397		
CP Anchor Pier on 24" by 24" bearing pad	25	EA	132.27	\$3,307		
SUBTOTAL					\$8,598	
TOTAL - FOUNDATIONS						\$8,598
B10 SUPERSTRUCTURE						
B1010 FLOOR CONSTRUCTION						
4x12 beams	285	LF	9.15	\$2,608		
4x10 joists	183	LF	7.95	\$1,452		
2x10 joists	551	LF	2.75	\$1,516		
2x12 joists, treated	814	LF	2.26	\$1,839		
1-3/4"x11-7/8"x40" LVL beams (QTY 6)	242	LF	8.96	\$2,166		
5/8" OSB under insulation	200	SF	1.44	\$288		
3/4" OSB subfloor	829	SF	1.70	\$1,409		
Subfloor Adhesive 3/8" bead	1,019	LF	0.34	\$341		
Havelock Wool batt insulation R19, 8" depth	19	EA	115.52	\$2,195		
Simpson Strong Tie hardware	1	LS	5,000.00	\$5,000		
SUBTOTAL					\$18,815	
B1020 ROOF CONSTRUCTION						
1.75x11.25 2.0E LVL Joists	435	LF	5.63	\$2,449		
3.5x11.25 2.0E LVL Beams	129	LF	28.20	\$3,635		
5.25x11.25 2.0E LVL Beams	71	LF	31.87	\$2,254		
8x8 NO.1 DF-L Column	38	LF	15.62	\$594		
6x6 NO.1 DF-L Column	118	LF	11.31	\$1,331		
4x4 NO.1 DF-L Column	19	LF	4.81	\$91		
3/4" OSB Sheathing	960	SF	1.50	\$1,440		
Havelock Wool batt insulation R19, 5.5" depth	18	EA	114.44	\$2,060		
Simpson Strong Tie hardware	1	LS	3,000.00	\$3,000		
Proclima WELDANO waterproofing, rolls	2	EA	951.00	\$1,902		
Rigid Foam Insulation 1", R5	960	SF	2.19	\$2,102		
Wood sleepers, treated 1x3", 16" o/c	720	LF	0.69	\$497		
SUBTOTAL					\$21,356	
TOTAL - SUPERSTRUCTURE						\$40,170
B20 EXTERIOR CLOSURE						
B2010 EXTERIOR WALLS						
1/2" OSB Sheathing	2,629	SF	1.23	\$3,234		
Solitex Mento 1000 House Wrap Taped with Tescon V	1,475	SF	3.86	\$5,695		
Cedar Plank Siding	1,920	SF	5.84	\$11,213		
Tescon Vana Air Barrier Tape (interior)	3	EA	34.35	\$103		
1x3 Furring Strips	1,350	LF	0.53	\$716		
Havelock Wool batt insulation R19, 5.5" depth	16	EA	95.00	\$1,520		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
Havelock Wool batt insulation R13, 3.5" depth	16	EA	95.00	\$1,520		
SUBTOTAL					\$24,001	
B2020 EXTERIOR WINDOWS						
SUBTOTAL					\$0	
B2030 EXTERIOR DOORS						
Tyrol Series Side Hinged Door Left 46x92	1	EA	2,637.90	\$2,638		
Tyrol Series Side Hinged Door Left 46x92	1	EA	2,637.90	\$2,638		
Tyrol Series Side Hinged Door Left & Right 64x92	1	EA	4,242.99	\$4,243		
Tyrol Series Side Hinged Door Left & Right 64x92	1	EA	4,242.99	\$4,243		
Front Door	1	EA	450.00	\$450		
SUBTOTAL					\$14,212	
TOTAL - EXTERIOR CLOSURE						\$38,212
B30 ROOFING						
B3010 ROOF COVERINGS						
Roof Decking - Composite Roof Decking	960	SF	4.94	\$4,742		
Flashing/ Coping	128	LF	7.50	\$960		
SUBTOTAL					\$5,702	
B3020 ROOF OPENINGS						
SUBTOTAL					\$0	
TOTAL - ROOFING						\$5,702
C10 INTERIOR CONSTRUCTION						
C1010 PARTITIONS						
2x4 stud wall, 10' high, studs 24" O.C.	61	LF	10.77	\$657		
2x6 stud wall, 10' high, studs 24" O.C.	16	LF	13.62	\$215		
Gypsum Board 1/2" thick, taped and finished (level 4)	1,094	SF	1.43	\$1,564		
Gypsum Board 5/8" thick, fire resistant, taped and finish	1,463	SF	1.71	\$2,501		
Movable Wall (Tracks)	4	EA	200.00	\$800		
Movable Wall (2x4 stud wall, 10' high, studs 24" O.C.)	22	LF	10.77	\$232		
SUBTOTAL					\$5,968	
C1020 INTERIOR DOORS						
Bathroom Door 36", 3' x 6'	1	EA	118.45	\$118		
Interior hanging sliding doors with hardware	2	EA	400.00	\$800		
Mech. Room bifold door 5'	2	EA	284.01	\$568		
SUBTOTAL					\$1,486	
C1030 FITTINGS						
Countertop						
IKEA base cabinet 24"	2	EA	149.49	\$299		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
IKEA base cabinet 24" for sink	1	EA	159.80	\$160		
IKEA base cabinet 30"	1	EA	124.80	\$125		
IKEA wall cabinet 24x40"	3	EA	169.40	\$508		
IKEA Wall Cabinet 30x20"	1	EA	154.4	\$154		
IKEA wall cabinet 18x40"	1	EA	131.40	\$131		
IKEA wall cabinet 24x20"	1	EA	111.40	\$111		
IKEA cabinet suspension rails, toe kicks, knobs/handle	14	LF	13.20	\$190		
IKEA Installation Labor, 1.25 hrs per cabinet	10	EA	75.00	\$750		
Upper shelving, 3 tiers	3	EA	16.00	\$48		
Countertop	14	LF	173.00	\$2,493		
Bathroom Specialties						
Towel Bar, stainless steel, 18" long	1	EA	57.15	\$57		
Towel Bar, stainless steel, 30" long	1	EA	75.50	\$76		
Toilet Paper Holder	1	EA	35.00	\$35		
Bathroom Under-sink Cabinet	1	EA	231.21	\$231		
Shower Enclosure, tempered glass, corner unit, 2 pan	1	EA	989.00	\$989		
Mirror, 18x24", stainless steel frame	1	EA	61.35	\$61		
SUBTOTAL					\$6,419	
TOTAL - INTERIOR CONSTRUCTION						\$13,874
C20 STAIRCASES						
C2010 STAIR CONSTRUCTION						
Wood Handrail, fir, 1 1/2"x1 3/4"	28	LF	8.63	\$238		
Stair Treads, oak, 1-1/32" x 11-1/2", 72"	11	EA	82.29	\$905		
Simpson Strong Tie Hardware	1	LS	600.00	\$600		
2x12 stringers, treated	95	LF	4.84	\$460		
SUBTOTAL					\$2,203	
C2020 STAIR FINISHES						
SUBTOTAL					\$0	
TOTAL - STAIRCASES						\$2,203
C30 INTERIOR FINISHES						
C3010 WALL FINISHES						
Painting walls, 2 coats finish, on drywall, with roller	1,500	SF	0.65	\$975		
Bathroom Tile	54	SF	10.72	\$577		
SUBTOTAL					\$1,552	
C3020 FLOOR FINISHES						
Wood Flooring, Maple Hardwood, with Finish	716	SF	8.51	\$6,093		
Bathroom Tile Flooring	21	SF	10.72	\$225		
SUBTOTAL					\$6,318	
C3030 CEILING FINISHES						
Painting ceiling, 2 coats finish, on drywall, with roller	816	SF	0.65	\$530		
2x4 suspended ceiling framing	175	LF	1.61	\$282		
Gypsum wallboard, fire resistant, taped and finished (f	816	SF	1.71	\$1,395		
SUBTOTAL					\$2,208	

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
TOTAL - INTERIOR FINISHES						\$10,078
D10 CONVEYING						
D1010 ELEVATORS & LIFTS						
SUBTOTAL					\$0	
D1020 ESCALATORS & MOVING WALKWAYS						
SUBTOTAL					\$0	
D1090 OTHER CONVEYING SYSTEMS						
SUBTOTAL					\$0	
TOTAL - CONVEYING SYSTEMS						\$0
D20 PLUMBING						
D2010 PLUMBING FIXTURES						
Kitchen sink, incl. faucet and drain	1	EA	486.11	\$486		
Toilet	1	EA	284.43	\$284		
Wall mount sink	1	EA	289.46	\$289		
Shower pressure balance, arm and head incl.	1	EA	250.24	\$250		
Bathroom faucet	1	EA	156.42	\$156		
Exterior Hose Bibb	1	EA	8.00	\$8		
Washer Connection	1	EA	40.00	\$40		
Dishwasher Connection	1	EA	10.00	\$10		
SUBTOTAL					\$1,525	
D2020 DOMESTIC WATER DISTRIBUTION						
Domestic water distribution piping	50	LF	9.23	\$462		
Domestic water tank 1500 gallon	0	EA	900.00			
Sun Bandit Water Heater	1	EA	5,756.00	\$5,756		
Delivery Pump - Flotec FP4157	1	EA	361.00	\$361		
SUBTOTAL					\$6,579	
D2030 SANITARY WASTE						
Sanitary/Waste Vent Pipe, 2" PVC	25	LF	7.31	\$183		
Wastewater Tank 500 gallon	0	EA	500.00			
SUBTOTAL					\$183	
D2040 RAIN WATER DRAINAGE						
SUBTOTAL					\$0	
D2090 OTHER PLUMBING SYSTEMS						
Recover Greywater System	1	EA	3,395.00	\$3,395		
SUBTOTAL					\$3,395	

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
TOTAL - PLUMBING						\$11,681
D30 MECHANICAL						
D3010 ENERGY SUPPLY						
Panasonic Solar Panels	20	EA	390.00	\$7,800		
Inverter - Solar Edge	1	EA	1,218.72	\$1,219		
Inverter conduit box	1	EA	102.33	\$102		
Tesla Powerwall Battery	1	EA	5,500.00	\$5,500		
PV Racking System, per panel	20	EA	171.49	\$3,430		
SUBTOTAL					\$18,051	
D3020 HEAT GENERATING SYSTEMS						
SUBTOTAL					\$0	
D3030 COOLING GENERATING SYSTEMS						
SUBTOTAL					\$0	
D3040 DISTRIBUTION SYSTEMS						
Outdoor Mitsubishi Minisplit Unit	1	EA	1,909.00	\$1,909		
Indoor Mitsubishi Minisplit Unit	1	EA	1,909.00	\$1,909		
Refridgerant Piping, Copper Tube, 1/4" and 1/2" set, 5	1	EA	278.86	\$279		
Zhender HRV Unit and Ductwork	1	EA	4,319.49	\$4,319		
8" round ductwork	45	LF	12.97	\$584		
Grills	14	EA	37.70	\$528		
Louvers	2	EA	34.50	\$69		
SUBTOTAL					\$9,597	
D3050 TERMINAL & PACKAGE UNITS						
SUBTOTAL					\$0	
D3060 CONTROLS & INSTRUMENTATION						
Temperature Control - MHK1 Thermostat	1	EA	300.00	\$300		
SUBTOTAL					\$300	
D3070 SYSTEMS TESTING & BALANCING						
Testing and Balancing	816	SF	0.50	\$408		
SUBTOTAL					\$408	
TOTAL - HVAC						\$28,356
D40 FIRE PROTECTION						
D4010 SPRINKLERS						
Fire Supression Pump	1	EA	789.00	\$789		
Fire Sprinkler Head, concealed	8	EA	51.63	\$413		
1" CPVC Pipe	59	LF	14.47	\$854		
1" Flow Switch	1	EA	174.25	\$174		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1 1/4" Control Valve, Ball Valve	3	EA	282.41	\$847		
SUBTOTAL					\$3,077	
D4020 STANDPIPES						
SUBTOTAL					\$0	
D4030 FIRE PROTECTION SPECIALTIES						
SUBTOTAL					\$0	
TOTAL - FIRE PROTECTION						\$3,077
D50 ELECTRICAL						
D5010 ELECTRICAL SERVICE & DISTRIBUTION						
225A Panel	1	EA	203.50	\$204		
Circuit Breakers	42	EA	8.20	\$344		
HD 40PSN 240V NEMA 1	1	EA	253.50	\$254		
120/240V Meter	1	EA	73.50	\$74		
SUBTOTAL					\$875	
D5020 LIGHTING & BRANCH WIRING						
Single Receptical	2	EA	9.30	\$19		
GFCI Duplex Receptical	14	EA	12.25	\$172		
WP GFCI Plate	4	EA	2.91	\$12		
Ivory Plate 1 Switch	19	EA	0.19	\$4		
Brown Plate 1 Switch	2	EA	0.19	\$0		
Brown Plate 1 Duplex	25	EA	0.19	\$5		
Branch						
Romex w/ grid #12 2/C	630	LF	0.34	\$214		
Romex w/ grid #12 3/C	359	LF	0.53	\$190		
Romex w/ grid #10 3/C	31	LF	1.33	\$41		
Romex w/ grid #8 3/C	20	LF	1.44	\$29		
Lighting						
Recessed LED, WAC #3272	18	EA	22.00	\$396		
SUBTOTAL					\$1,081	
D5030 COMMUNICATIONS & SECURITY						
SUBTOTAL					\$0	
D5090 OTHER ELECTRICAL SYSTEMS						
E Gauge System	1	EA	1,891.00	\$1,891		
Smoke Detector	5	EA	281.18	\$1,406		
SUBTOTAL					\$3,297	
TOTAL - ELECTRICAL						\$5,253

DESCRIPTION		QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
E10 EQUIPMENT							
E1010 COMMERCIAL EQUIPMENT							
	Electric Stove\Oven	1	EA	549.99	\$550		
	Microwave	1	EA	499.00	\$499		
	Refrigerator/Freezer	1	EA	899.00	\$899		
	Dishwasher	1	EA	599.00	\$599		
	Washing Machine	1	EA	999.00	\$999		
	Dryer	1	EA	1,199.98	\$1,200		
	SUBTOTAL					\$4,746	
E1020 INSTITUTIONAL EQUIPMENT							
	SUBTOTAL					\$0	
E1030 VEHICULAR EQUIPMENT							
	SUBTOTAL					\$0	
E1090 OTHER EQUIPMENT							
	SUBTOTAL					\$0	
TOTAL - EQUIPMENT							\$4,746
E20 FURNISHINGS							
E2010 FIXED FURNISHINGS							
	Murphy Bed Furniture	2	EA	2,500.00	\$5,000		
	SUBTOTAL					\$5,000	
E2020 MOVABLE FURNISHINGS							
	SUBTOTAL					\$0	
TOTAL - FURNISHINGS							\$5,000
F10 SPECIAL CONSTRUCTION							
F1010 SPECIAL STRUCTURES							
	Accoya Wood Façade	110	EA	110.00	\$12,100		
	Accoya Façade Labor	130	LF	8.00	\$1,040		
	Moss Wall - Moss Acres panels 4x8'	28	EA	171.00	\$4,788		
	Moss Wall Labor est. 0.5hr per panel	28	EA	20.00	\$560		
	SUBTOTAL					\$18,488	
F1020 INTEGRATED CONSTRUCTION							
	SUBTOTAL					\$0	

DESCRIPTION		QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
F1030	SPECIAL CONSTRUCTION SYSTEMS						
	SUBTOTAL					\$0	
F1040	SPECIAL FACILITIES						
	SUBTOTAL					\$0	
TOTAL - SPECIAL CONSTRUCTION							\$18,488
F20 SELECTIVE BUILDING DEMOLITION							
F2010	BUILDING ELEMENTS DEMOLITION						
	SUBTOTAL					\$0	
F2020	HAZARDOUS COMPONENTS ABATEMENT						
	SUBTOTAL					\$0	
TOTAL - SELECTIVE BUILDING DEMOLITION							\$0
G10 SITE PREPARATION							
G1010	SITE CLEARING						
	SUBTOTAL					\$0	
G1020	SITE DEMOLITION AND RELOCATION						
	SUBTOTAL					\$0	
G1030	SITE EARTHWORK						
	SUBTOTAL					\$0	
G1040	HAZARDOUS WASTE REMEDIATION						
	SUBTOTAL					\$0	
TOTAL - SITE PREPARATION							\$0
G20 SITE IMPROVEMENT							
G2010	ROADWAYS						
	SUBTOTAL					\$0	
G2020	PARKING LOTS						
	SUBTOTAL					\$0	

DESCRIPTION		QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST	
G2030	PEDESTRIAN PAVING							
	SUBTOTAL					\$0		
G2040	SITE DEVELOPMENT							
	SUBTOTAL					\$0		
G2050	LANDSCAPING							
	Water Tank Covering, 2x4 wall	30	LF	9.39	\$282			
	Planter boxes	8	EA	60.00	\$480			
	Plants	100	EA	5.00	\$500			
	SUBTOTAL					\$1,262		
TOTAL - SITE IMPROVEMENT							\$1,262	
G30 SITE MECHANICAL UTILITIES								
G3010	WATER SUPPLY							
	SUBTOTAL					\$0		
G3020	SANITARY SEWER							
	SUBTOTAL					\$0		
G3030	STORM SEWER							
	SUBTOTAL					\$0		
TOTAL - SITE MECHANICAL UTILITIES							\$0	
G40 SITE ELECTRICAL UTILITIES								
G4010	ELECTRICAL DISTRIBUTION							
	SUBTOTAL					\$0		
G4020	SITE LIGHTING							
	SUBTOTAL					\$0		
G4030	SITE COMMUNICATION AND SECURITY							
	SUBTOTAL					\$0		
G4090	OTHER SITE ELECTRICAL UTILITIES							
	SUBTOTAL					\$0		
TOTAL - SITE ELECTRICAL UTILITIES							\$0	
TOTAL DIRECT COST (Trade Costs)							\$196,699	

July 6, 2017

RISE

U.C. Berkeley / U. of Denver

As-Built

Denver, CO

GFA 1,049

CONSTRUCTION COST SUMMARY					
SYSTEM DESCRIPTION		SUB-TOTAL	TOTAL	\$/SF	%
A10	FOUNDATIONS				
A1010	Standard Foundations	\$0			
A1020	Special Foundations	\$8,598			
A1030	Lowest Floor Construction	\$0	\$8,598	\$8.20	4.2%
A20	BASEMENT				
A2010	Basement Excavation	\$0			
A2020	Basement Walls	\$0	\$0	\$0.00	0.0%
B10	SUPERSTRUCTURE				
B1010	Upper Floor Construction	\$18,815			
B1020	Roof Construction	\$21,356	\$40,170	\$38.31	19.5%
B20	EXTERIOR CLOSURE				
B2010	Exterior Walls	\$24,001			
B2020	Windows	\$0			
B2030	Exterior Doors	\$14,212	\$38,212	\$36.44	18.6%
B30	ROOFING				
B3010	Roof Coverings	\$5,702			
B3020	Roof Openings	\$0	\$5,702	\$5.44	2.8%
C10	INTERIOR CONSTRUCTION				
C1010	Partitions	\$5,968			
C1020	Interior Doors	\$1,486			
C1030	Specialties/Millwork	\$6,419	\$13,874	\$13.23	6.7%
C20	STAIRCASES				
C2010	Stair Construction	\$2,203			
C2020	Stair Finishes	\$0	\$2,203	\$2.10	1.1%
C30	INTERIOR FINISHES				
C3010	Wall Finishes	\$1,552			
C3020	Floor Finishes	\$6,318			
C3030	Ceiling Finishes	\$2,208	\$10,078	\$9.61	4.9%
D10	CONVEYING				
D1010	Elevator	\$0			
D1020	Escalators and Moving Walkways	\$0			
D1090	Other Conveying Systems	\$0	\$0	\$0.00	0.0%
D20	PLUMBING				
D2010	Plumbing Fixtures	\$1,525			
D2020	Domestic Water Distribution	\$6,579			
D2030	Sanitary Waste	\$183			
D2040	Rain Water Drainage	\$0			
D2090	Other Plumbing Systems	\$3,395	\$11,681	\$11.14	5.7%
D30	MECHANICAL				
D3010	Energy Supply	\$18,051			
D3020	Heat Generating Systems	\$0			

July 6, 2017

RISE

U.C. Berkeley / U. of Denver

As-Built

Denver, CO

GFA 1,049

CONSTRUCTION COST SUMMARY					
SYSTEM DESCRIPTION		SUB-TOTAL	TOTAL	\$/SF	%
D3030	Cooling Generating Systems	\$0			
D3040	Distribution Systems	\$9,597			
D3050	Terminal & Package Units	\$0			
D3060	Controls & Instrumentation	\$300			
D3070	Systems Testing & Balancing	\$408	\$28,356	\$27.04	13.8%
D40	FIRE PROTECTION				
D4010	Fire Protection	\$3,077			
D4020	Standpipes	\$0			
D4030	Fire Protection Specialties	\$0	\$3,077	\$2.93	1.5%
D50	ELECTRICAL				
D5010	Electrical Service & Distribution	\$875			
D5020	Lighting & Branch Wiring	\$1,081			
D5030	Communications & Security Systems	\$0			
D5090	Other Electrical Systems	\$3,297	\$5,253	\$5.01	2.6%
E10	EQUIPMENT				
E1010	Commercial Equipment	\$4,746			
E1020	Institutional Equipment	\$0			
E1030	Vehicular Equipment	\$0			
E1090	Other Equipment	\$0	\$4,746	\$4.53	2.3%
E20	FURNISHINGS				
E2010	Fixed Furnishings	\$5,000			
E2020	Movable Furnishings	\$0	\$5,000	\$4.77	2.4%
F10	SPECIAL CONSTRUCTION				
F1010	Special Structures	\$18,488			
F1020	Integrated Construction	\$0			
F1030	Special Construction Systems	\$0			
F1040	Special Facilities	\$0	\$18,488	\$17.63	9.0%
F20	SELECTIVE BUILDING DEMOLITION				
F2010	Building Elements Demolition	\$0			
F2020	Hazardous Components Abatement	\$0	\$0	\$0.00	0.0%
G10	SITE PREPARATION				
G1010	Site Clearing	\$0			
G1020	Site Demolition and Relocations	\$0			
G1030	Site Earthwork	\$0			
G1040	Hazardous Waste Remediation	\$0	\$0	\$0.00	0.0%
G20	SITE IMPROVEMENT				
G2010	Roadways	\$0			
G2020	Parking Lots	\$0			
G2030	Pedestrian Paving	\$0			
G2040	Site Development	\$0			
G2050	Landscaping	\$1,262	\$1,262	\$1.20	0.6%

July 6, 2017
 RISE
 U.C. Berkeley / U. of Denver
 As-Built

Denver, CO

GFA 1,049

CONSTRUCTION COST SUMMARY					
SYSTEM DESCRIPTION		SUB-TOTAL	TOTAL	\$/SF	%
G30 SITE MECHANICAL UTILITIES					
G3010	Water Supply	\$0			
G3020	Sanitary Sewer	\$0			
G3030	Storm Sewer	\$0	\$0	\$0.00	0.0%
G40 SITE ELECTRICAL UTILITIES					
G4010	Electrical Distribution	\$0			
G4020	Site Lighting	\$0			
G4030	Site Communications and Security	\$0			
G4090	Other Electrical Utilities	\$0	\$0	\$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)			\$196,699	\$187.60	95.5%
MARKUPS					
	General Conditions, Overhead & Profit	0.00%	\$0	\$0	0.0%
SUBTOTAL CONSTRUCTION			\$196,699	\$187.60	95.5%
CONTINGENCIES/ESCALATION					
	Design and Pricing Contingency		\$0		
	Trucking 3 trucks		\$6,000		
	Crane time 2 days		\$3,250		
	Lull/Forklift 0 days		\$0		
			\$9,250	\$8.82	4.5%
TOTAL PROJECT COST			\$205,949	\$196.42	100.0%

July 6, 2017
RISE
U.C. Berkeley / U. of Denver
As-Built

Denver, CO

Labor Rate Log

Trade	Labor Rate (\$/hr)
CP Pier Installation:	
Framing	\$60.00
Insulation	\$20.00
OSB Sheathing	\$61.11
Waterproofing Walls, Roof incl. flashing	\$40.00
Rigid Foam Insulation	\$40.00
Cedar Siding Installation	\$51.85
Drywall Hanging & Finish	\$59.41
Interior Construction, Doors	\$52.11
IKEA Cabinet Installation	\$60.00
Interior Construction, fittings	\$46.47
Painting	\$49.00
Plumbing	\$60.00
Moss Wall Installation	\$40.00
Accoya Façade Installation	\$40.00
HVAC	\$56.00
Solar Installation	\$54.93
Fire Sprinklers	\$30.00
Electrial	\$32.40
Landscaping	\$32.00

July 6, 2017
RISE
U.C. Berkeley / U. of Denver
As-Built

Denver, CO

Labor Rate Log

Trade	Labor Rate (\$/hr)

July 6, 2017

RISE

U.C. Berkeley / U. of Denver

As-Built

Denver, CO

Labor Rate Log

Trade	Labor Rate (\$/hr)

RISE

U.C. Berkeley / U. of Denver

Solar Decathlon 2017

As-Built

Denver, CO

August 10, 2017

July 6, 2017

RISE

U.C. Berkeley / U. of Denver

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Denver, CO

GFA 812

CONSTRUCTION COST SUMMARY					
SYSTEM DESCRIPTION	SUB-TOTAL	TOTAL	\$/SF	%	
A10 FOUNDATIONS					
A1010 Standard Foundations	\$0				
A1020 Special Foundations	\$8,698				
A1030 Lowest Floor Construction	\$0	\$8,698	\$10.71	4.4%	
A20 BASEMENT					
A2010 Basement Excavation	\$0				
A2020 Basement Walls	\$0	\$0	\$0.00	0.0%	
B10 SUPERSTRUCTURE					
B1010 Upper Floor Construction	\$18,312				
B1020 Roof Construction	\$16,839	\$35,151	\$43.29	17.8%	
B20 EXTERIOR CLOSURE					
B2010 Exterior Walls	\$21,309				
B2020 Windows	\$0				
B2030 Exterior Doors	\$14,212	\$35,520	\$43.74	18.0%	
B30 ROOFING					
B3010 Roof Coverings	\$5,216				
B3020 Roof Openings	\$0	\$5,216	\$6.42	2.6%	
C10 INTERIOR CONSTRUCTION					
C1010 Partitions	\$3,521				
C1020 Interior Doors	\$1,205				
C1030 Specialties/Millwork	\$6,557	\$11,283	\$13.90	5.7%	
C20 STAIRCASES					
C2010 Stair Construction	\$1,925				
C2020 Stair Finishes	\$0	\$1,925	\$2.37	1.0%	
C30 INTERIOR FINISHES					
C3010 Wall Finishes	\$1,061				
C3020 Floor Finishes	\$6,260				
C3030 Ceiling Finishes	\$1,526	\$8,847	\$10.89	4.5%	
D10 CONVEYING					
D1010 Elevator	\$0				
D1020 Escalators and Moving Walkways	\$0				
D1090 Other Conveying Systems	\$0	\$0	\$0.00	0.0%	
D20 PLUMBING					
D2010 Plumbing Fixtures	\$2,015				
D2020 Domestic Water Distribution	\$6,218				
D2030 Sanitary Waste	\$128				
D2040 Rain Water Drainage	\$0				
D2090 Other Plumbing Systems	\$3,395	\$11,756	\$14.48	5.9%	
D30 MECHANICAL					
D3010 Energy Supply	\$17,857				
D3020 Heat Generating Systems	\$0				

July 6, 2017

RISE

U.C. Berkeley / U. of Denver

As-Built

Denver, CO

GFA 812

CONSTRUCTION COST SUMMARY					
SYSTEM DESCRIPTION		SUB-TOTAL	TOTAL	\$/SF	%
D3030	Cooling Generating Systems	\$0			
D3040	Distribution Systems	\$9,415			
D3050	Terminal & Package Units	\$0			
D3060	Controls & Instrumentation	\$300			
D3070	Systems Testing & Balancing	\$408	\$27,980	\$34.46	14.2%
D40	FIRE PROTECTION				
D4010	Fire Protection	\$3,077			
D4020	Standpipes	\$0			
D4030	Fire Protection Specialties	\$0	\$3,077	\$3.79	1.6%
D50	ELECTRICAL				
D5010	Electrical Service & Distribution	\$875			
D5020	Lighting & Branch Wiring	\$1,081			
D5030	Communications & Security Systems	\$0			
D5090	Other Electrical Systems	\$3,297	\$5,253	\$6.47	2.7%
E10	EQUIPMENT				
E1010	Commercial Equipment	\$4,746			
E1020	Institutional Equipment	\$0			
E1030	Vehicular Equipment	\$0			
E1090	Other Equipment	\$0	\$4,746	\$5.84	2.4%
E20	FURNISHINGS				
E2010	Fixed Furnishings	\$5,000			
E2020	Movable Furnishings	\$0	\$5,000	\$6.16	2.5%
F10	SPECIAL CONSTRUCTION				
F1010	Special Structures	\$18,488			
F1020	Integrated Construction	\$0			
F1030	Special Construction Systems	\$0			
F1040	Special Facilities	\$0	\$18,488	\$22.77	9.4%
F20	SELECTIVE BUILDING DEMOLITION				
F2010	Building Elements Demolition	\$0			
F2020	Hazardous Components Abatement	\$0	\$0	\$0.00	0.0%
G10	SITE PREPARATION				
G1010	Site Clearing	\$0			
G1020	Site Demolition and Relocations	\$0			
G1030	Site Earthwork	\$0			
G1040	Hazardous Waste Remediation	\$0	\$0	\$0.00	0.0%
G20	SITE IMPROVEMENT				
G2010	Roadways	\$0			
G2020	Parking Lots	\$0			
G2030	Pedestrian Paving	\$0			
G2040	Site Development	\$0			
G2050	Landscaping	\$5,502	\$5,502	\$6.78	2.8%

July 6, 2017
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 As-Built

Denver, CO

GFA 812

CONSTRUCTION COST SUMMARY					
SYSTEM DESCRIPTION		SUB-TOTAL	TOTAL	\$/SF	%
G30 SITE MECHANICAL UTILITIES					
G3010	Water Supply	\$0			
G3020	Sanitary Sewer	\$0			
G3030	Storm Sewer	\$0	\$0	\$0.00	0.0%
G40 SITE ELECTRICAL UTILITIES					
G4010	Electrical Distribution	\$0			
G4020	Site Lighting	\$0			
G4030	Site Communications and Security	\$0			
G4090	Other Electrical Utilities	\$0	\$0	\$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)			\$188,441	\$232.07	95.3%
MARKUPS					
	General Conditions, Overhead & Profit	0.00%	\$0	\$0	0.0%
SUBTOTAL CONSTRUCTION			\$188,441	\$232.07	95.3%
CONTINGENCIES/ESCALATION					
	Design and Pricing Contingency		\$0		
	Trucking 3 trucks		\$6,000		
	Crane time 2 days		\$3,250		
	Lull/Forklift 0 days		\$0		
			\$9,250	\$11.39	4.7%
TOTAL PROJECT COST			\$197,691	\$243.46	100.0%

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
A10 FOUNDATIONS						
A1020 SPECIAL FOUNDATIONS						
CP Standard Pier on 24" x 24" bearing pad	37	EA	132.27	\$4,894		
CP Seismic Pier on 24" by 24" bearing pad	3	EA	132.27	\$397		
CP Anchor Pier on 24" by 24" bearing pad	25	EA	132.27	\$3,307		
Temporary Foundation Labor	4	EA	25.00	\$100		
SUBTOTAL					\$8,698	
TOTAL - FOUNDATIONS						\$8,698
B10 SUPERSTRUCTURE						
B1010 FLOOR CONSTRUCTION						
4x12 beams	285	LF	7.36	\$2,098		
4x10 joists	183	LF	5.84	\$1,067		
2x10 joists	551	LF	1.85	\$1,020		
2x12 joists, treated	814	LF	5.08	\$4,134		
1-3/4"x11-7/8"x40" LVL beams (QTY 6)	242	LF	6.43	\$1,554		
5/8" OSB under insulation	200	SF	0.85	\$170		
3/4" OSB subfloor	829	SF	1.05	\$870		
Subfloor Adhesive 3/8" bead	1,019	LF	0.20	\$204		
Havelock Wool batt insulation R19, 8" depth	19	EA	115.52	\$2,195		
Simpson Strong Tie hardware	1	LS	5,000.00	\$5,000		
SUBTOTAL					\$18,312	
B1020 ROOF CONSTRUCTION						
1.75x11.25 2.0E LVL Joists	435	LF	5.63	\$2,449		
3.5x11.25 2.0E LVL Beams	129	LF	11.26	\$1,451		
5.25x11.25 2.0E LVL Beams	71	LF	16.89	\$1,195		
8x8 NO.1 DF-L Column	38	LF	10.40	\$395		
6x6 NO.1 DF-L Column	118	LF	7.31	\$861		
4x4 NO.1 DF-L Column	19	LF	2.84	\$54		
3/4" OSB Sheathing	960	SF	0.91	\$874		
Havelock Wool batt insulation R19, 5.5" depth	18	EA	114.44	\$2,060		
Simpson Strong Tie hardware	1	LS	3,000.00	\$3,000		
Proclima WELDANO waterproofing, rolls	2	EA	951.00	\$1,902		
Rigid Foam Insulation 1", R5	960	SF	2.19	\$2,102		
Wood sleepers, treated 1x3", 16" o/c	720	LF	0.69	\$497		
SUBTOTAL					\$16,839	
TOTAL - SUPERSTRUCTURE						\$35,151
B20 EXTERIOR CLOSURE						
B2010 EXTERIOR WALLS						
1/2" OSB Sheathing	2,629	SF	0.71	\$1,867		
Solitex Mento 1000 House Wrap Taped with Tescon V	1,475	SF	3.86	\$5,695		
Cedar Plank Siding	1,920	SF	5.15	\$9,888		
Tescon Vana Air Barrier Tape (interior)	3	EA	34.35	\$103		
1x3 Furring Strips	1,350	LF	0.53	\$716		
Havelock Wool batt insulation R19, 5.5" depth	16	EA	95.00	\$1,520		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
Havelock Wool batt insulation R13, 3.5" depth	16	EA	95.00	\$1,520		
SUBTOTAL					\$21,309	
B2020 EXTERIOR WINDOWS						
SUBTOTAL					\$0	
B2030 EXTERIOR DOORS						
Tyrol Series Side Hinged Door Left 46x92	1	EA	2,637.90	\$2,638		
Tyrol Series Side Hinged Door Left 46x92	1	EA	2,637.90	\$2,638		
Tyrol Series Side Hinged Door Left & Right 64x92	1	EA	4,242.99	\$4,243		
Tyrol Series Side Hinged Door Left & Right 64x92	1	EA	4,242.99	\$4,243		
Front Door	1	EA	450.00	\$450		
SUBTOTAL					\$14,212	
TOTAL - EXTERIOR CLOSURE						\$35,520
B30 ROOFING						
B3010 ROOF COVERINGS						
Roof Decking - Composite Roof Decking	960	SF	4.50	\$4,320		
Flashing/ Coping	128	LF	7.00	\$896		
SUBTOTAL					\$5,216	
B3020 ROOF OPENINGS						
SUBTOTAL					\$0	
TOTAL - ROOFING						\$5,216
C10 INTERIOR CONSTRUCTION						
C1010 PARTITIONS						
2x4 stud wall, 10' high, studs 24" O.C.	61	LF	5.98	\$365		
2x6 stud wall, 10' high, studs 24" O.C.	16	LF	8.08	\$127		
Gypsum Board 1/2" thick, taped and finished (level 4)	1,094	SF	0.81	\$886		
Gypsum Board 5/8" thick, fire resistant, taped and finish	1,463	SF	0.83	\$1,214		
Movable Wall (Tracks)	4	EA	200.00	\$800		
Movable Wall (2x4 stud wall, 10' high, studs 24" O.C.)	22	LF	5.98	\$129		
SUBTOTAL					\$3,521	
C1020 INTERIOR DOORS						
Bathroom Door 36", 3' x 6'	1	EA	98.10	\$98		
Interior hanging sliding doors with hardware	2	EA	400.00	\$800		
Mech. Room bifold door 5'	2	EA	153.47	\$307		
SUBTOTAL					\$1,205	
C1030 FITTINGS						
Countertop						
IKEA base cabinet 24"	2	EA	149.49	\$299		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
IKEA base cabinet 24" for sink	1	EA	159.80	\$160		
IKEA base cabinet 30"	1	EA	124.80	\$125		
IKEA wall cabinet 24x40"	3	EA	169.40	\$508		
IKEA Wall Cabinet 30x20"	1	EA	154.4	\$154		
IKEA wall cabinet 18x40"	1	EA	131.40	\$131		
IKEA wall cabinet 24x20"	1	EA	111.40	\$111		
IKEA cabinet suspension rails, toe kicks, knobs/handle	14	LF	13.20	\$190		
IKEA Installation Labor, 1.25 hrs per cabinet	10	EA	50.00	\$500		
Upper shelving, 3 tiers	3	EA	16.00	\$48		
Countertop	14	LF	173.00	\$2,493		
Bathroom Specialties						
Towel Bar, stainless steel, 18" long	1	EA	57.15	\$57		
Towel Bar, stainless steel, 30" long	1	EA	75.50	\$76		
Toilet Paper Holder	1	EA	35.00	\$35		
Porcelanosa bathroom cabinet - G100320058	1	EA	648.00	\$648		
Shower Enclosure, tempered glass, corner unit, 2 pan	1	EA	960.00	\$960		
Mirror, 18x24", stainless steel frame	1	EA	61.35	\$61		
SUBTOTAL					\$6,557	
TOTAL - INTERIOR CONSTRUCTION						\$11,283
C20 STAIRCASES						
C2010 STAIR CONSTRUCTION						
Wood Handrail, fir, 1 1/2"x1 3/4"	28	LF	4.78	\$132		
Stair Treads, oak, 1-1/32" x 11-1/2", 72"	11	EA	66.67	\$733		
Simpson Strong Tie Hardware	1	LS	600.00	\$600		
2x12 stringers, treated	95	LF	4.84	\$460		
SUBTOTAL					\$1,925	
C2020 STAIR FINISHES						
SUBTOTAL					\$0	
TOTAL - STAIRCASES						\$1,925
C30 INTERIOR FINISHES						
C3010 WALL FINISHES						
Painting walls, 2 coats finish, on drywall, with roller	1,500	SF	0.35	\$525		
Bathroom Tile - Porcelanosa L138000741	54	SF	9.95	\$536		
SUBTOTAL					\$1,061	
C3020 FLOOR FINISHES						
Wood Flooring, Maple Hardwood, with Finish	716	SF	8.51	\$6,093		
Bathroom Tile Flooring - Porcelanosa V56090161	21	SF	7.95	\$167		
SUBTOTAL					\$6,260	
C3030 CEILING FINISHES						
Painting ceiling, 2 coats finish, on drywall, with roller	816	SF	0.86	\$702		
2x4 suspended ceiling framing	175	LF	0.84	\$147		
Gypsum wallboard, fire resistant, taped and finished (f	816	SF	0.83	\$677		
SUBTOTAL					\$1,526	

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
TOTAL - INTERIOR FINISHES						\$8,847
D10 CONVEYING						
D1010 ELEVATORS & LIFTS						
SUBTOTAL					\$0	
D1020 ESCALATORS & MOVING WALKWAYS						
SUBTOTAL					\$0	
D1090 OTHER CONVEYING SYSTEMS						
SUBTOTAL					\$0	
TOTAL - CONVEYING SYSTEMS						\$0
D20 PLUMBING						
D2010 PLUMBING FIXTURES						
Porcelanosa Lavatory Faucet - N199999603	1	EA	251.60	\$252		
Porcelanosa Toilet - N369225493	1	EA	652.80	\$653		
Porcelanosa Wall mount sink - N369225490	1	EA	152.32	\$152		
Porcelanosa shower arm - N168199929	1	EA	54.40	\$54		
Porcelanosa shower head - N168199930	1	EA	123.76	\$124		
Porcelanosa pressure balance - N168199907	1	EA	341.36	\$341		
Porcelanosa kitchen faucet - N199999476	1	EA	380.80	\$381		
Exterior Hose Bibb	1	EA	8.00	\$8		
Washer Connection	1	EA	40.00	\$40		
Dishwasher Connection	1	EA	10.00	\$10		
SUBTOTAL					\$2,015	
D2020 DOMESTIC WATER DISTRIBUTION						
Domestic water distribution piping	50	LF	9.23	\$462		
Domestic water tank 1500 gallon	0	EA	900.00			
Sun Bandit Water Heater	1	EA	5,756.00	\$5,756		
Delivery Pump - Flotec FP4157	0	EA	361.00			
SUBTOTAL					\$6,218	
D2030 SANITARY WASTE						
Sanitary/Waste Vent Pipe, 2" PVC	25	LF	5.13	\$128		
Wastewater Tank 500 gallon	0	EA	500.00			
SUBTOTAL					\$128	
D2040 RAIN WATER DRAINAGE						
SUBTOTAL					\$0	
D2090 OTHER PLUMBING SYSTEMS						
Recover Greywater System	1	EA	3,395.00	\$3,395		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SUBTOTAL					\$3,395	
TOTAL - PLUMBING						\$11,756
D30 MECHANICAL						
D3010 ENERGY SUPPLY						
Panasonic Solar Panels	20	EA	390.00	\$7,800		
Inverter - Solar Edge	1	EA	1,218.72	\$1,219		
Inverter conduit box	1	EA	102.33	\$102		
Tesla Powerwall Battery	1	EA	5,500.00	\$5,500		
PV Racking System, per panel	20	EA	161.79	\$3,236		
SUBTOTAL					\$17,857	
D3020 HEAT GENERATING SYSTEMS						
SUBTOTAL					\$0	
D3030 COOLING GENERATING SYSTEMS						
SUBTOTAL					\$0	
D3040 DISTRIBUTION SYSTEMS						
Outdoor Mitsubishi Minisplit Unit	1	EA	1,909.00	\$1,909		
Indoor Mitsubishi Minisplit Unit	1	EA	1,909.00	\$1,909		
Refridgerant Piping, Copper Tube, 1/4" and 1/2" set, 5	1	EA	272.94	\$273		
Zhender HRV Unit	1	EA	4,319.49	\$4,319		
8" round ductwork	45	LF	9.07	\$408		
Grills	14	EA	37.70	\$528		
Louvers	2	EA	34.50	\$69		
SUBTOTAL					\$9,415	
D3050 TERMINAL & PACKAGE UNITS						
SUBTOTAL					\$0	
D3060 CONTROLS & INSTRUMENTATION						
Temperature Control - MHK1 Thermostat	1	EA	300.00	\$300		
SUBTOTAL					\$300	
D3070 SYSTEMS TESTING & BALANCING						
Testing and Balancing	816	SF	0.50	\$408		
SUBTOTAL					\$408	
TOTAL - HVAC						\$27,980
D40 FIRE PROTECTION						
D4010 SPRINKLERS						
Fire Supression Pump	1	EA	789.00	\$789		
Fire Sprinkler Head, concealed	8	EA	51.63	\$413		

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1" CPVC Pipe	59	LF	14.47	\$854		
1" Flow Switch	1	EA	174.25	\$174		
1 1/4" Control Valve, Ball Valve	3	EA	282.41	\$847		
SUBTOTAL					\$3,077	
D4020 STANDPIPES						
SUBTOTAL					\$0	
D4030 FIRE PROTECTION SPECIALTIES						
SUBTOTAL					\$0	
TOTAL - FIRE PROTECTION						\$3,077
D50 ELECTRICAL						
D5010 ELECTRICAL SERVICE & DISTRIBUTION						
225A Panel	1	EA	203.50	\$204		
Circuit Breakers	42	EA	8.20	\$344		
HD 40PSN 240V NEMA 1	1	EA	253.50	\$254		
120/240V Meter	1	EA	73.50	\$74		
SUBTOTAL					\$875	
D5020 LIGHTING & BRANCH WIRING						
Single Receptical	2	EA	9.30	\$19		
GFCI Duplex Receptical	14	EA	12.25	\$172		
WP GFCI Plate	4	EA	2.91	\$12		
Ivory Plate 1 Switch	19	EA	0.19	\$4		
Brown Plate 1 Switch	2	EA	0.19	\$0		
Brown Plate 1 Duplex	25	EA	0.19	\$5		
Branch						
Romex w/ grid #12 2/C	630	LF	0.34	\$214		
Romex w/ grid #12 3/C	359	LF	0.53	\$190		
Romex w/ grid #10 3/C	31	LF	1.33	\$41		
Romex w/ grid #8 3/C	20	LF	1.44	\$29		
Lighting						
Recessed LED, WAC #3272	18	EA	22.00	\$396		
SUBTOTAL					\$1,081	
D5030 COMMUNICATIONS & SECURITY						
SUBTOTAL					\$0	
D5090 OTHER ELECTRICAL SYSTEMS						
E Gauge System	1	EA	1,891.00	\$1,891		
Smoke Detector	5	EA	281.18	\$1,406		
SUBTOTAL					\$3,297	

DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
TOTAL - ELECTRICAL						\$5,253
E10 EQUIPMENT						
E1010 COMMERCIAL EQUIPMENT						
Electric Stove\Oven Frigidaire FGEF3035RF	1	EA	549.99	\$550		
Microwave MWOTR30200CSS	1	EA	499.00	\$499		
Refrigerator/Freezer BFBF2412WH	1	EA	899.00	\$899		
Dishwasher DDT28430W	1	EA	599.00	\$599		
Washing Machine WMY10148CO	1	EA	999.00	\$999		
Dryer HPD24412W	1	EA	1,199.98	\$1,200		
SUBTOTAL						\$4,746
E1020 INSTITUTIONAL EQUIPMENT						
SUBTOTAL						\$0
E1030 VEHICULAR EQUIPMENT						
SUBTOTAL						\$0
E1090 OTHER EQUIPMENT						
SUBTOTAL						\$0
TOTAL - EQUIPMENT						\$4,746
E20 FURNISHINGS						
E2010 FIXED FURNISHINGS						
Murphy Bed Furniture	2	EA	2,500.00	\$5,000		
SUBTOTAL						\$5,000
E2020 MOVABLE FURNISHINGS						
SUBTOTAL						\$0
TOTAL - FURNISHINGS						\$5,000
F10 SPECIAL CONSTRUCTION						
F1010 SPECIAL STRUCTURES						
Accoya Wood Façade	110	EA	110.00	\$12,100		
Accoya Façade Labor	130	LF	8.00	\$1,040		
Moss Wall - Moss Acres panels 4x8'	28	EA	171.00	\$4,788		
Moss Wall Labor est. 0.5hr per panel	28	EA	20.00	\$560		
SUBTOTAL						\$18,488
F1020 INTEGRATED CONSTRUCTION						

DESCRIPTION		QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST	
	SUBTOTAL					\$0		
F1030	SPECIAL CONSTRUCTION SYSTEMS							
	SUBTOTAL					\$0		
F1040	SPECIAL FACILITIES							
	SUBTOTAL					\$0		
TOTAL - SPECIAL CONSTRUCTION							\$18,488	
F20	SELECTIVE BUILDING DEMOLITION							
F2010	BUILDING ELEMENTS DEMOLITION							
	SUBTOTAL					\$0		
F2020	HAZARDOUS COMPONENTS ABATEMENT							
	SUBTOTAL					\$0		
TOTAL - SELECTIVE BUILDING DEMOLITION							\$0	
G10	SITE PREPARATION							
G1010	SITE CLEARING							
	SUBTOTAL					\$0		
G1020	SITE DEMOLITION AND RELOCATION							
	SUBTOTAL					\$0		
G1030	SITE EARTHWORK							
	SUBTOTAL					\$0		
G1040	HAZARDOUS WASTE REMEDIATION							
	SUBTOTAL					\$0		
TOTAL - SITE PREPARATION							\$0	
G20	SITE IMPROVEMENT							
G2010	ROADWAYS							
	SUBTOTAL					\$0		
G2020	PARKING LOTS							

DESCRIPTION		QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SUBTOTAL						\$0	
G2030	PEDESTRIAN PAVING						
SUBTOTAL						\$0	
G2040	SITE DEVELOPMENT						
SUBTOTAL						\$0	
G2050	LANDSCAPING						
	Water Tank Covering, 2x4 wall	30	LF	9.39	\$282		
	Planter boxes	8	EA	50.00	\$400		
	Plants	100	EA	5.00	\$500		
	Front Decking	960	SF	4.50	\$4,320		
SUBTOTAL						\$5,502	
TOTAL - SITE IMPROVEMENT							\$5,502
G30 SITE MECHANICAL UTILITIES							
G3010	WATER SUPPLY						
SUBTOTAL						\$0	
G3020	SANITARY SEWER						
SUBTOTAL						\$0	
G3030	STORM SEWER						
SUBTOTAL						\$0	
TOTAL - SITE MECHANICAL UTILITIES							\$0
G40 SITE ELECTRICAL UTILITIES							
G4010	ELECTRICAL DISTRIBUTION						
SUBTOTAL						\$0	
G4020	SITE LIGHTING						
SUBTOTAL						\$0	
G4030	SITE COMMUNICATION AND SECURITY						
SUBTOTAL						\$0	
G4090	OTHER SITE ELECTRICAL UTILITIES						
SUBTOTAL						\$0	
TOTAL - SITE ELECTRICAL UTILITIES							\$0

<i>DESCRIPTION</i>	<i>QTY</i>	<i>UNIT</i>	<i>UNIT COST</i>	<i>EST'D COST</i>	<i>SUB TOTAL</i>	<i>TOTAL COST</i>
<i>TOTAL DIRECT COST (Trade Costs)</i>						<i>\$188,441</i>

July 6, 2017
RISE
U.C. Berkeley / U. of Denver
As-Built

Denver, CO

Labor Rate Log

Trade	Labor Rate (\$/hr)
CP Pier Installation	\$25.00
Framing	\$20.91
Insulation	\$20.00
OSB Subfloor, Sheathing	\$22.31
Waterproofing Walls, Roof incl. flashing	\$25.00
Rigid Foam Insulation	\$21.00
Cedar Siding Installation	\$26.67
Drywall Hanging & Finish	\$21.76
Interior Construction, Doors	\$22.19
IKEA Cabinet Installation	\$40.00
Interior Construction, fittings	\$29.57
Painting	\$18.00
Plumbing	\$60.00
Moss Wall Installation	\$40.00
Accoya Façade Installation	\$40.00
HVAC	\$28.39
Solar Installation	\$32.17
Fire Sprinklers	\$30.00
Electrial	\$32.40
Landscaping	\$32.00

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Labor Rate Log

Trade	Labor Rate (\$/hr)

July 6, 2017

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Labor Rate Log

Trade	Labor Rate (\$/hr)