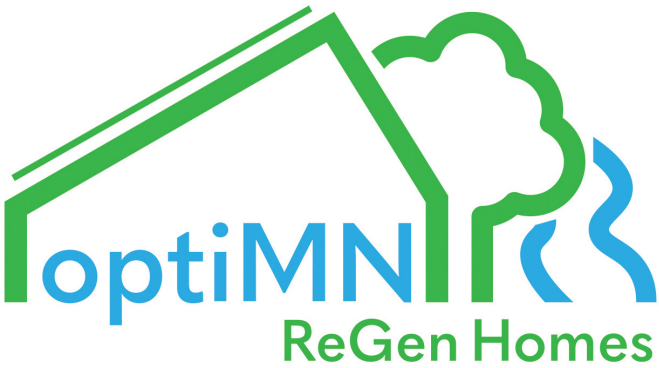
Resilient Home
Regenerative Home
Zero Energy Home
Water Home
Renewable Home
Right-Size Home
Responsible Home
Adaptive Home
Long-Lasting Home
Safe Home
Urban Home
Grow Home
Expandable Home
Diversity Home
Innovation Home
Restorative Home
Ecological Home
Dream Home
My Home
OptiMN Home

Bassett Creek **ReGen Home**

Volume Two



Team OptiMN

University of Minnesota

April 4, 2017

United States
Department of Energy
2017 Race to Zero Competition

00

University of Minnesota OptiMN Team

Bassett Creek ReGen Homes

Rendering

Table of Contents

01: Renderings 3
02: Master Plan 5
03. Construction Documents 7
Sheet List 8
04: Water Management 43
05: Enclosure Analysis 45
06: Systems Analysis 47
Indoor airPLUS Verification Checklist 47
Manual J 48
07: Energy Analysis 58
08: Renewable Energy Analysis 77
DEO Zero Energy Ready Home PV-Ready Checklist 77
09: Financial Information 83
10: Construction Management 85
Construction Schedule 86
11: Homeowner Manual 89
Maintenance Schedule 93

Team OptiMN's Bassett Creek ReGen Homes

Renderings

Front Yard and Entry

Kitchen

Living Room from Entry

Second Floor

First Floor

Master Plan

Figure 2A: View looking east from site

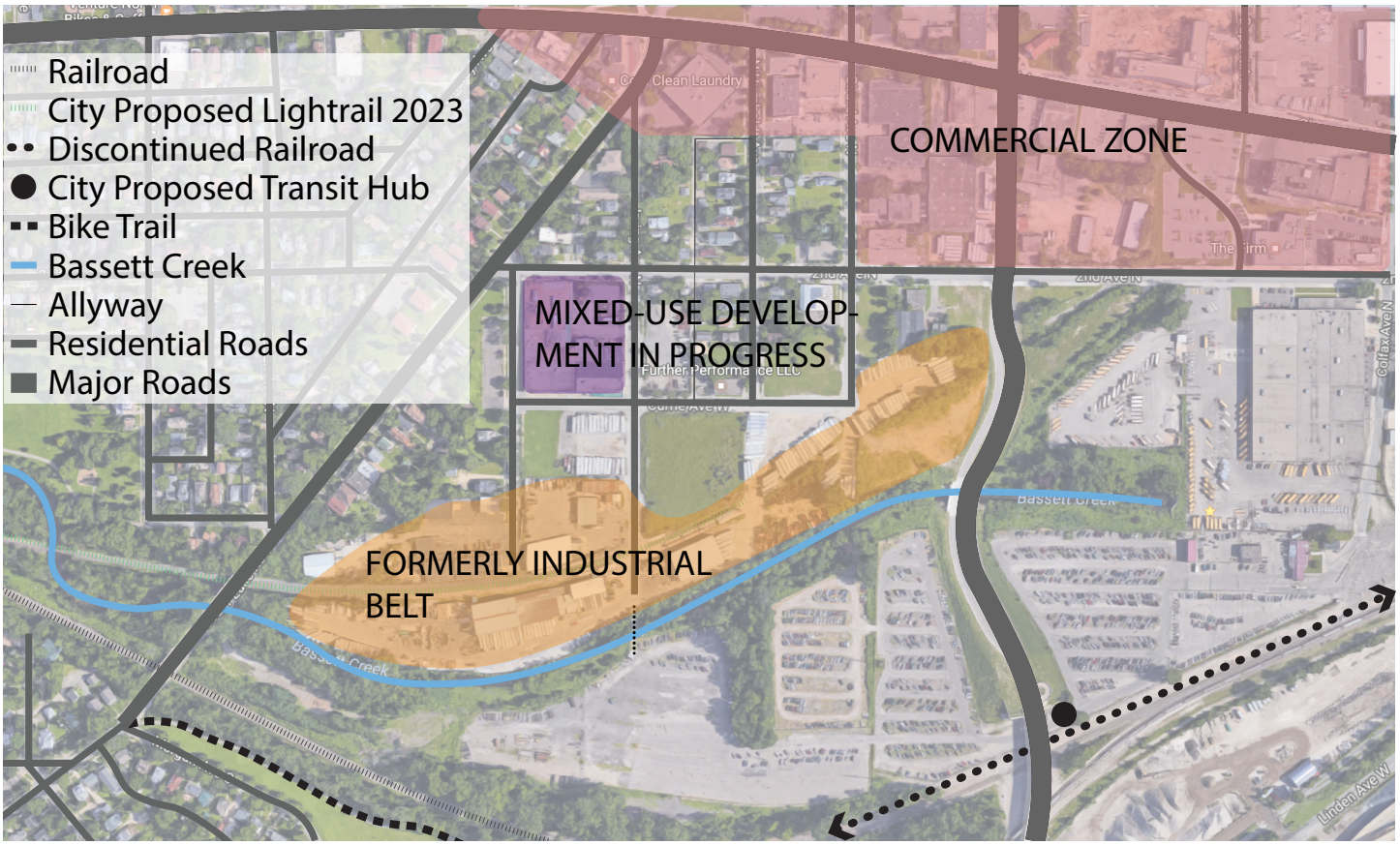


Figure 2B: Current conditions

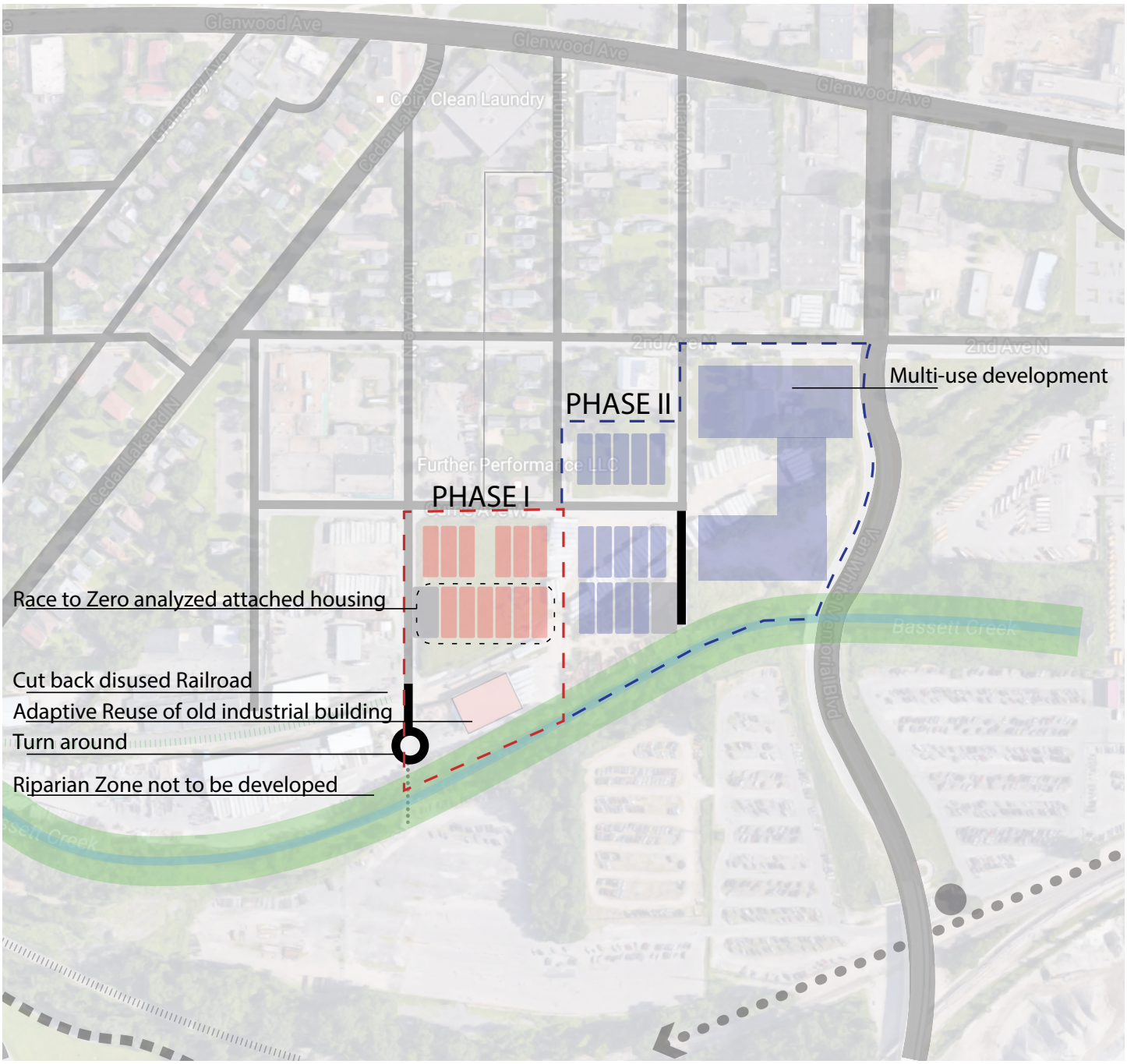


Figure 2C: Site Master Plan

The project sits as part of a larger master plan which is in line with the city's plan for development in the neighborhood.

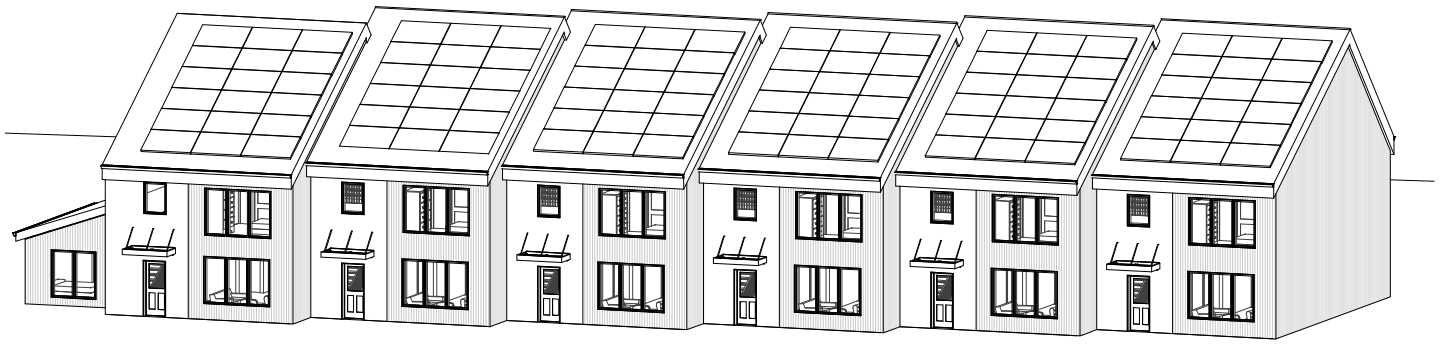
It will be located near several major transit areas including a proposed light rail line south of the site.

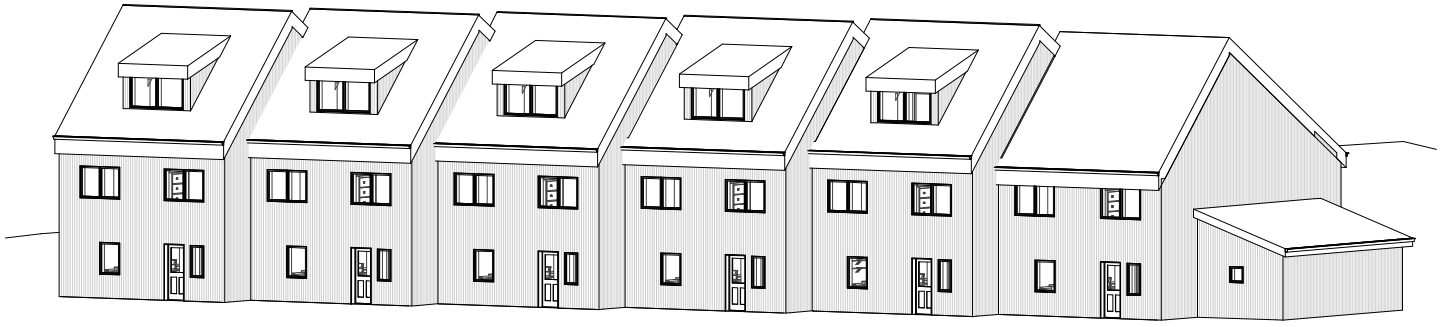
The analyzed units sit in a larger development that will be built in two phases.

03

Bassett Creek ReGen Homes

Construction Documents





Sheet	Name	Page
G-100	Sheet List	8
L-100	Site Landscape Plan	9
L-110	Front & Back Yard Landscape Plan	10
A-101	Level 1 & 2	11
A-102	Level 2.5 & Roof	12
A-110	Single Unit- Level 1	13
A-120	Single Unit- Level 2	14
A-130	Single Unit- Level 2.5	15
A-140	Roof	16
A-200	Full Elevations	17
A-201	South Elevation	18
A-202	North Elevation	19
A-301	North-South Section	20
A-302	East-West Section	21
A-410	Foundation Details	22
A-420	Wall Details	23
A-430	Roof Details	24
A-450	Window Details	25
A-451	Window Schedule	26
S-110	Foundation Structural Plan	27
S-110	Level 1 Structural Plan	28
S-120	Level 2 Structural Plan	29
S-130	Level 2.5 Structural Plan	30
S-301	Structural Section	31
M-110	Level 1 Mechanical	32
M-120	Level 2 Mechanical	33
M-130	Level 3 Mechanical	34
E-110	Level 1 Electrical and Lighting	35
E-120	Level 2 Electrical and Lighting	36
E-130	Level 3 Electrical and Lighting	37
P-110	Level 1 Plumbing	38
P-120	Level 2 Plumbing	39
P-130	Level 3 Plumbing	40
G-110	Full Building “Pen Test”	41
G-120	Site Logistics	42

Sheet List

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

Site Features

1. 2nd Avenue
2. ADA Unit
3. Basset Creek
4. Boardwalk
5. Bioretention Basin
6. Community Warehouse
7. Community Garden
8. Humboldt Avenue North
9. Irving Avenue North
10. RTZ Units
11. Pear Orchard
12. Playground
13. Plaza w/Fire Lane
14. Swale
15. Shared Parking

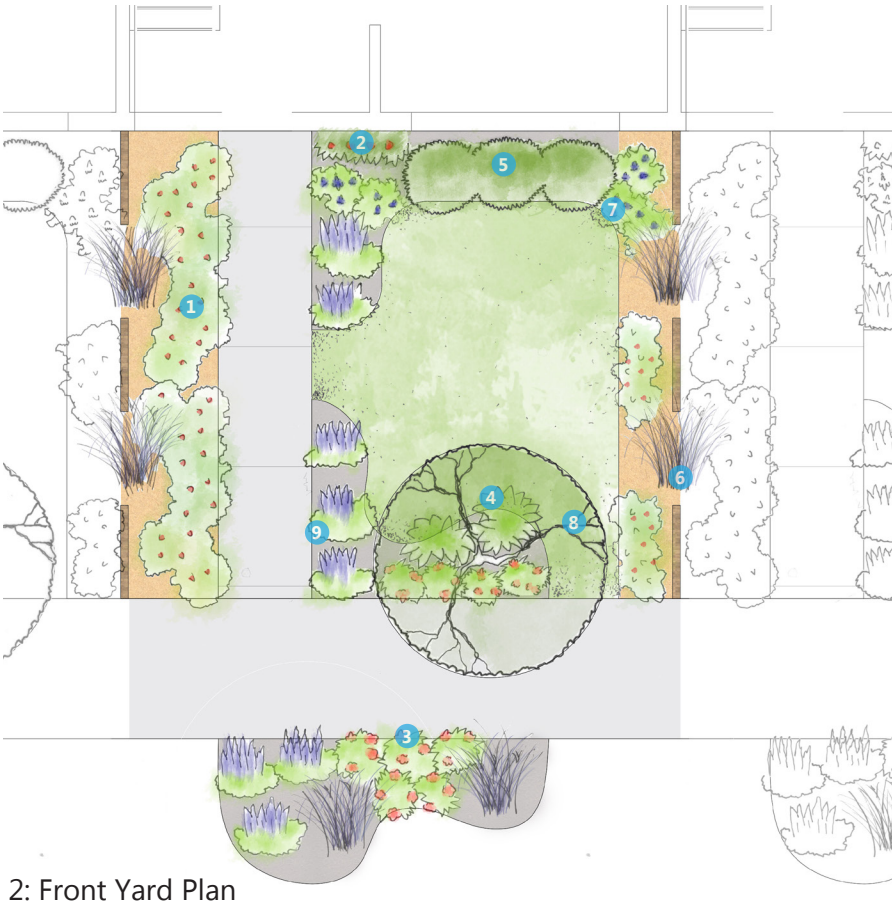
Site Plan

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

L-100

1: Backyard Plan
Scale: Not to Scale

	Common	Botanical	Height	Width
1	Alpine Strawberry	Fragaria vesca	6″	12″
2	Assorted Annuals			
3	Assorted Herbs			
4	Hakonechloa Grass	Hakonechloa macra ‘aureola’	12″-18″	12″-18″
5	Service Berry Tree	Amelanchier alnifolia ‘Regent’	4′-6′	4′-6″
6	Wild Grape Vine	Vitis riparia		



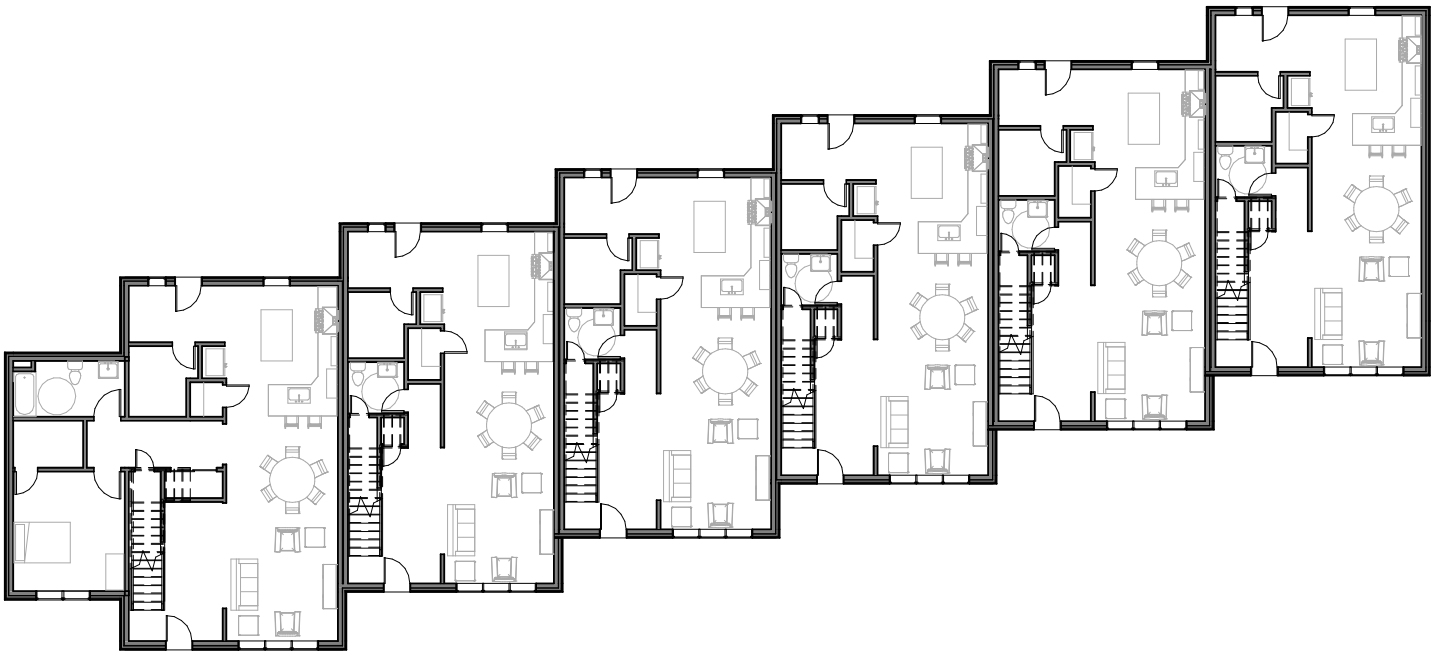
2: Front Yard Plan
Scale: Not to Scale

	Common	Botanical	Height	Width
1	Alpine Strawberry	Fragaria vesca	6″	12″
2	Clematis Vine	Clematis hybrids		
3	Daylilly	Hermocallis ‘Rosy Returns’	12″-18″	12″
4	Hosta	Hosta sieboldi-ana elegans	2′-3′	3′-4′
5	Inkberry	Ilex glabra ‘shamrock’	3′-4′	3′-4″
6	Little BlueStem	Schizachyrium scoparium	2′-4′	18″-24″
7	Purple Coneflower	Echinacea purpurea	2′-5′	18″-24″
8	Service Berry Tree	Amelanchier alnifolia ‘Re-gent’	4′-6′	4′-6″
9	Walker’s Low Catmint	Nepeta racemosa ‘Walker’s Low’	2.5′	2.5′

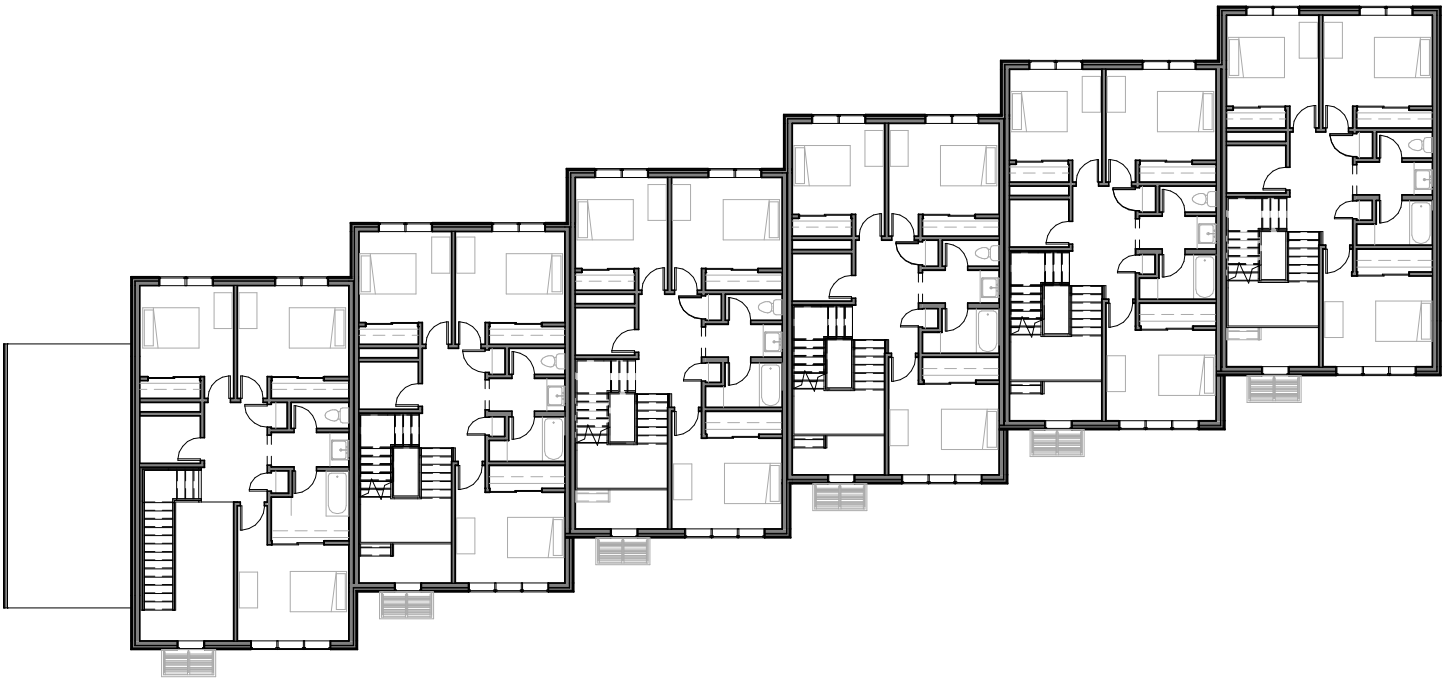
Front & Back Yard

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

L-110



1: Level 1
Scale: 1/32″=1′

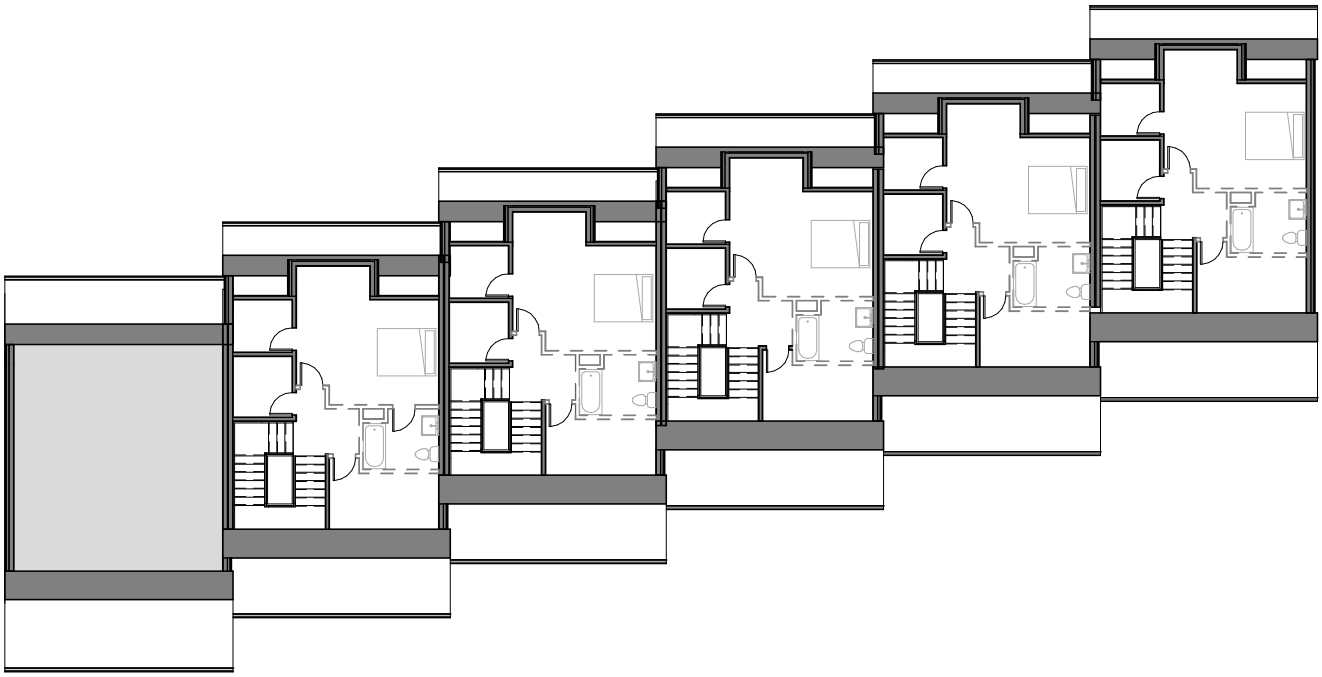


2: Level 2
Scale: 1/32″=1′

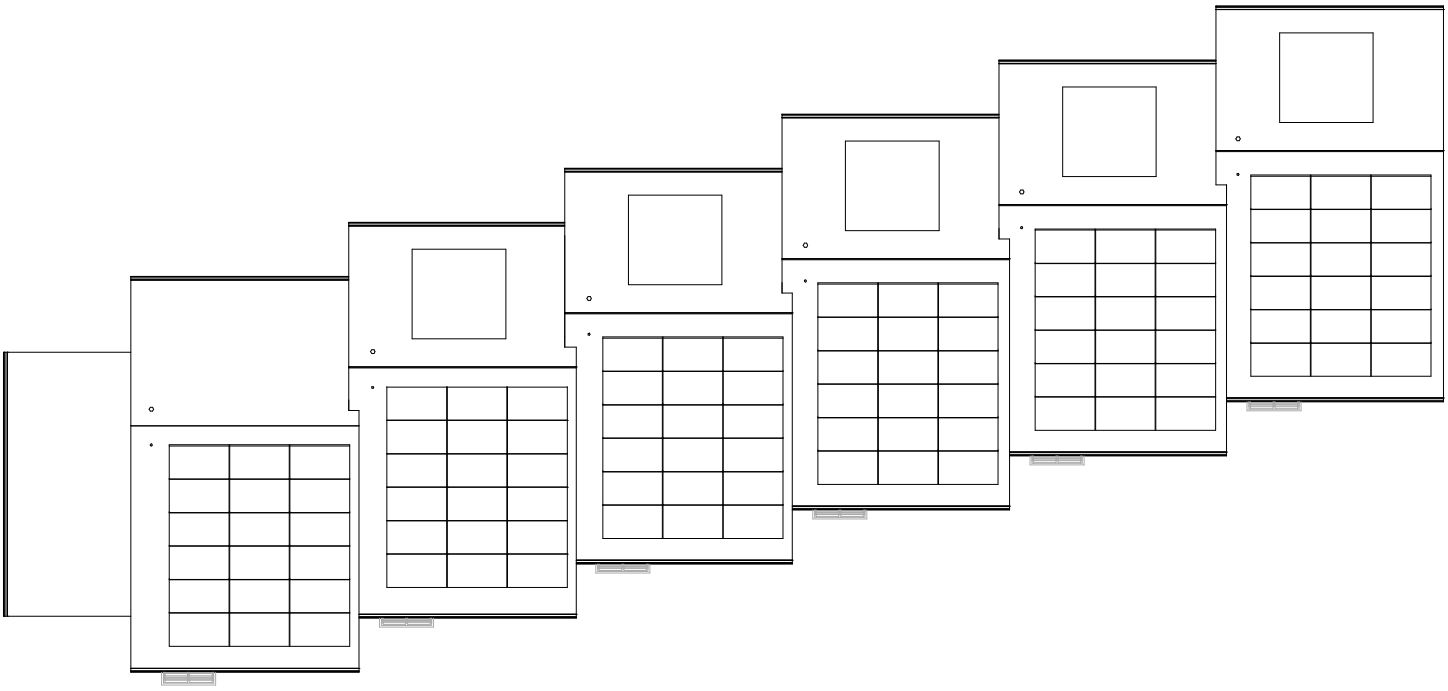
Level 1 & 2

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

A-101



1: Level 2.5
Scale: 1/32″=1′

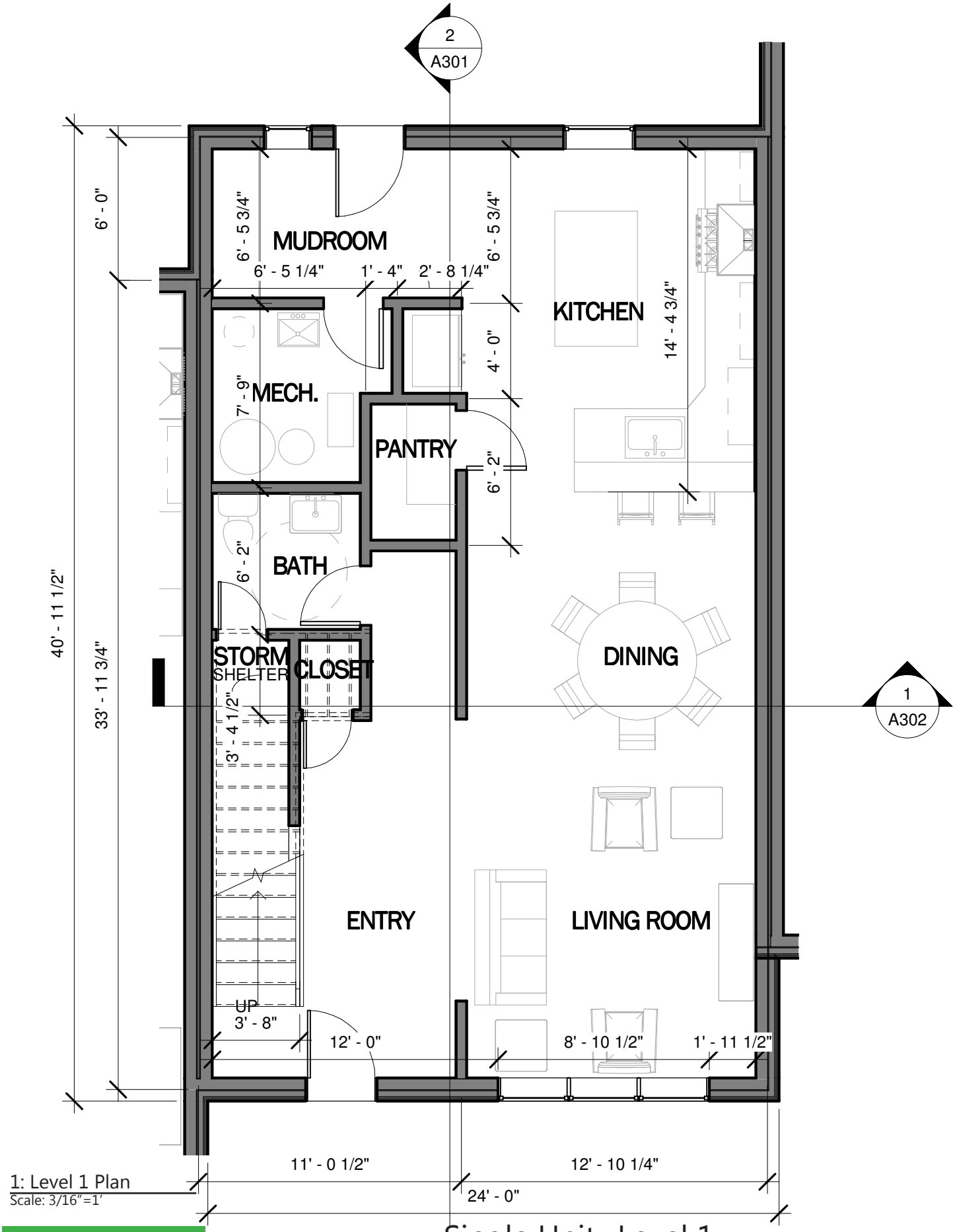


2: Roof
Scale: 1/32″=1′

Level 2.5 & Roof

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

A-102

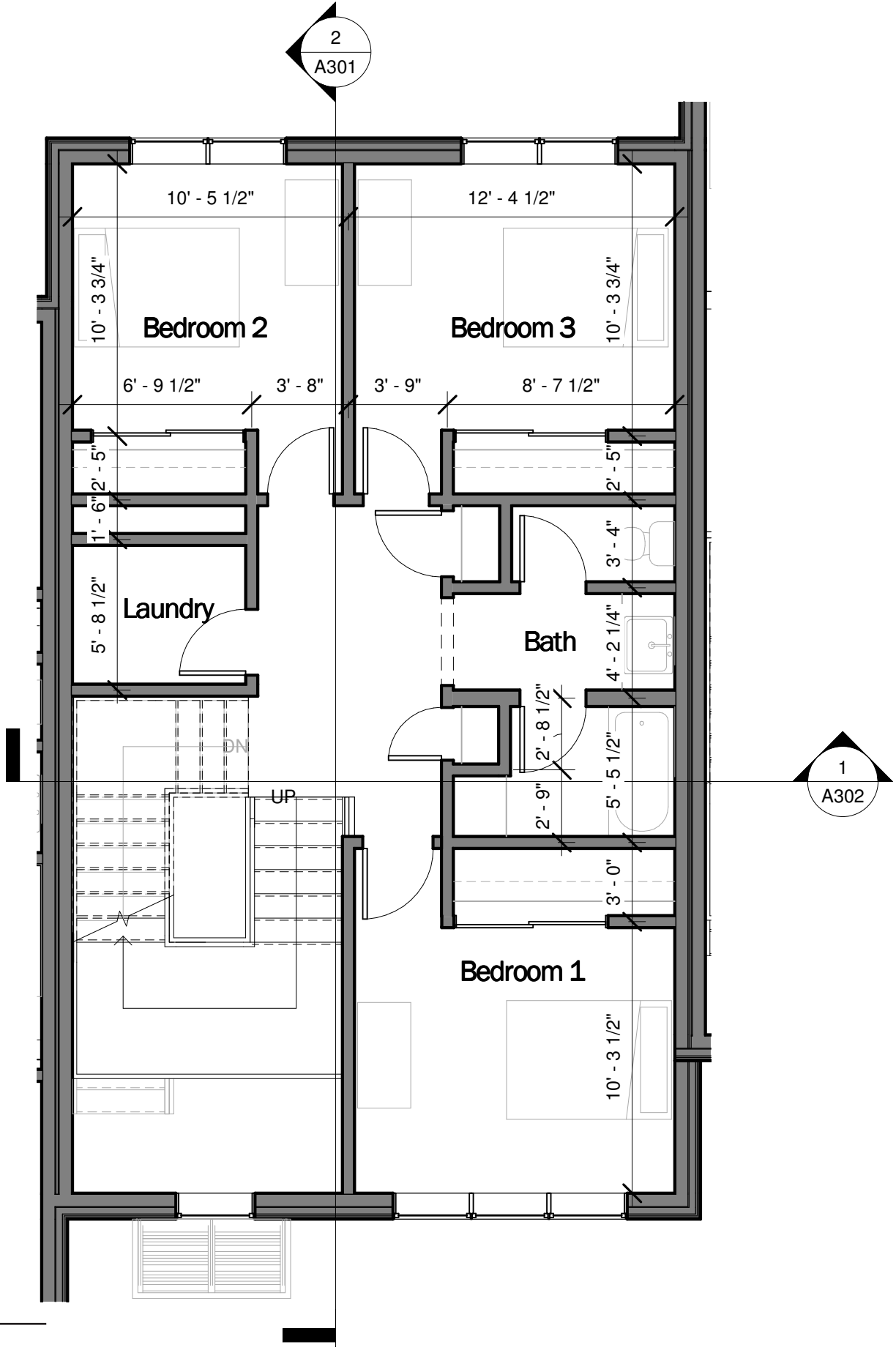


1: Level 1 Plan
Scale: 3/16"=1'

Single Unit- Level 1

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

A-110

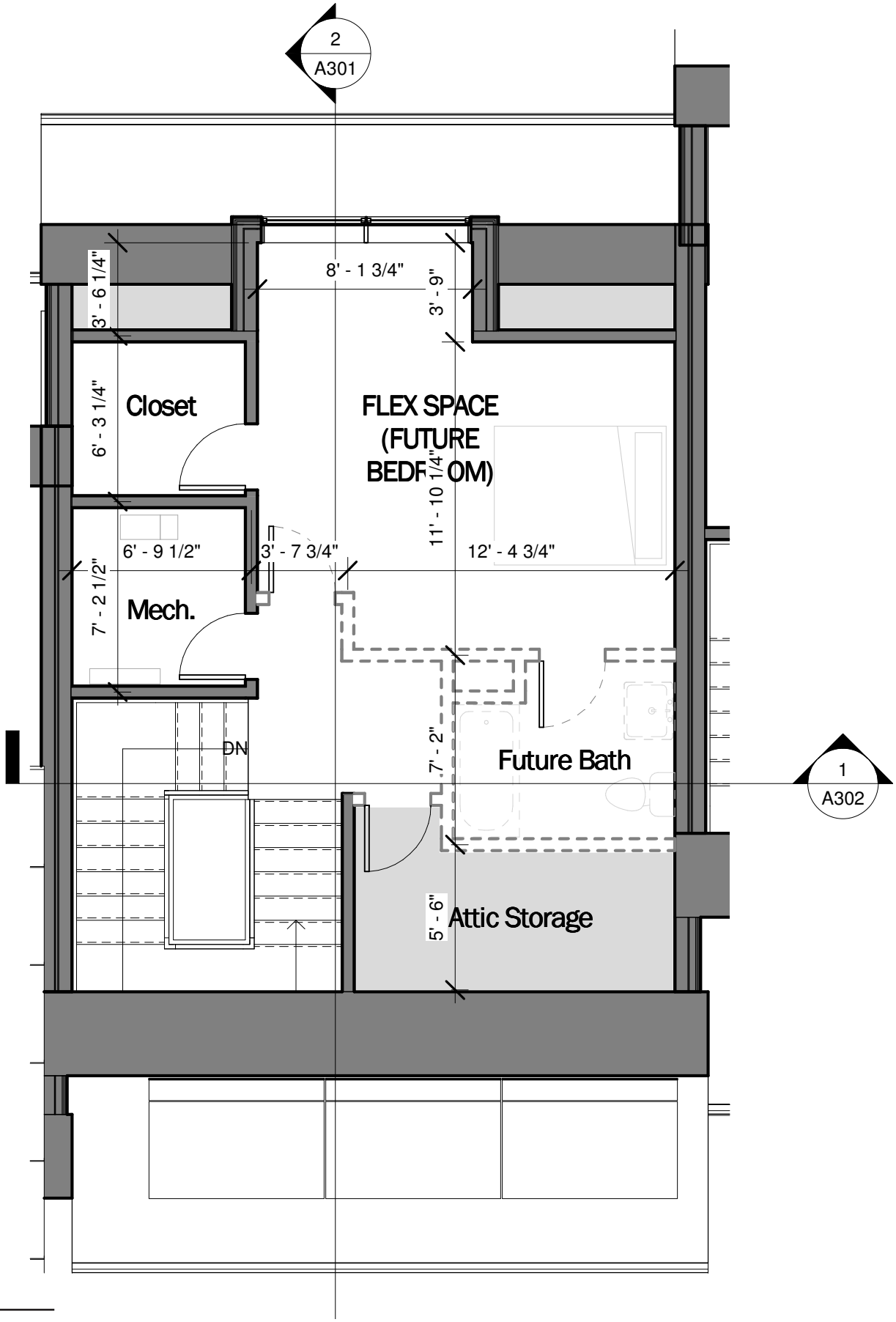


1: Level 2 Plan
Scale: 3/16"=1'

Single Unit- Level 2

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

A-120

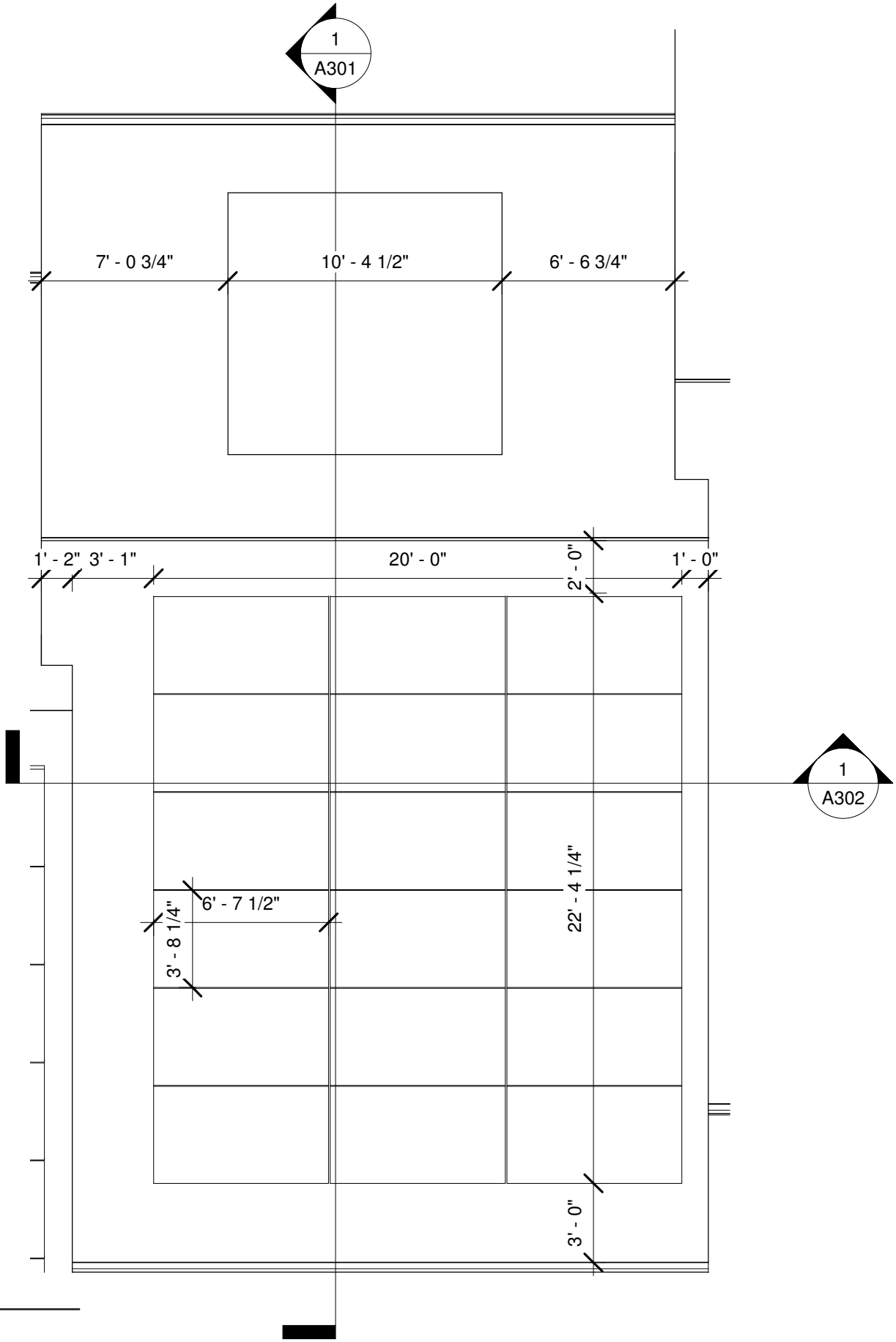


1: Floor 2.5 Plan
Scale: 3/16"=1'

Level 2.5

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

A-130

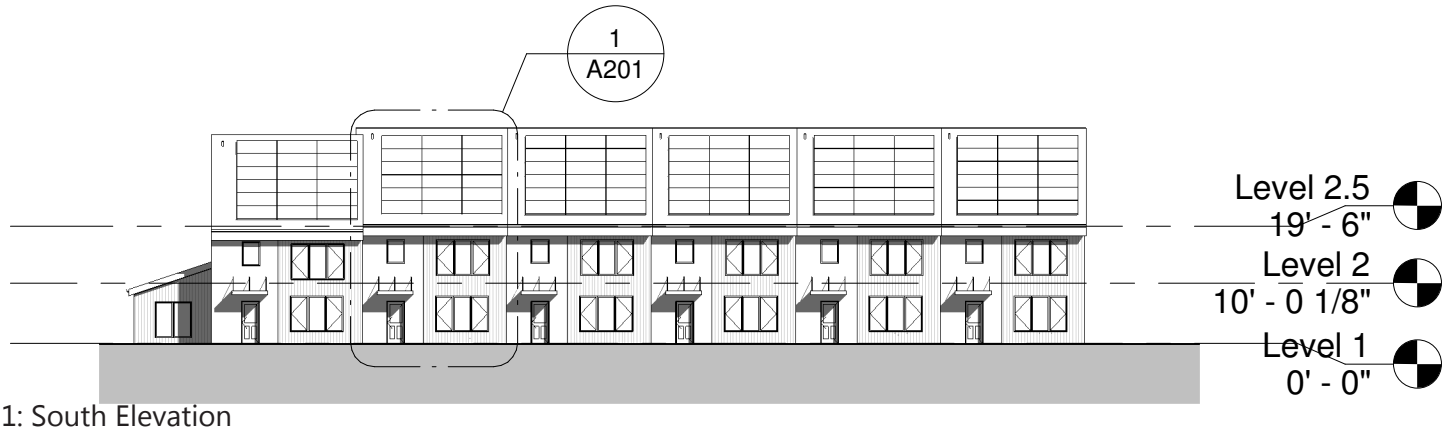


1: Roof Plan
Scale: 3/16"=1'

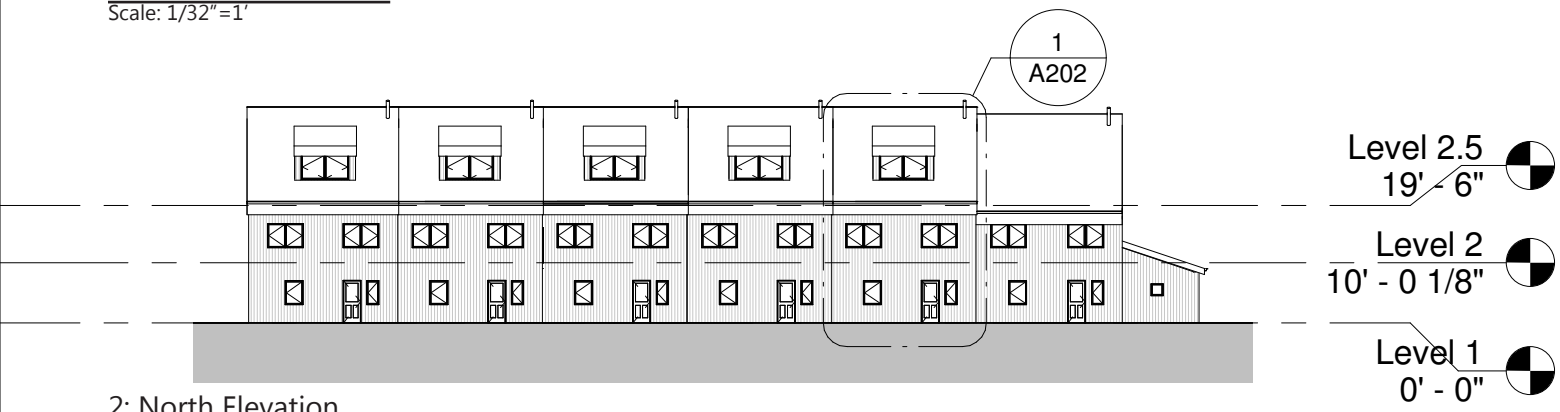
Roof

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

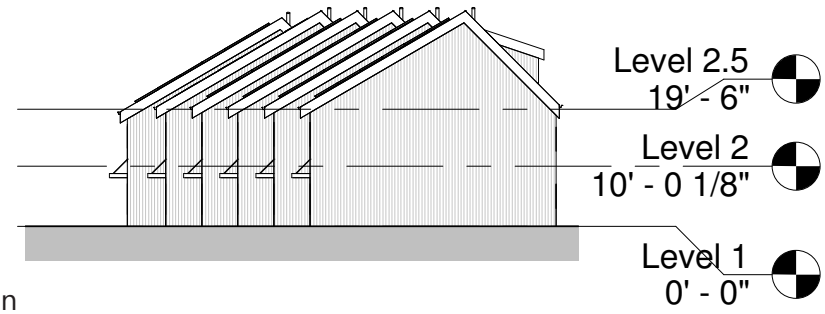
A-140



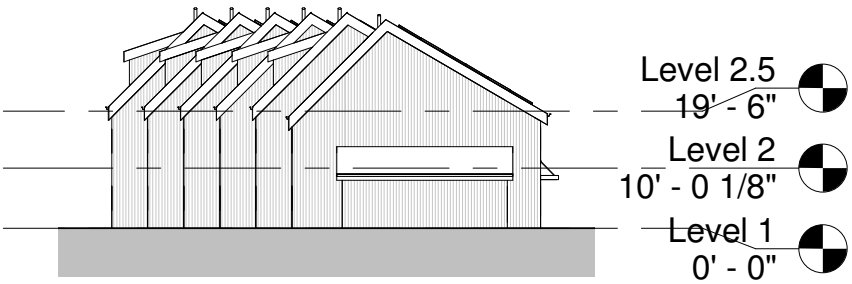
1: South Elevation
Scale: 1/32"=1'



2: North Elevation
Scale: 1/32"=1'



3: East-West Section
Scale: 1/32"=1'



4: West Facade
Scale: 1/32"=1'

Full Elevations

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

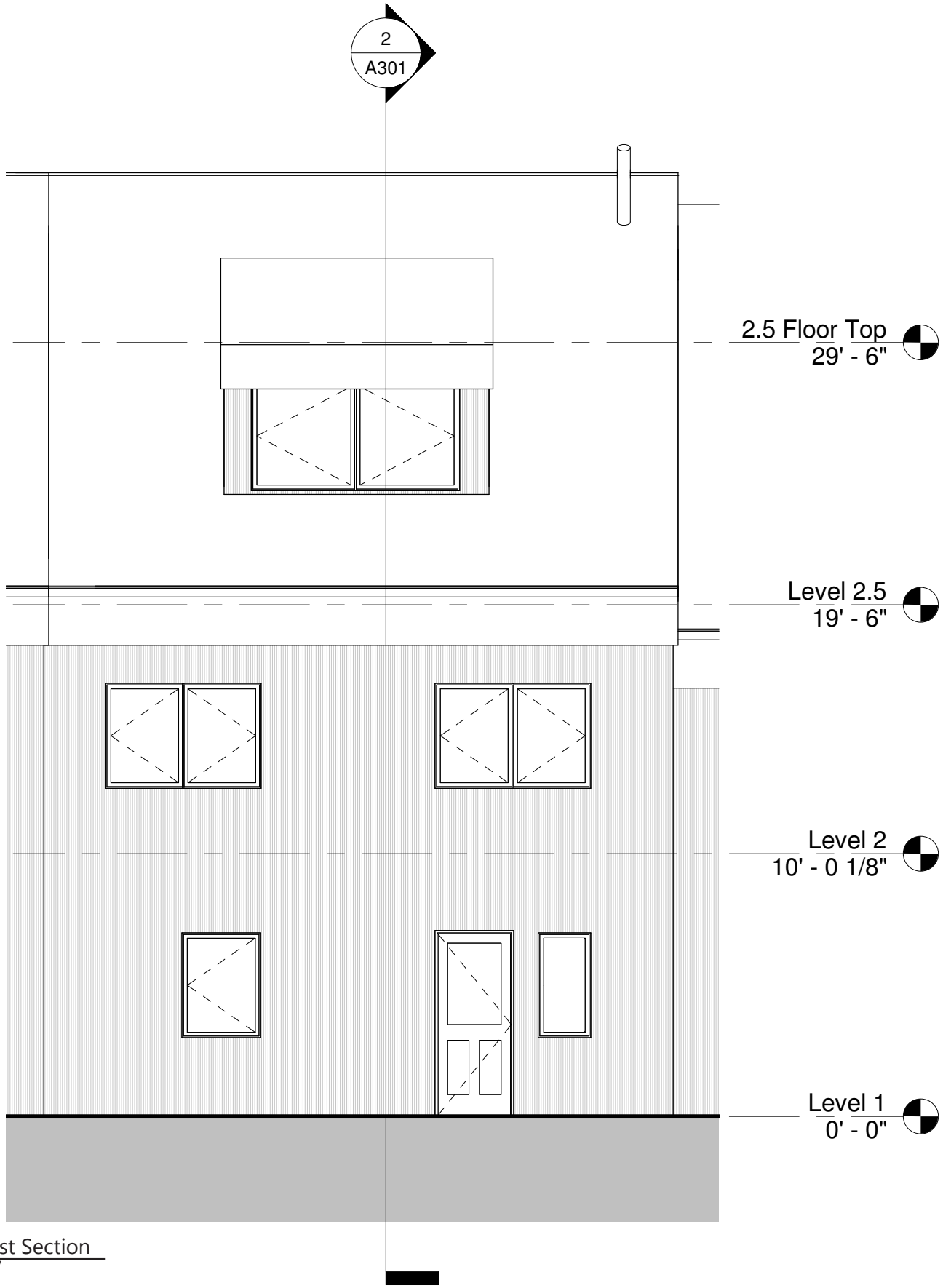
A-200

1: East-West Section
Scale: 1/32"=1'

South Elevation

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

A-201

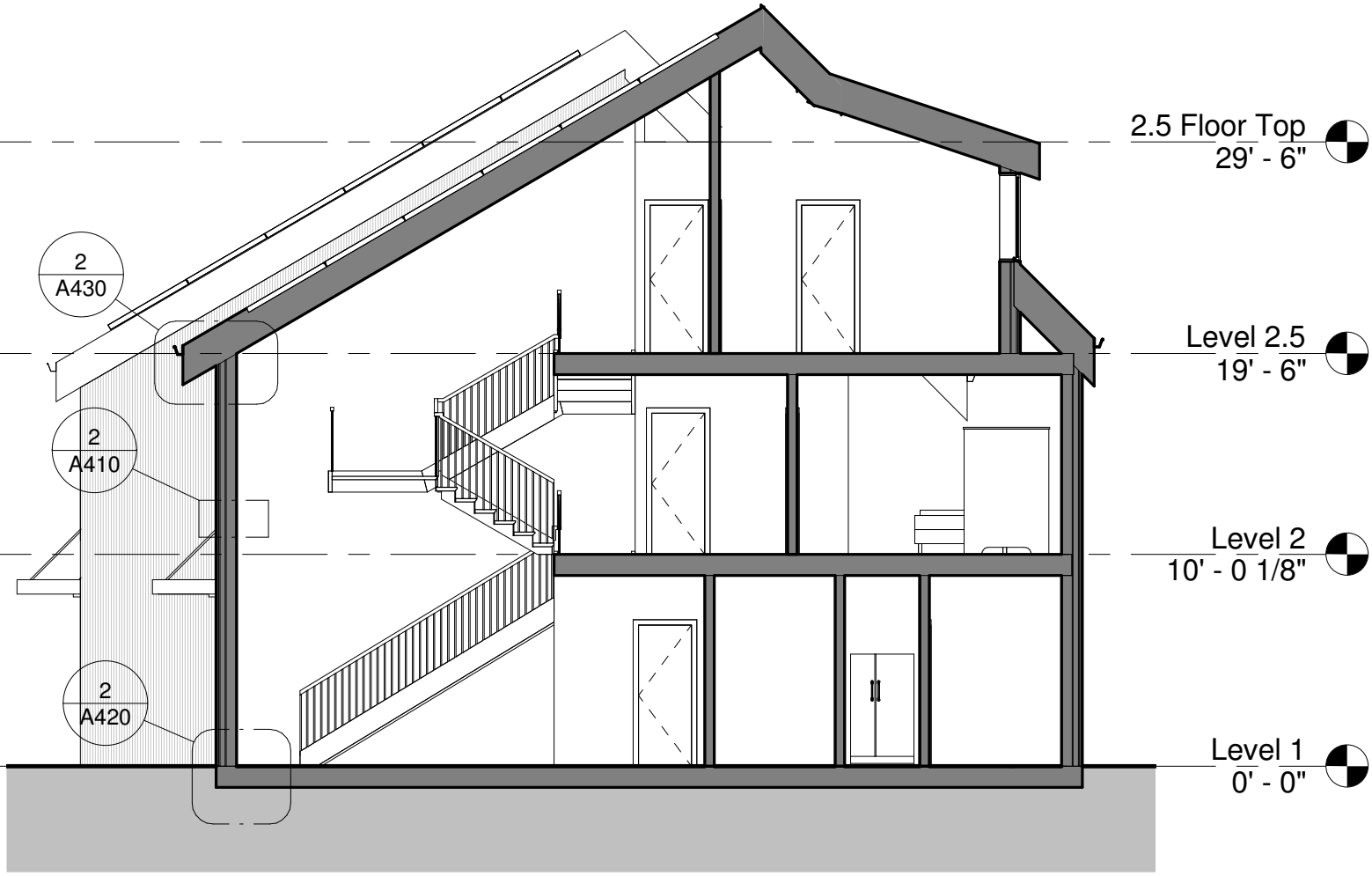


1: East-West Section
Scale: 1/32"=1'

North Elevation

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

A-102

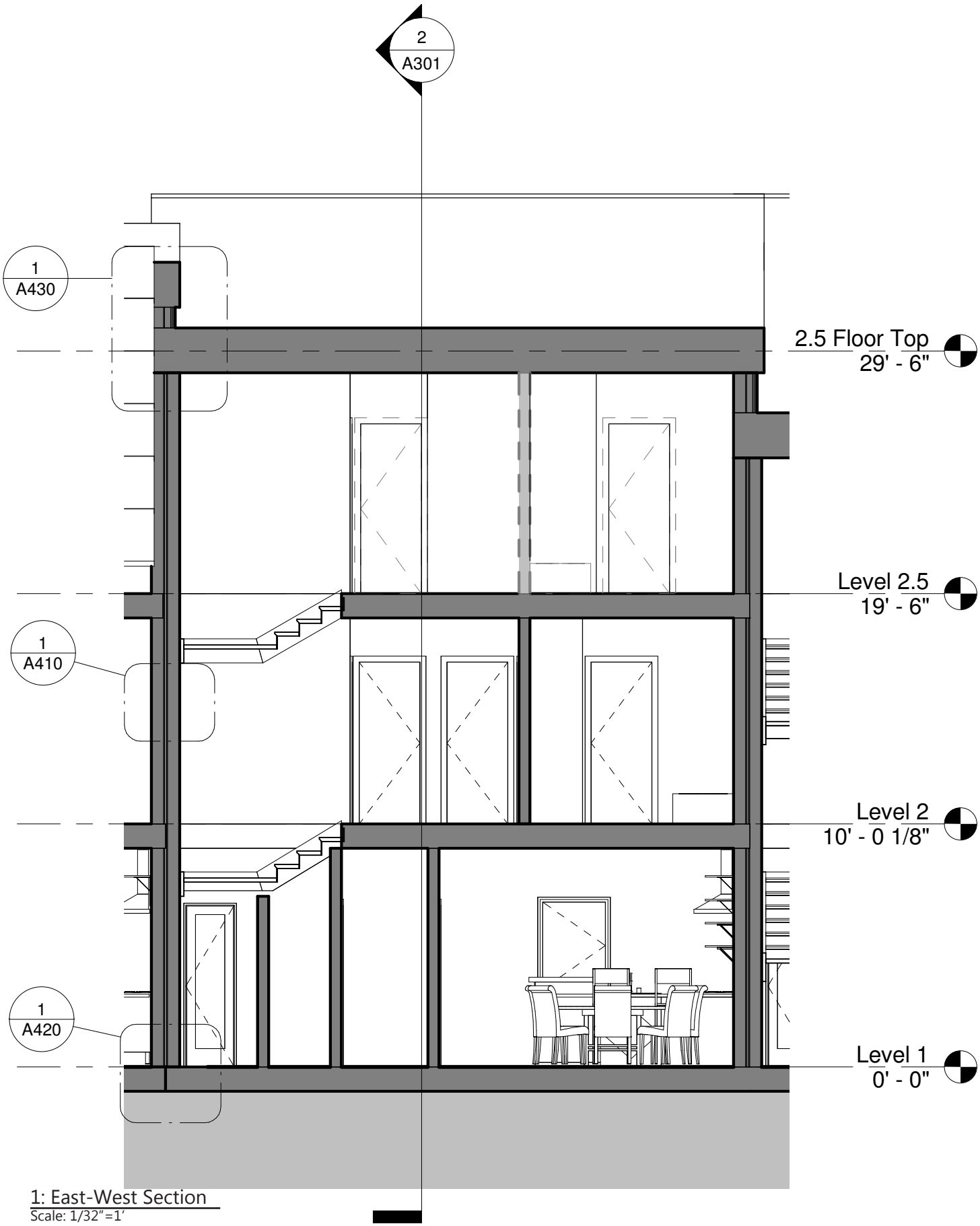


1: East-West Section
Scale: 1/32"=1'

North-South Section

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

A-301

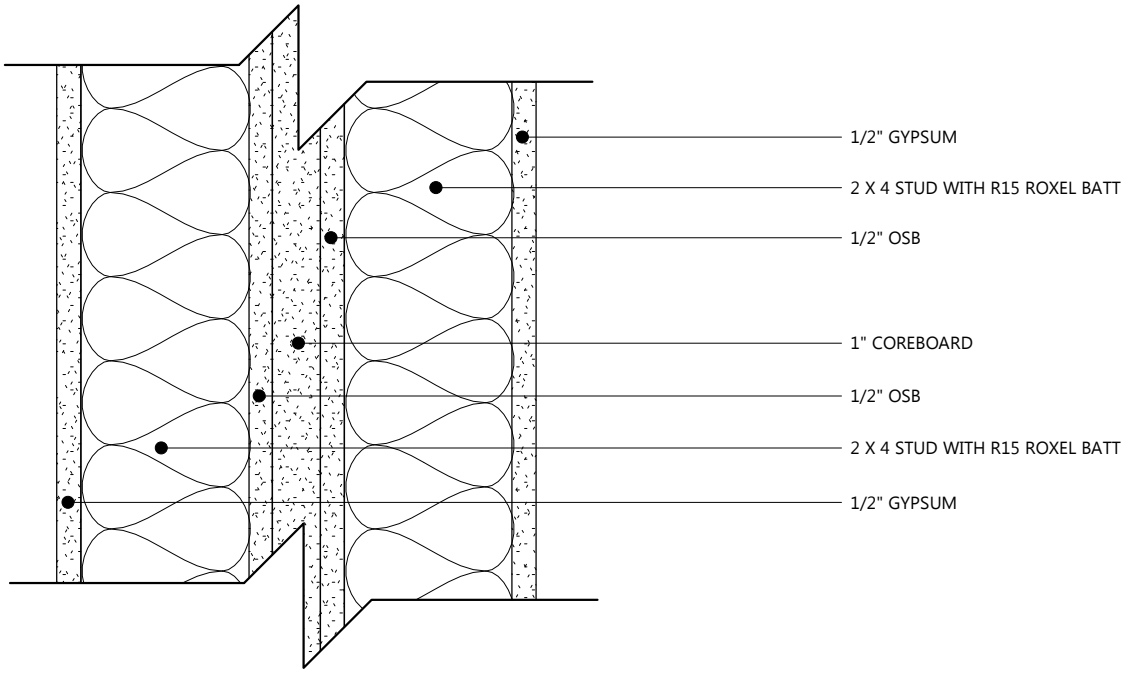


1: East-West Section
Scale: 1/32"=1'

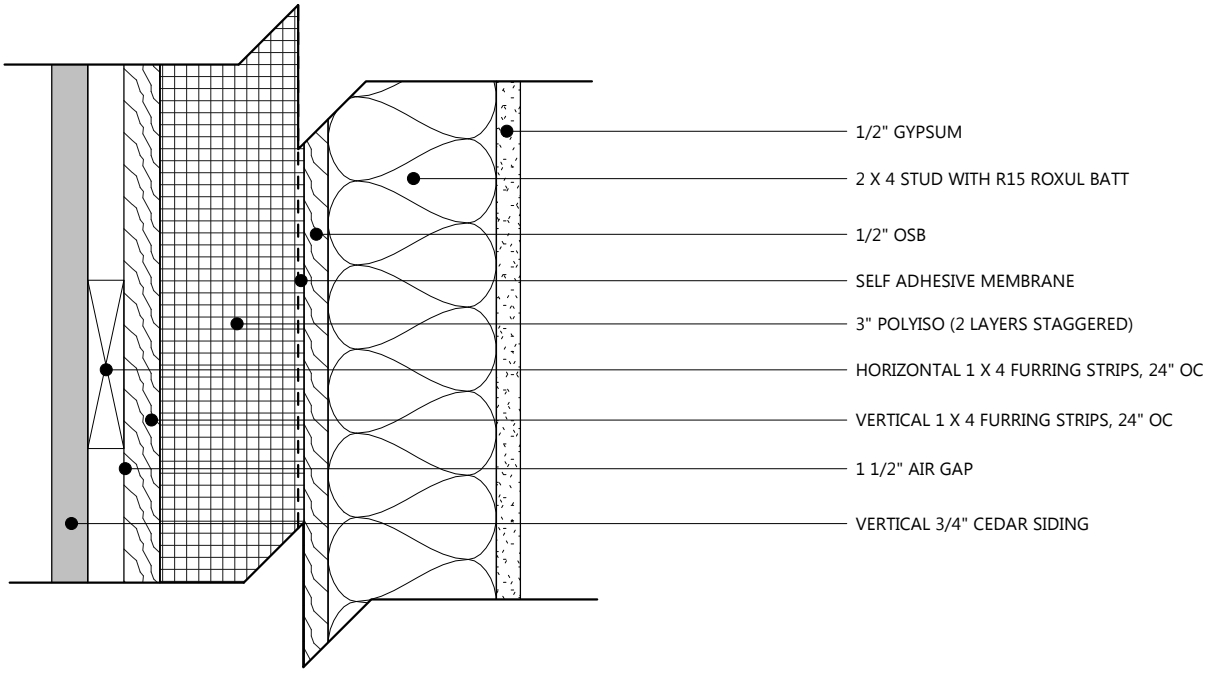
East-West Section

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

A-302



1: Party Wall
Scale: 3"=1'

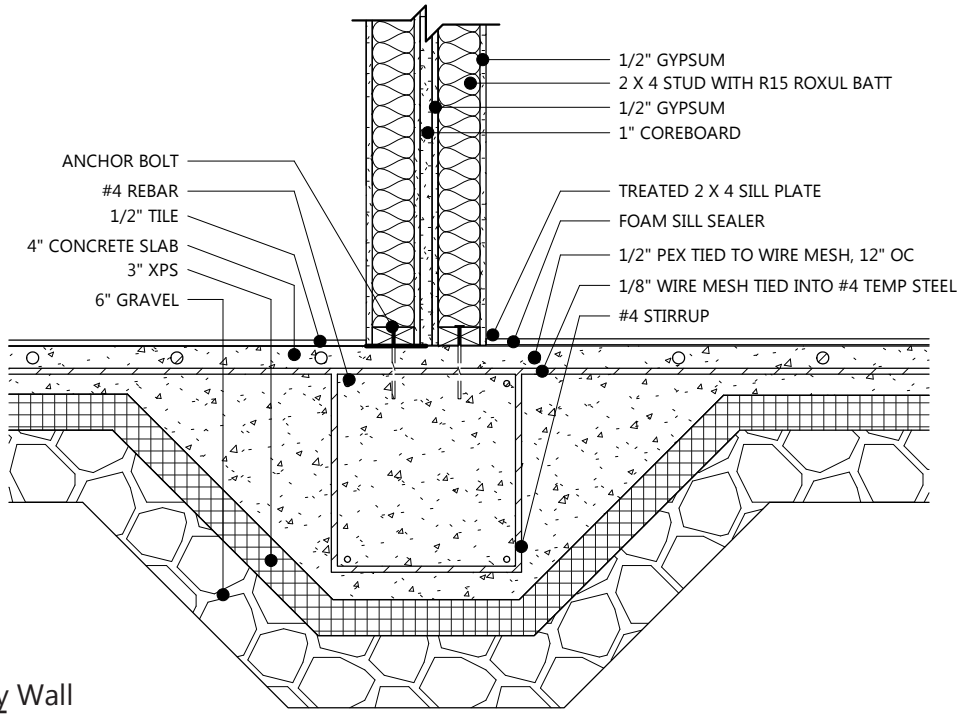


2: OptiMN Wall
Scale: 3"=1'

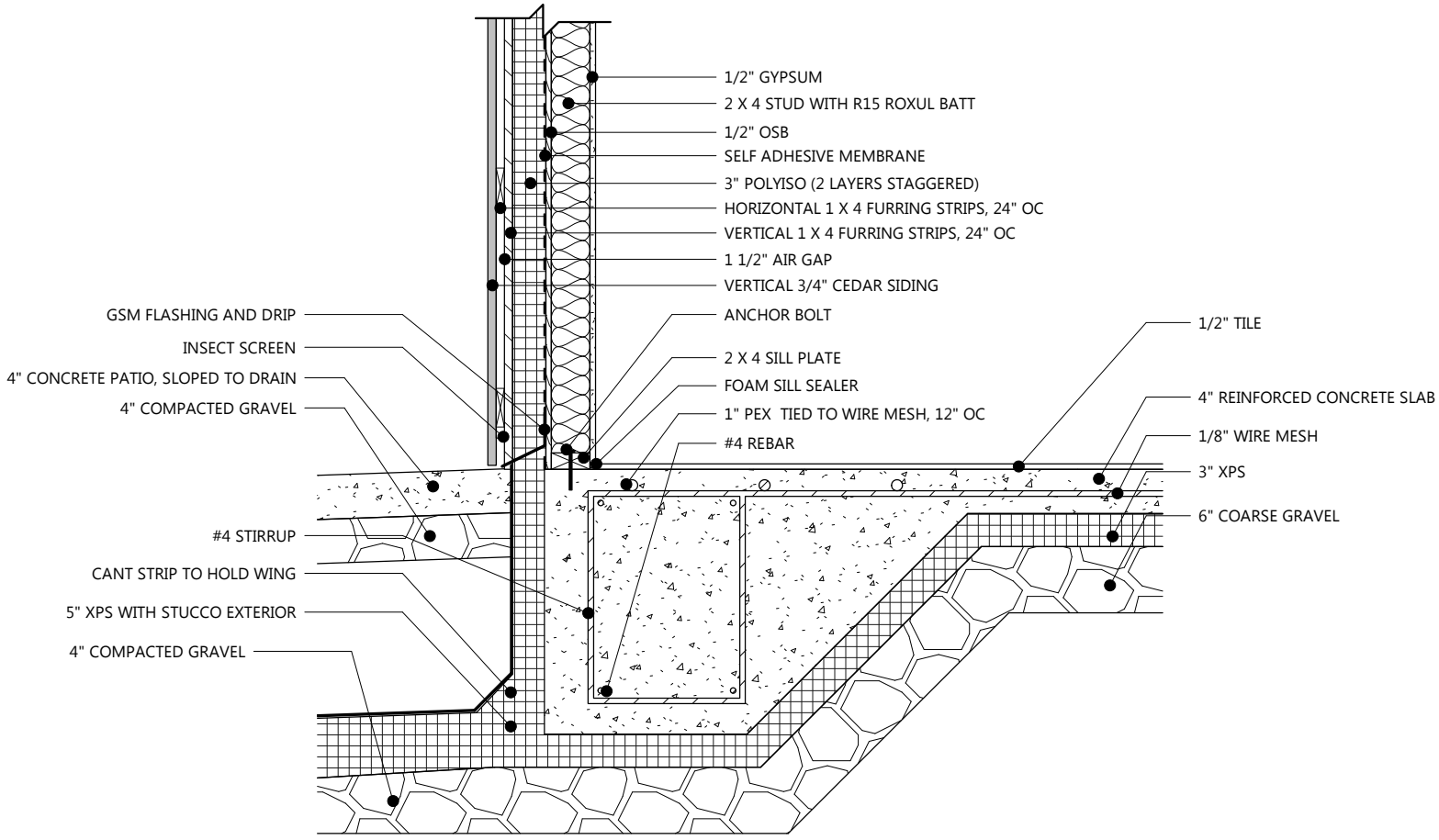
Wall Details

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

A-410



1: Foundation at Party Wall
Scale: 3/4"=1'

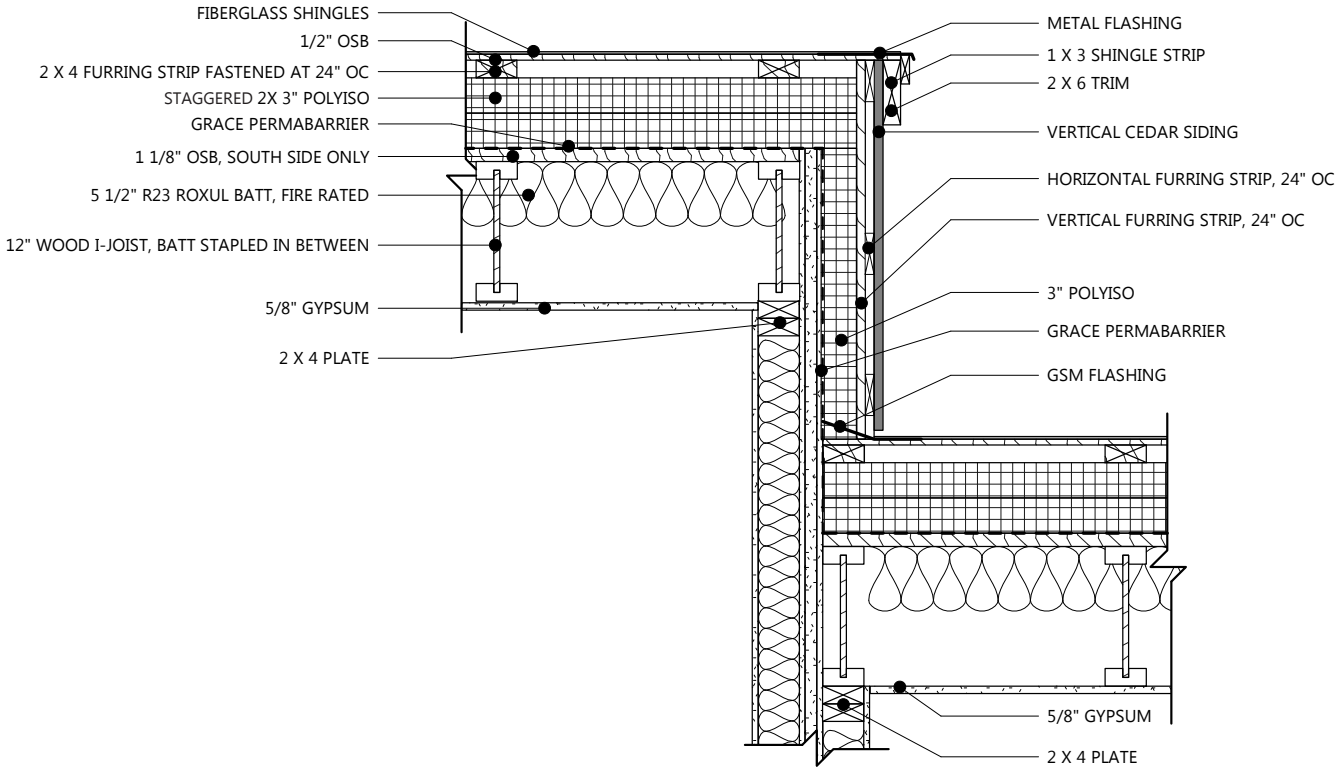


2: Foundation at Exterior Wall
NOTE: WING EXTENDS 4' FROM WALLS, 6' ON CORNERS
Scale: 3/4"=1'

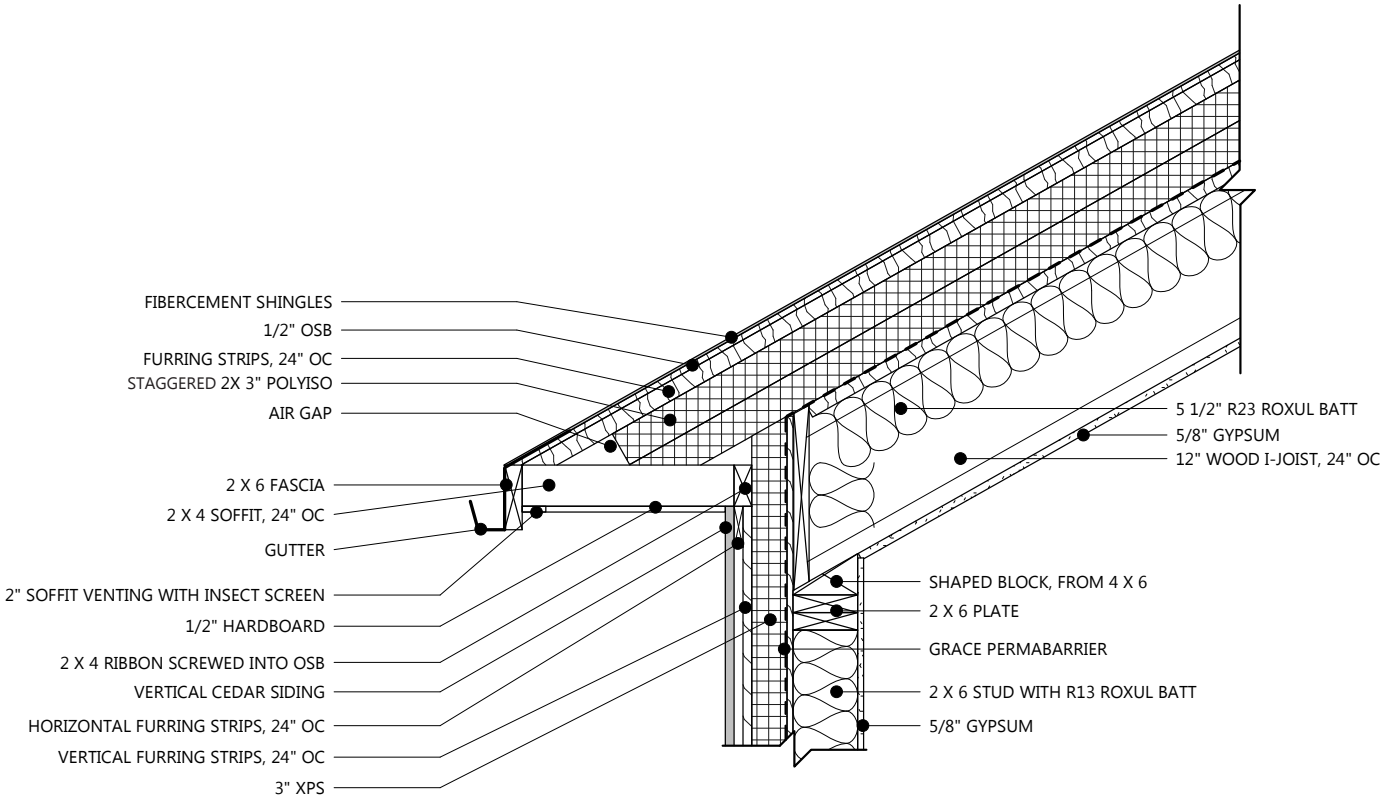
Foundation Details

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

A-420



1: Party Wall
Scale: 3/4"=1'

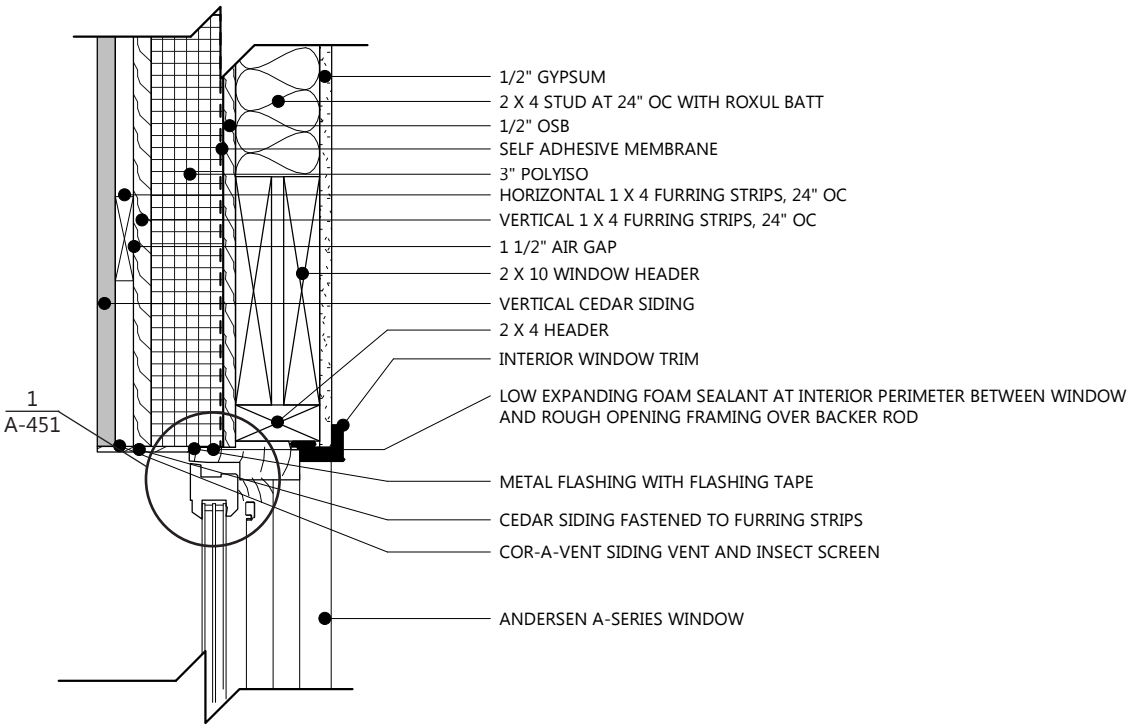


2: Roof Detail
Scale: 3/4"=1'

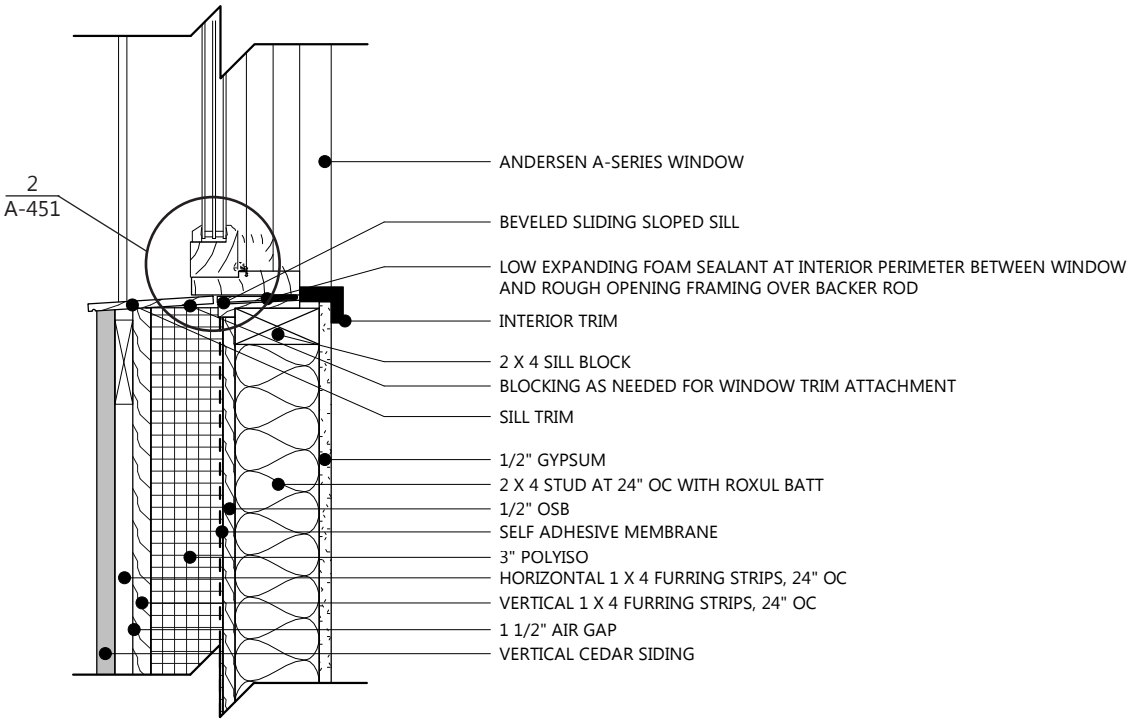
Roof Details

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

A-430



1: Window Head Detail
Scale: 1-1/2"=1'

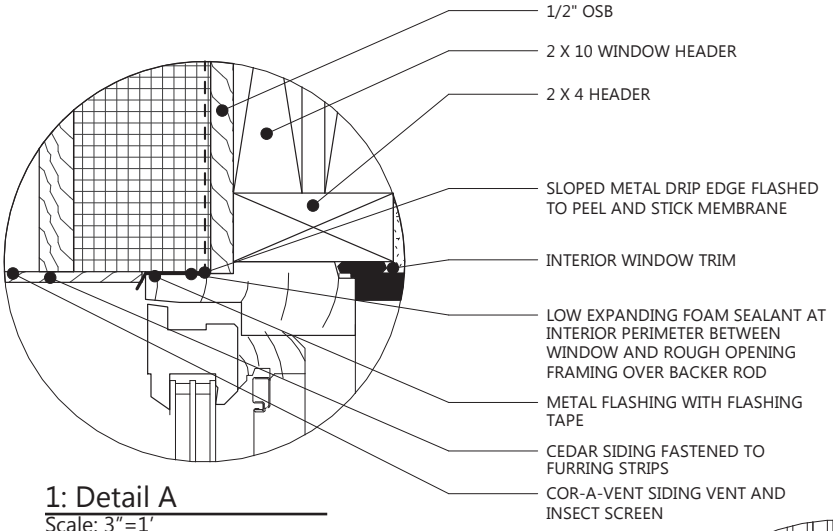


2: Window Seal Detail
Scale: 1-1/2=1'

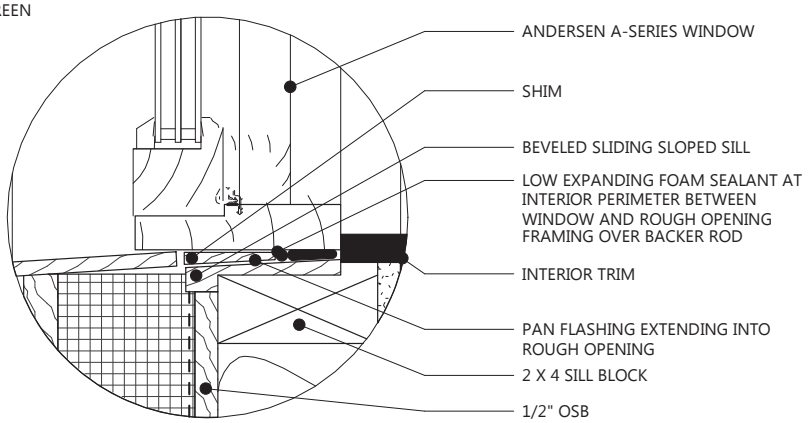
A-450

Window Details

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota



1: Detail A
Scale: 3″=1′

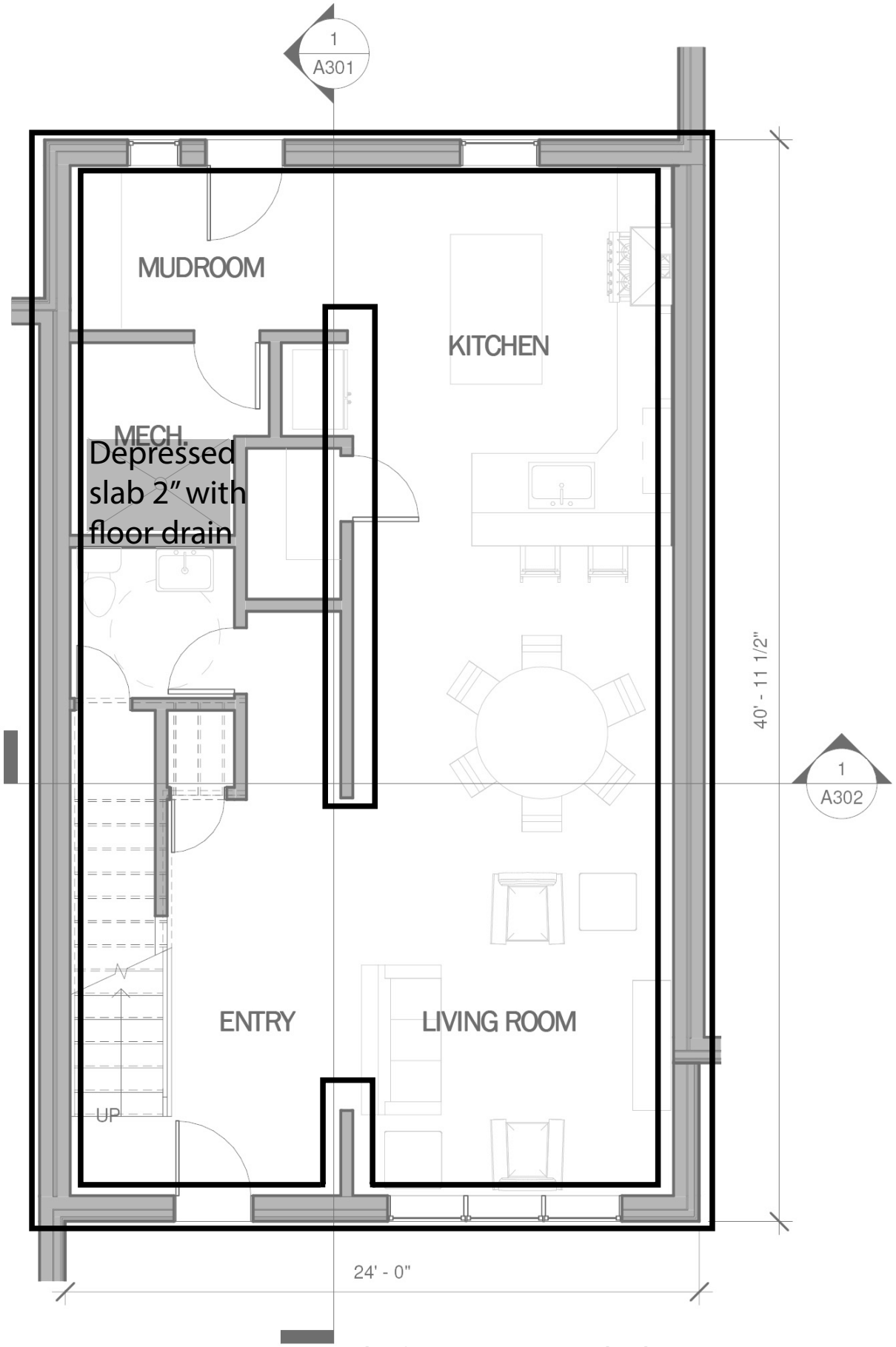


2: Detail B
Scale: 3″=1′

ID	Manufacturer	Series	Type	Rough Opening	Window Size	U-factor	SHGC	VT	Quantity
A	Andersen	A-Series Casement	Low E4 PassivSun Double Pane w/ Heatlock	3' 1"x6' 1"	3' x 6'	0.2	0.21	0.35	24
B	Andersen	A-Series Fixed	Low E4 PassivSun Double Pane w/ Heatlock	3' 1" x 6' 1"	3' x 6'	0.2	0.21	0.35	12
C	Andersen	A Series Sidelite	Low E4 PassivSun Double Pane w/ Heatlock	2' 11"	3' 7"	0.2	0.21	0.35	6
D	Andersen	A Series Fixed	Low E4 PassivSun Double Pane w/ Heatlock	3' 1" x 6' 1"	3' x 6'	0.2	0.21	0.35	1
E	Andersen	A-Series Casement	Low E4 Enhanced Triple Pane w/ Heatlock	3' 1" x 4' 1"	3' x 4'	0.24	0.36	0.44	30
F	Andersen	A-Series Fixed	Low E4 Enhanced Triple Pane w/ Heatlock	2' 1" x 4' 1"	2' x 4'	0.24	0.36	0.44	6
G	Andersen	A Series Sidelite	Low E4 Enhanced Triple Pane w/ Heatlock	2' 11" x 3' 7"	2' 10" x 3' 6"	0.24	0.36	0.44	6
H	Andersen	A Series Casement	Low E4 Enhanced Triple Pane w/ Heatlock	4' 1" x 5' 1"	4' x 5'	0.24	0.36	0.44	6

Window Schedule

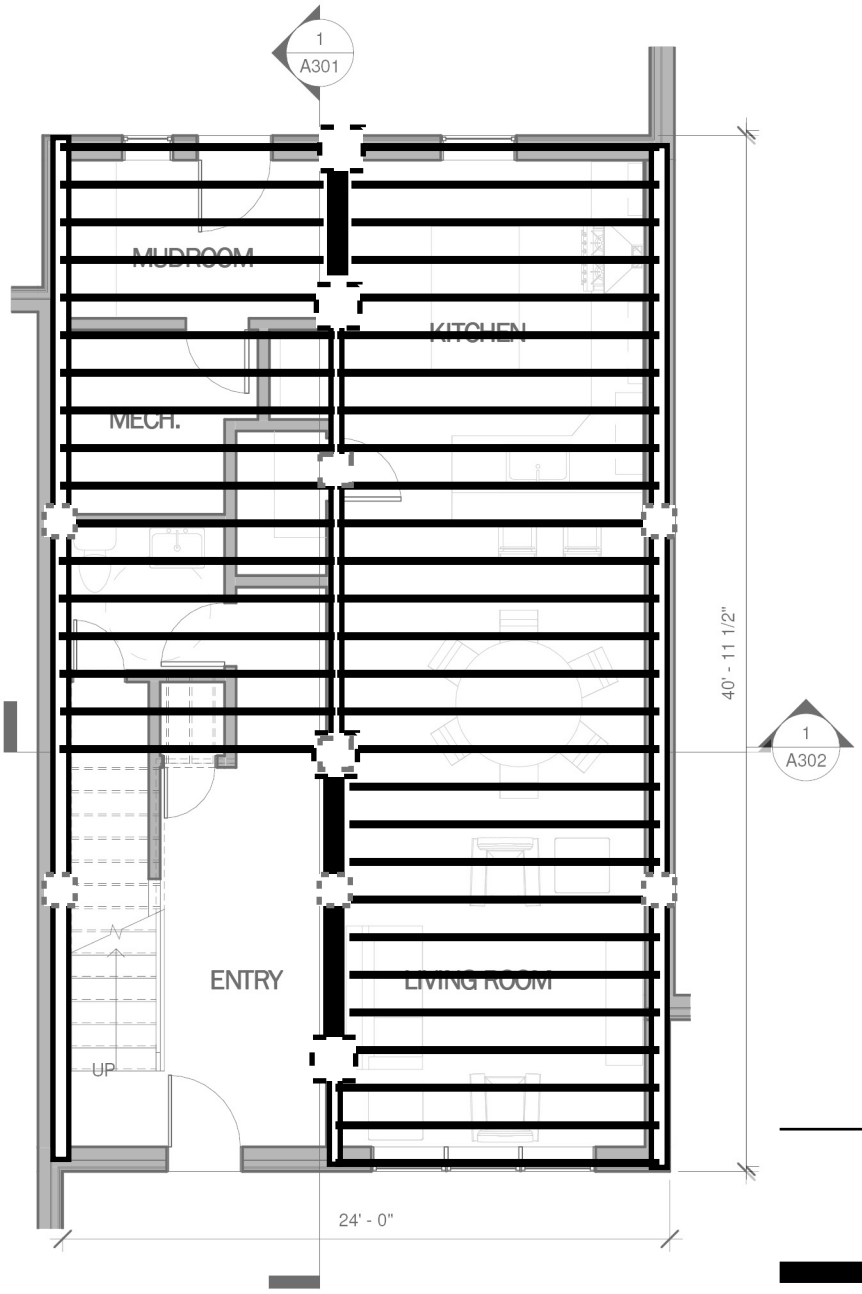
Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota



Foundation Structural Plan

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

S-100



Point Load Bearing in the wall - from level above

Point LoadBearing in the wall

2x8 Wood Floor Joist 24" o.c.

Transfer Beam

12" Open Web Truss 24" o.c.

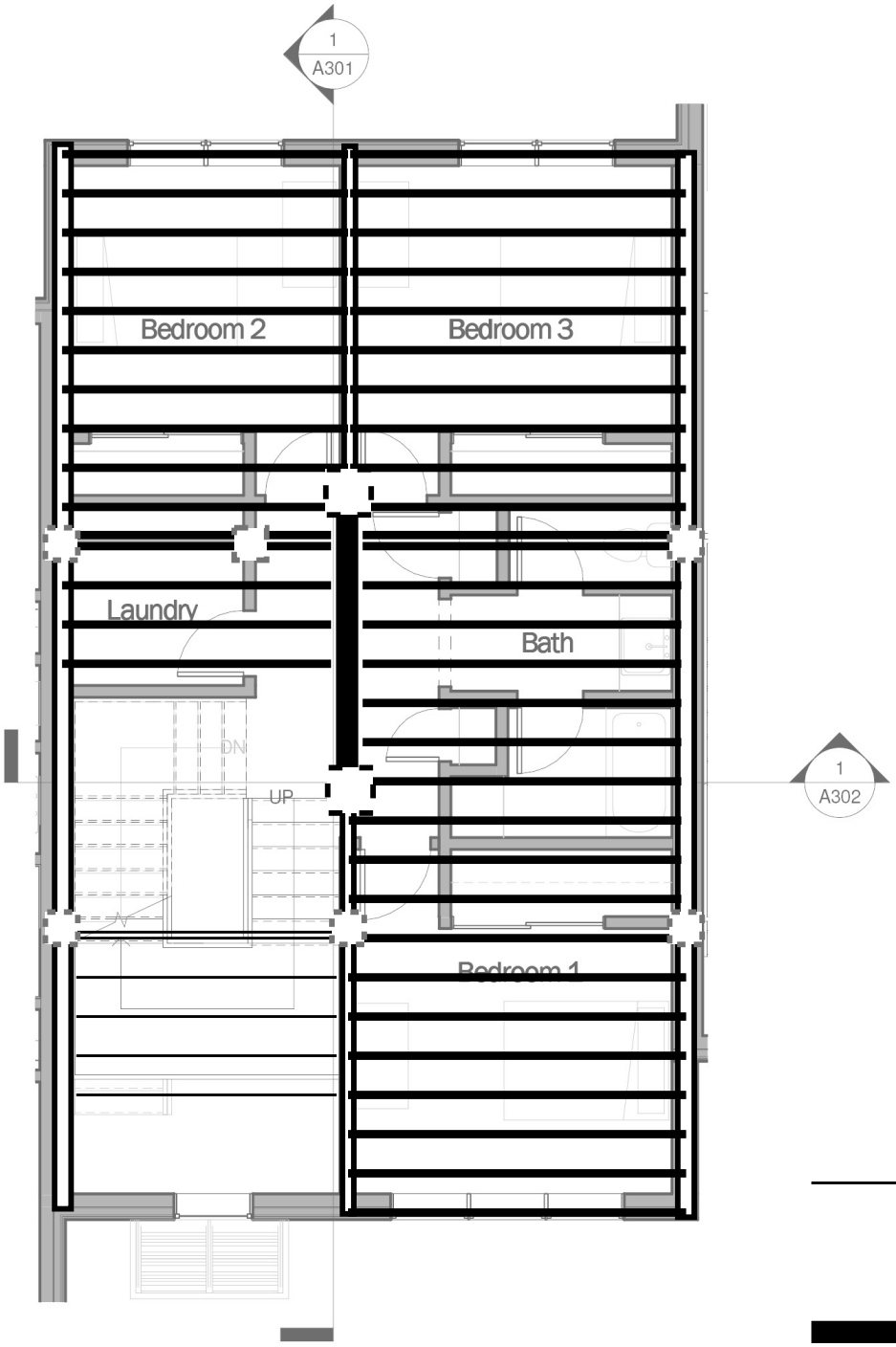
11 7/8" I-Joist Rafter 24" o.c.

Bearing Wall

Level 1 Structural Plan

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

S-110



Point Load Bearing in the wall - from level above

Point LoadBearing in the wall

2x8 Wood Floor Joist 24" o.c.

Transfer Beam

12" Open Web Truss 24" o.c.

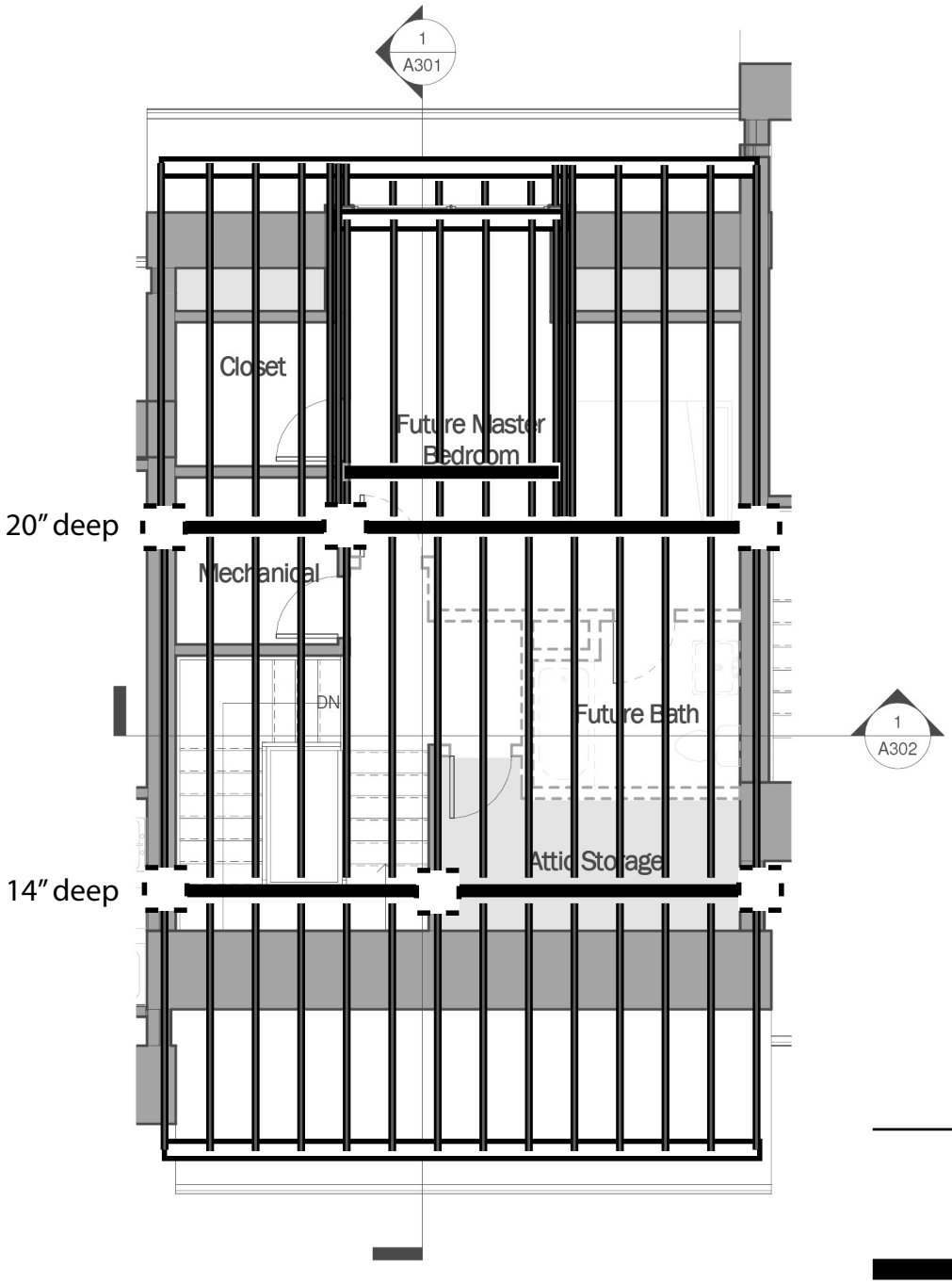
11 7/8" I-Joist Rafter 24" o.c.

Bearing Wall

Level 2 Structural Plan

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

S-140



Point Load Bearing in the wall - from level above

Point LoadBearing in the wall

2x8 Wood Floor Joist 24" o.c.

Transfer Beam

12" Open Web Truss 24" o.c.

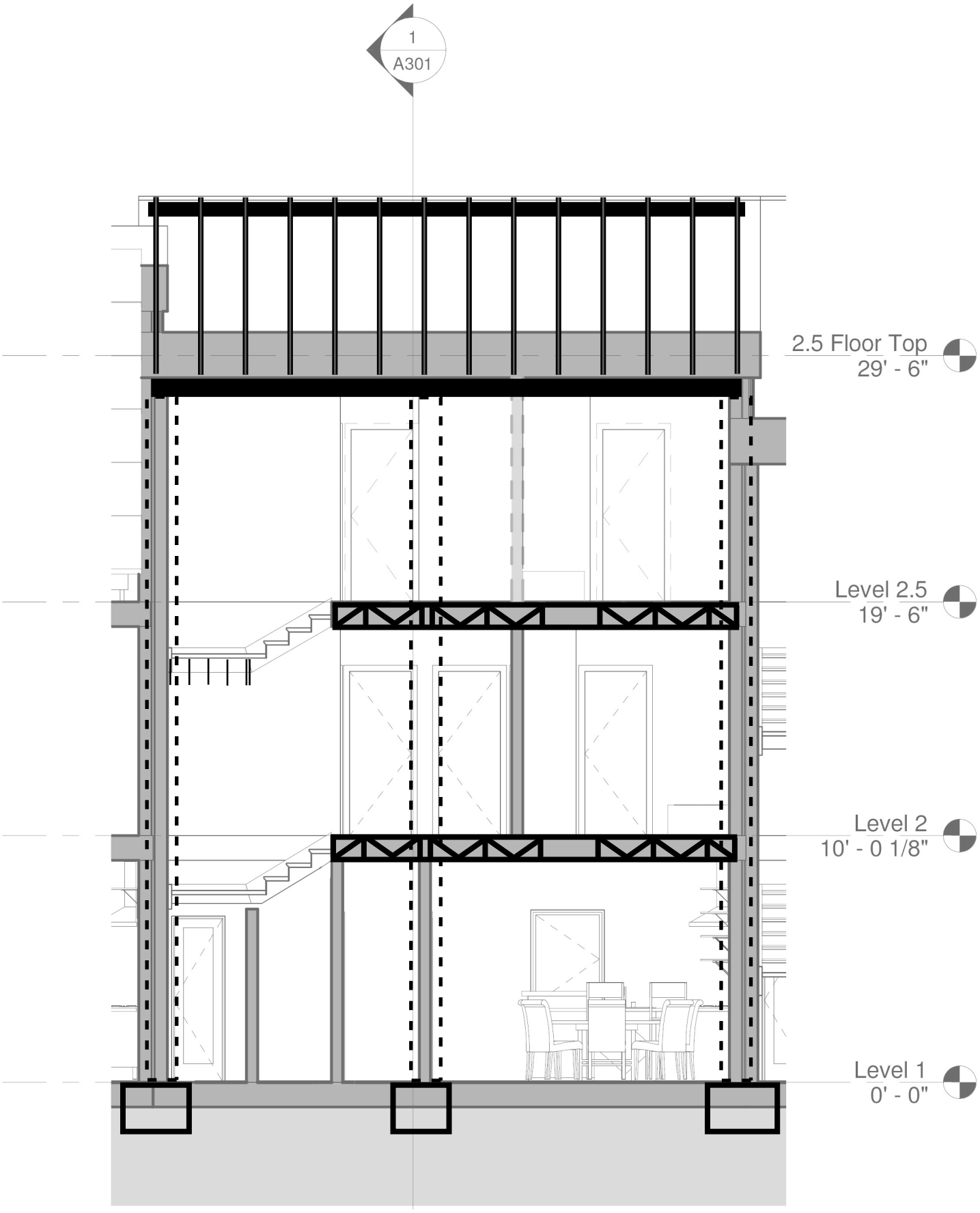
11 7/8" I-Joist Rafter 24" o.c.

Bearing Wall

Level 2.5 Structural Plan

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

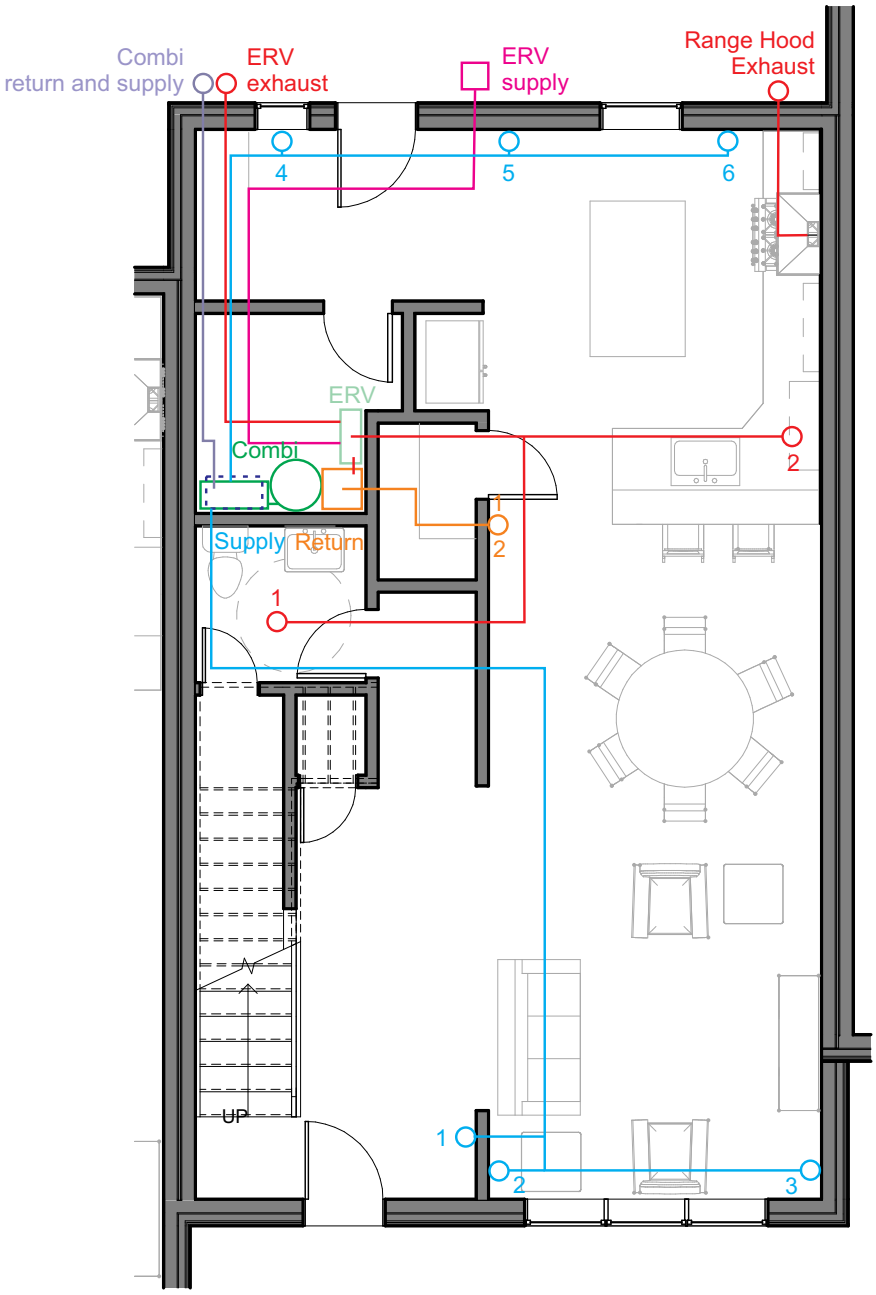
S-130



Structural Section

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

S-400

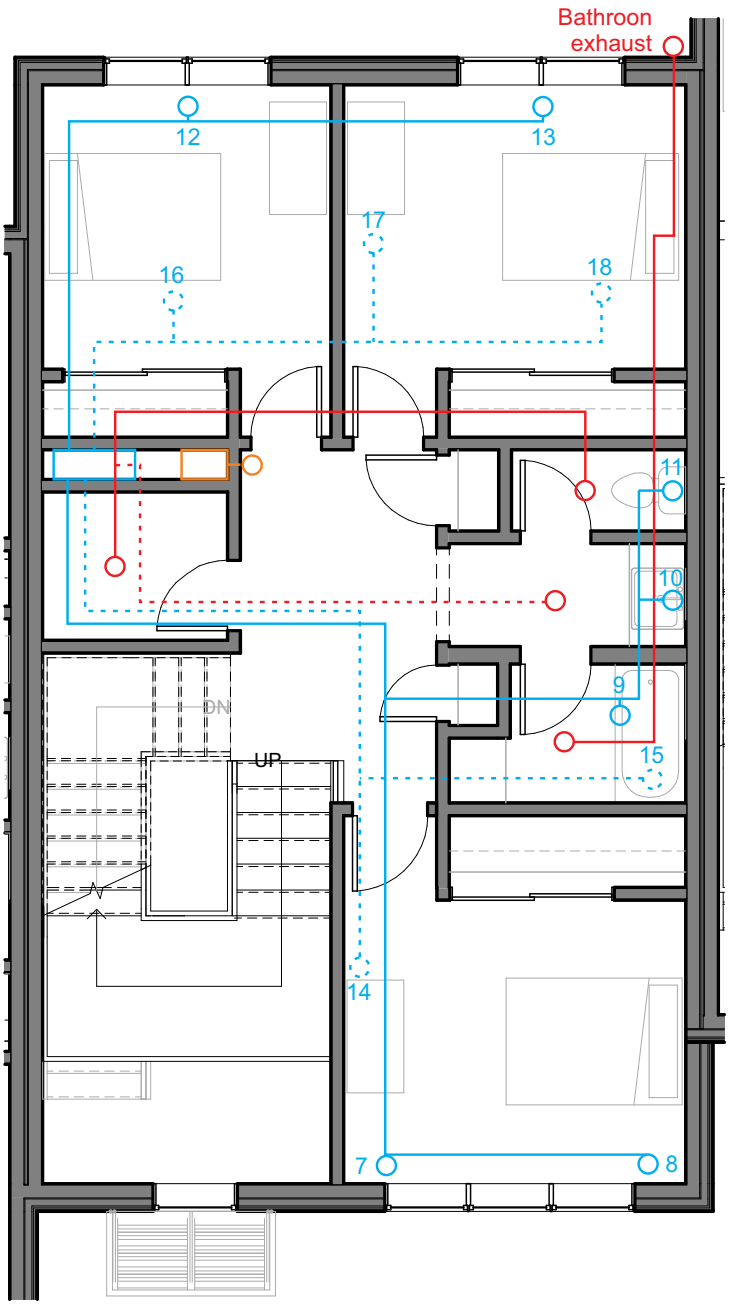


Air supply
Return
Exhaust
ERV
Combi System
Filter
Air Handling Unit (AHU)

Level 1 Mechanical

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

M-110

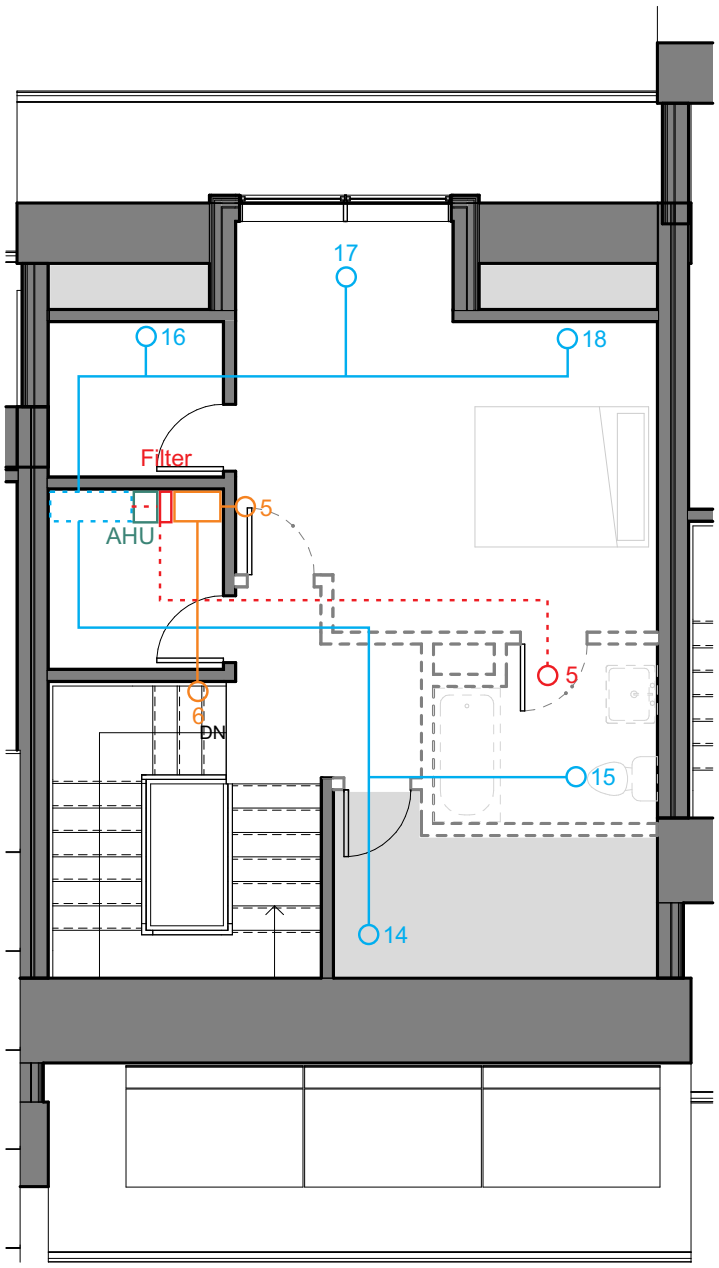


Air supply
Return
Exhaust
ERV
Combi System
Filter
Air Handling Unit (AHU)

Level 2 Mechanical

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

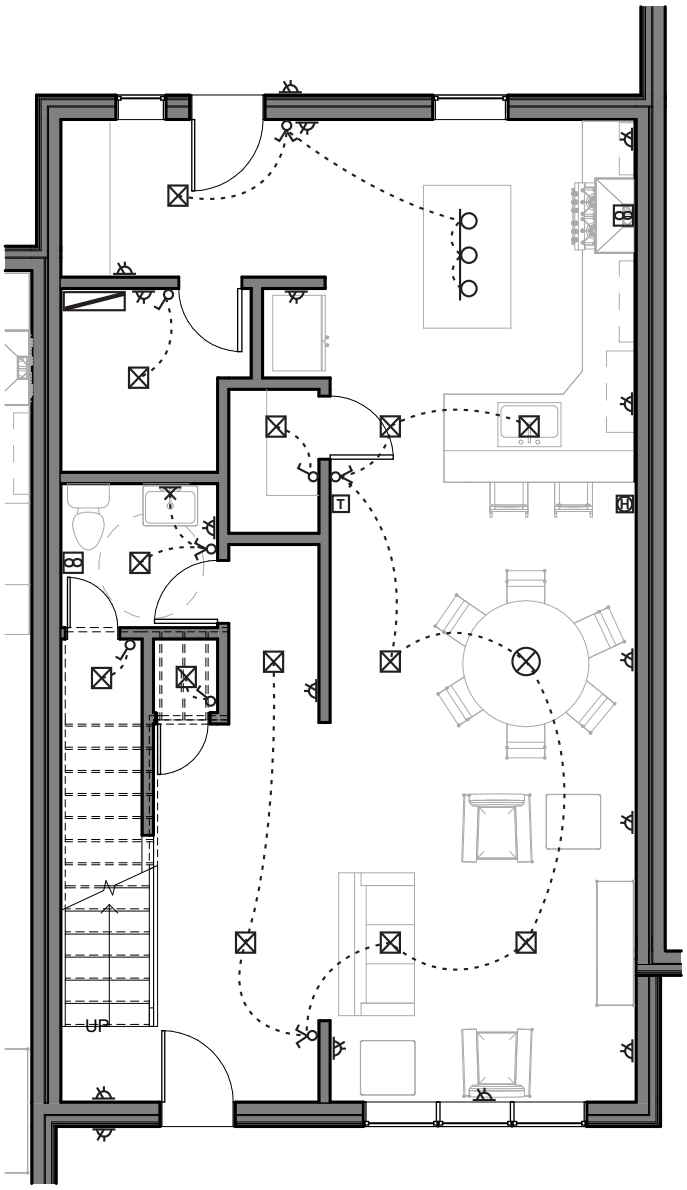
M-120



Air supply
Return
Exhaust
ERV
Combi System
Filter
Air Handling Unit (AHU)

Level 2.5 Mechanical

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

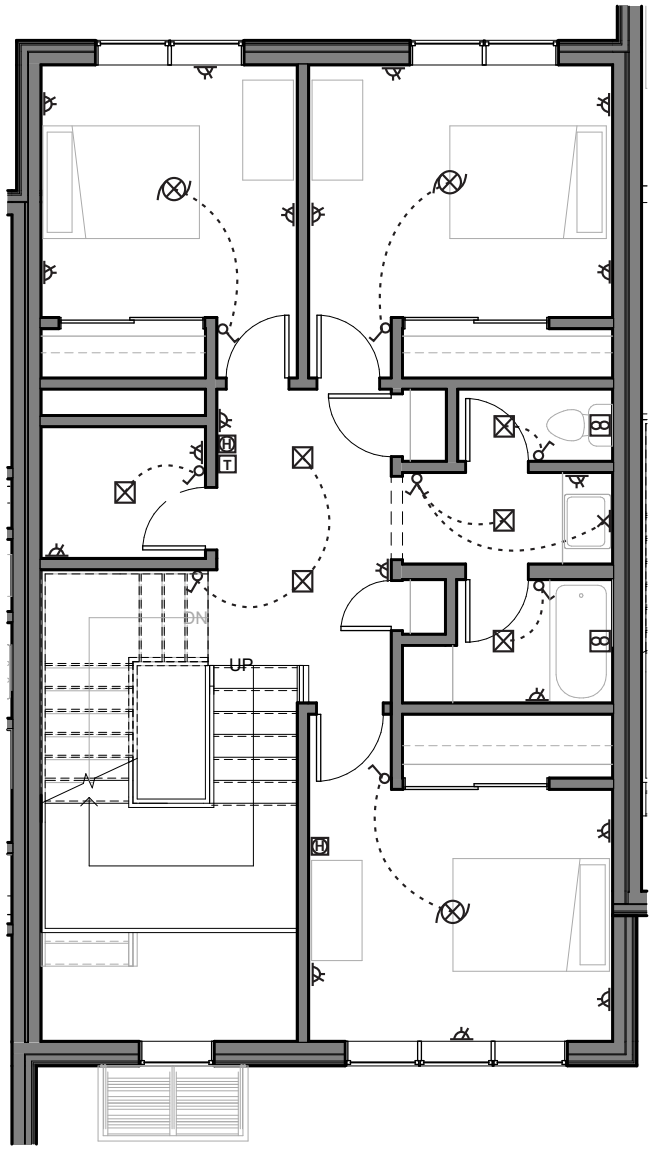


Electrical panel
Single switch
Double switch
Double outlet
Wall-mounted light
Recessed light
Exhaust fan
Programmable thermostat
Smoke/carbon monoxide detector
Linear pendant lights
Pendant light
Ceiling fan

Note: At least one smoke detector per floor will be a combination of smoke and carbon monoxide detector, located in a common area, and within 10' of all bedroom doors.

Level 1 Electrical and Lighting

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

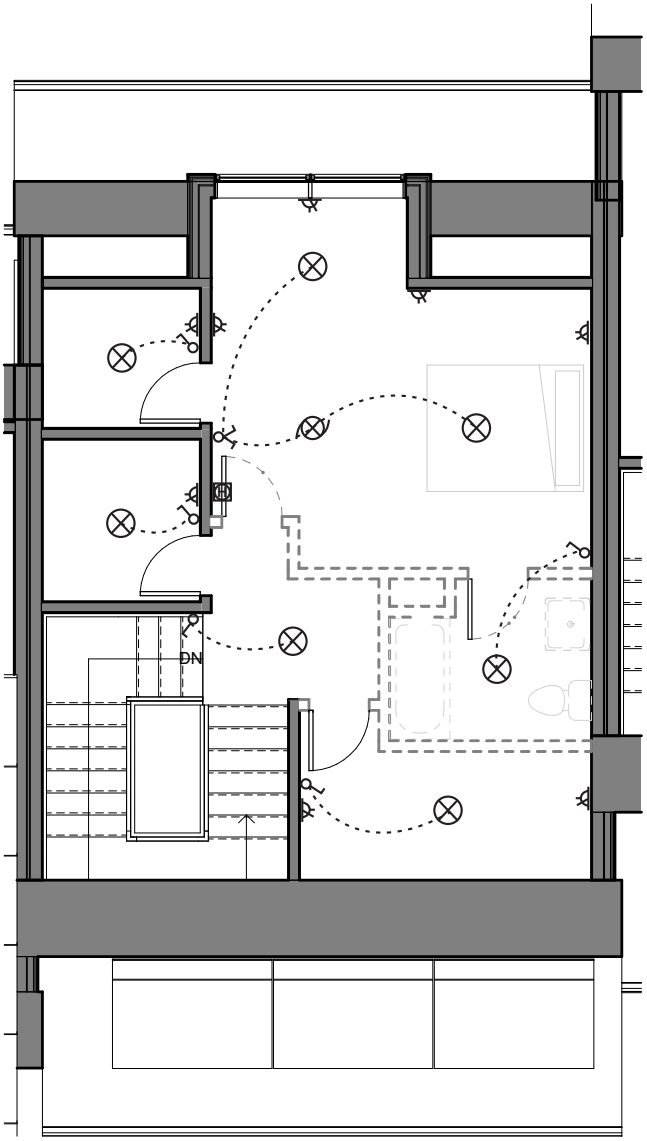


Electrical panel
Single switch
Double switch
Double outlet
Wall-mounted light
Recessed light
Exhaust fan
Programmable thermostat
Smoke/carbon monoxide detector
Linear pendant lights
Pendant light
Ceiling fan

Note: At least one smoke detector per floor will be a combination of smoke and carbon monoxide detector, located in a common area, and within 10' of all bedroom doors.

Level 2 Electrical and Lighting

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

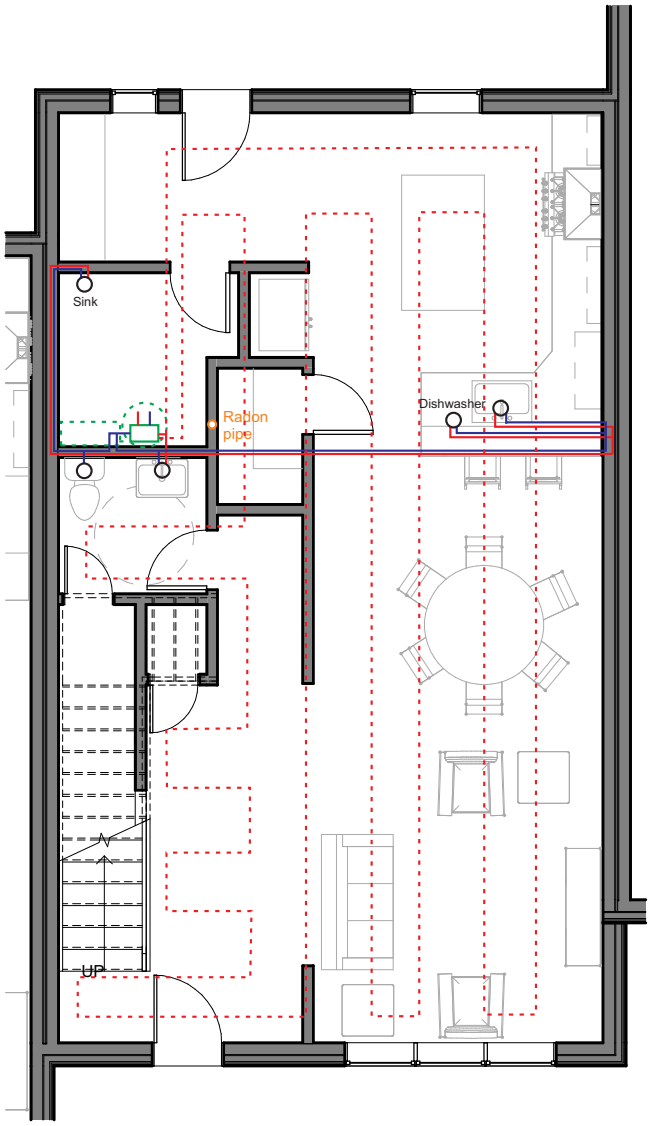


Electrical panel
Single switch
Double switch
Double outlet
Wall-mounted light
Recessed light
Exhaust fan
Programmable thermostat
Smoke/carbon monoxide detector
Linear pendant lights
Pendant light
Ceiling fan

Note: At least one smoke detector per floor will be a combination of smoke and carbon monoxide detector, located in a common area, and within 10' of all bedroom doors.

Level 2.5 Electrical and Lighting

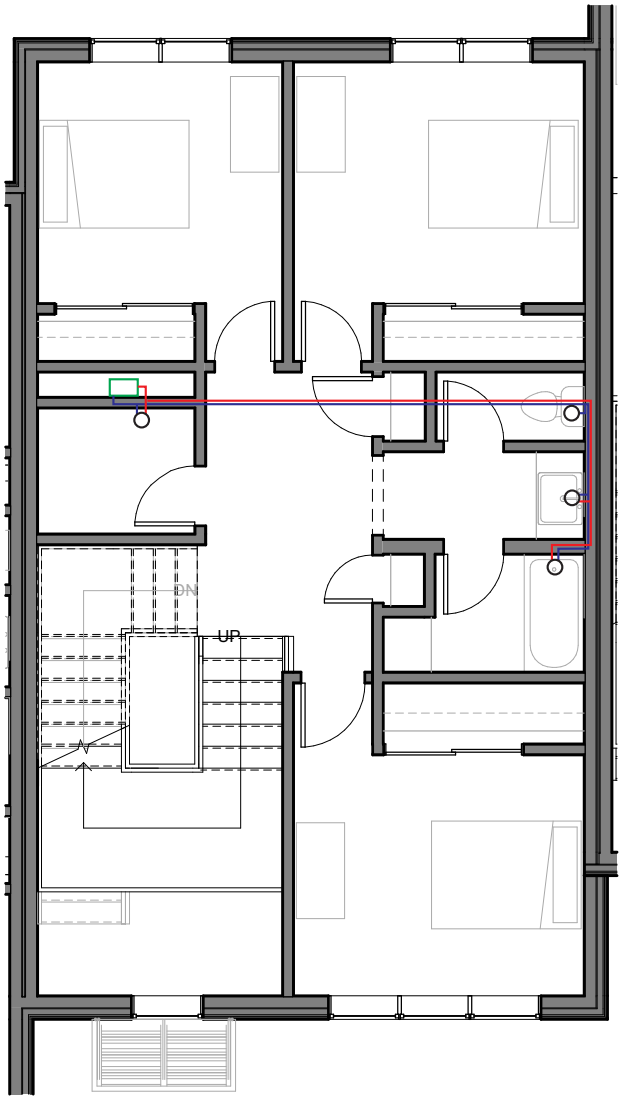
Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota



Level 1 Plumbing

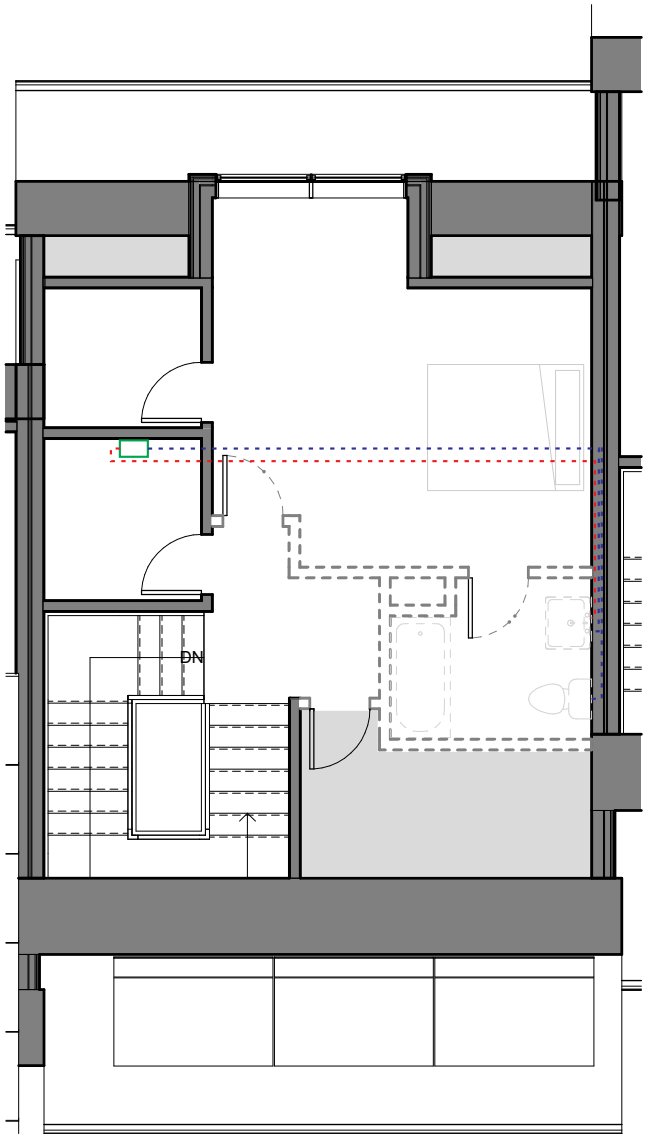
Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

P-110



Level 2 Plumbing

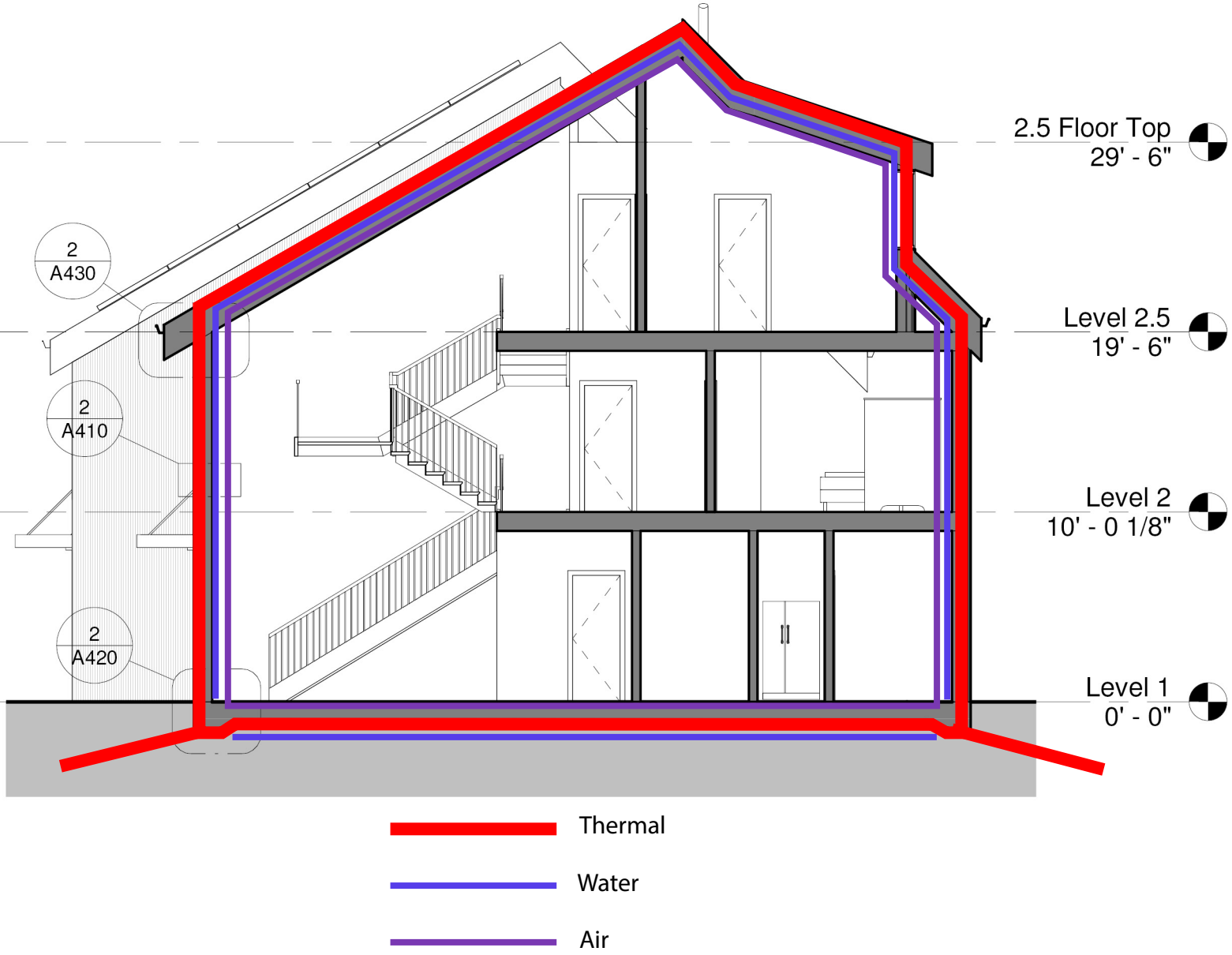
Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota



Cold water
Hot water
Combi System
Radiant Heating
Projected cold water plumbing for un-basement
Projected hot water plumbing for un-basement

Level 2.5 Plumbing

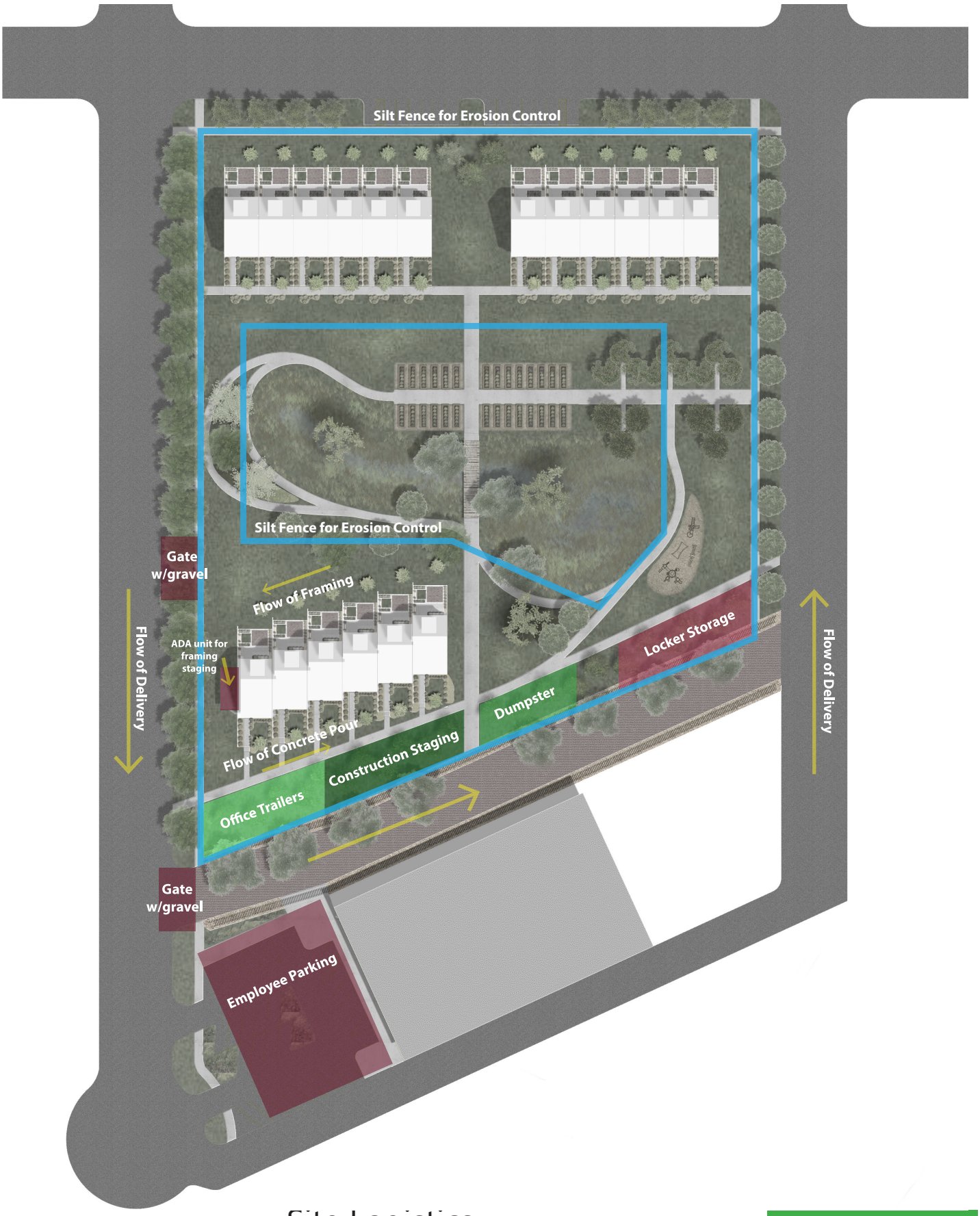
Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota



Full Building "Pen Test"

Bassett Creek ReGen Home
1401-1499 Currie Street W
Minneapolis, Minnesota

G-110



Site Logistics

Bassett Creek ReGen Home
1401-1499 Currie Street
Minneapolis, Minnesota

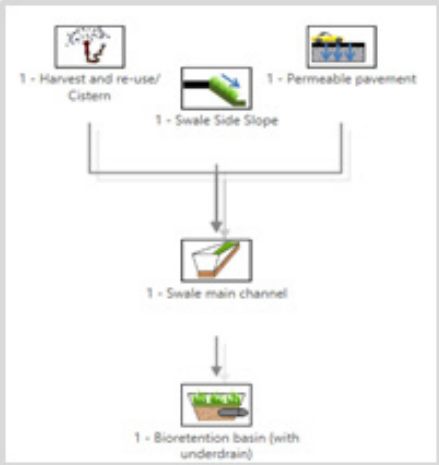
Team OptiMN's Bassett Creek ReGen Homes

Water Management

Area Statement for Water Analysis					
Catchment Areas	Number of Units	Each Unit	Area Sq.ft.	Area Acres	Notes
BIORETENTION BASIN SUBCATCHMENT					
Units	6	1073.00	6438.00	0.15	Consider as impervious surface for MIDS calculator
Permeable Paving Patios	6	120.00	720.00	0.02	
Backyards	6	533.95	3203.72	0.07	
Catchment			20164.07	0.46	
TOTAL			30525.78	0.70	
SWALE SUBCATCHMENT					collection which is 0 .15 acre impervious area for cisterns calculation
Units	12	1073.00	12876.00	0.30	
Catchment			62623.30	1.44	
TOTAL			75499.30	1.73	
NORTHERN TREE TRENCH (including permeable pavers in backyard)					
Permeable Paving Patios	12	120	1440.00	0.03	Total impervious area = .03+11 = .14 to put into MIDS
Catchment			17322.16	0.40	
Impervious sidewalk			5000.00	0.11	
TOTAL				0.55	
WESTERN TREE TRENCH					
Catchment			18469.22	0.42	
Impervious Sidewalk			2987.00	0.07	
TOTAL				0.49	
EASTERN TREE TRENCH					
Catchment			14528.56	0.33	
Impervious Sidewalk			2135.00	0.05	
TOTAL			16663.56	0.38	

Values used for MIDS Calculator

Minimal Impact Design Standards
for enhancing stormwater management in Minnesota



Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	1837	ft3
Volume removed by BMPs towards performance goal:	1837	ft3
Percent volume removed towards performance goal	**100**	**%**

Annual Volume and Pollutant Load Reductions

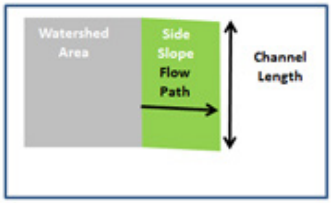
Post development annual runoff volume	2.0367	acre-ft
Annual runoff volume removed by BMPs:	1.9632	acre-ft
Percent annual runoff volume removed:	**96**	**%**
Post development annual particulate P load:	0.914	lbs
Annual particulate P removed by BMPs:	0.895	lbs
Post development annual dissolved P load:	0.748	lbs
Annual dissolved P removed by BMPs:	0.729	lbs
Percent annual total phosphorus removed:	**98**	**%**
Post development annual TSS load:	301.9	lbs
Annual TSS removed by BMPs:	294.7	lbs
Percent annual TSS removed:	**98**	**%**

Harvest and re-use/Cistern

Note: Credit toward the performance goal is only achieved during the time when the system is operational

Required treatment volume	599	ft³
Reuse storage volume (pond/cistern)	2005	ft³
Irrigation application area	5741	acres
Provide user defined maximum weekly irrigation rate?	Yes	
User defined maximum irrigation application rate	1.5	in/week
Soil type of irrigated area - Hydrologic Soils Group	HSG Type C	
Irrigated vegetation type	Vegetables	
Irrigation season start month	April	
Irrigation season end month	October	
Does the system go offline during off season?	Yes	
Is water retained on-site for non-irrigation uses?	No	
Weekly water volume retained for non-irrigation uses		ft³/week
Average achieved irrigation application rate	1.11	in/week
Volume reduction capacity of BMP [V]	2005	ft³
Volume of retention provided by BMP	599	ft³

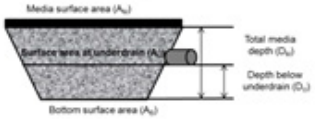
Swale Side Slope



Required treatment volume	559	ft³
Side slope [H:V]	7:1	
Side slope	14.00	%
Flow path length	25	ft
Channel length	230	ft
Underlying soil - Hydrologic Soil Group	8 ML (HSG C, 0.2 in/l	
Infiltration rate of underlying soils	0.2	in/hr
User defined infiltration rate		in/hr
Manning's n (Vegetation)	Native grass	
Manning's n	0.35	
User Defined Manning's n		
Volume reduction capacity of BMP [V]	23	ft³
Volume of retention provided by BMP	23	ft³

Permeable pavement

$$V = \left[\frac{A_U + A_B}{2} * D_U * n\right]$$

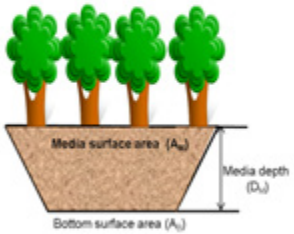


Required treatment volume	80	ft³
Surface area at underdrain [A_U]	800	ft²
(If no underdrain is used, enter Media surface area [A_M])	0.0184	acres
Bottom surface area [A_B]	650	ft²
Depth below underdrain [D_U]	0.4	ft
(If no underdrain is used, enter Total media depth [D_M])		
Media porosity [n](range 0.35-0.50)	0.4	ft³/ft³
Will subsoil require compaction?	Yes	
Underlying soil - Hydrologic Soil Group	8 ML (HSG C, 0.2	
Infiltration rate of underlying soils	0.2	in/hr
User defined infiltration rate		in/hr
Required drawdown time	24	hrs
Volume reduction from basin bottom infiltration [Vinf_b]	39	ft³
Volume reduction stored below underdrain	116	ft³
Volume reduction capacity of BMP [V]	155	ft³
Volume of retention provided by BMP	80	ft³

POLY-MART BLACK RAINWATER COLLECTION TANK

Tree trench system/Box (w/o underdrain)

$$V = \left(\frac{A_M + A_B}{2} * n * D_M\right) + V_I + V_{ET}$$



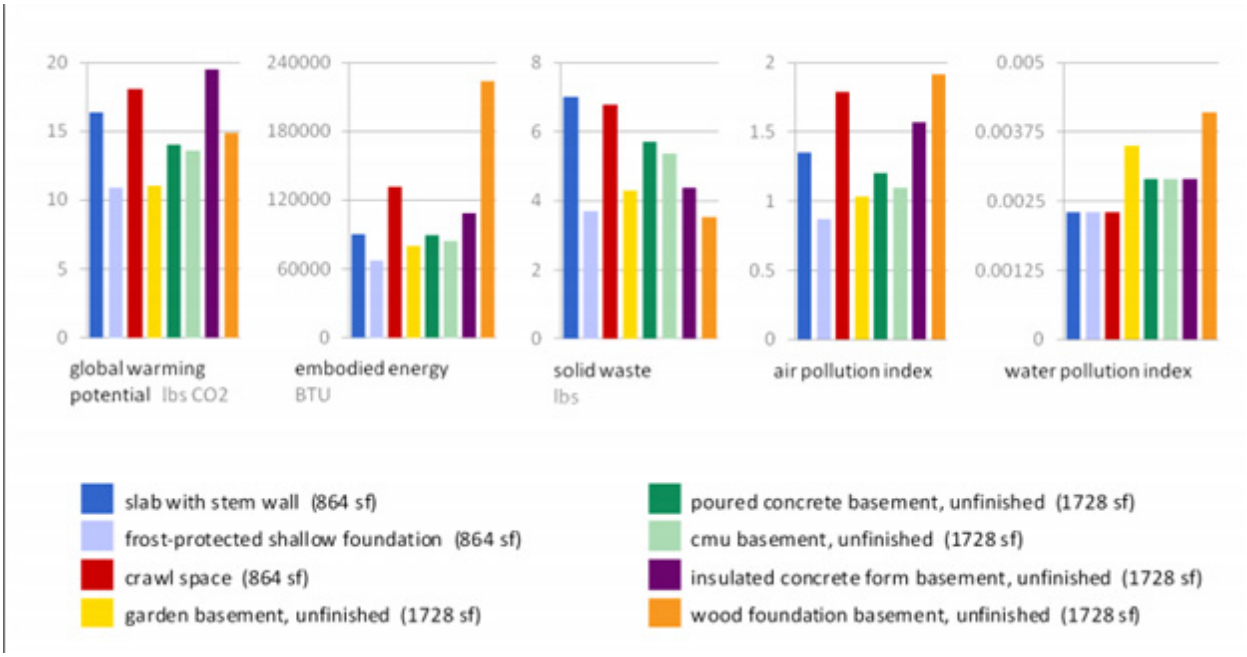
	Northern Tree Trench	Western Tree Trench	Eastern Tree Trench
Required treatment volume	439 ft³	280	200
Media surface area [A_M]	1200 ft²	2400	1500
Bottom surface area [A_B]	900 ft²	2100	1200
Media depth [D_M]	5 ft	5	5
Media field capacity - wilting point [FC - WP](range 0.05-0.17)	0.09 ft³/ft³	0.09	0.09
Media porosity - field capacity [n - FC](range 0.15-0.35)	0.31 ft³/ft³	0.31	0.31
Tree type (most common)	Deciduous	Deciduous	Deciduous
Tree size (average for all trees)	Small	Small	Small
Number of trees	8	16	10
Interception capacity [IC]	0.043 inches	0.043	0.043
Canopy projection [CP]	315 ft²	315	315
Leaf area index [LAI]	3.5	3.5	3.5
Soil volume per tree [S_V]	ft³		
Underlying soil - Hydrologic Soil Group	5 SP (HSG A, 0.8 ir	5 SP (HSG A, 0.8 ir	5 SP (HSG A, 0.8 ir
Infiltration rate of underlying soils	0.8 in/hr	0.8	0.8
User defined infiltration rate	in/hr		
Required drawdown time	24 hrs	24	24
Volume reduction of BMP from ET [V_{ET}]	106 ft³	212	132
Volume reduction of BMP from interception [V_I]	9 ft³	18	11
Volume reduction stored in soil media	1628 ft³	3488	2092

Best Management Practices: Storage Cistern Sizing and Details

Rainfall Collected:
Rainfall (inches) x Roof area (sq. ft.) x 0.85(Collection Efficiency) x 7.48 gal/cu. ft. x 1ft./12inch. = gallons collected
= 31.2 x 6438 sq.ft. x .85 x 7.48 x 1ft./12inch = 106,425.29 Ga (Annually)
We decided to use cistern, holding capacity of approx. 15,000 Ga. rainwater for site irrigation and community garden purposes. It can be three cistern with 5000 Ga each or one cistern 15,000 Ga depend on the cost.

Enclosure Analysis

RESFEN WINDOW ENERGY AND COST ANALYSIS						
	Case #1	U-Factor	SHGC	Heating (MBtu)	Cooling (KWh)	Total Cost
Case #1	North	0.32	0.4	8.2	111	$ 84.63
	South	0.32	0.4	-1.1	207	
Case #2	North	0.28	0.4	7.0	117	$ 64.09
	South	0.28	0.4	-2.3	211	
Case #3	North	0.26	0.36	6.6	100	$ 62.60
	South	0.26	0.36	-1.8	184	
Case #4	North	0.24	0.36	6.0	104	$ 52.26
	South	0.24	0.36	-2.4	187	
Case #5	North	0.22	0.32	5.7	87	$ 51.78
	South	0.22	0.32	-1.9	161	
Case #6	North	0.2	0.24	5.6	60	$ 59.40
	South	0.2	0.24	-0.1	113	
Case #7	North	0.24	0.22	7.1	54	$ 56.26
	South	0.24	0.36	-2.5	177	
SELECTED	North	0.2	0.21	5.8	54	$ 45.84
	South	0.24	0.36	-2.5	178	
Assumptions	118 Square footage on North and South, Minneapolis Climate, Electric Cost-$0.74/KWh, Gas Cost- $0.853/therms					



Foundation Comparision

Winter-Framing Assembly	R value	Thickness (")	Depth (")	Surface Temperature (F)	Surface Vapor Pressure (psi)	Saturation Vapor Pressure (psi)	Relative Humidity (%)
Indoor-30% RH, 70 degrees							
Interior Airfilm	0.68	0.0	0.00	70.00	0.364	0.146	40%
Latex Paint	0.1	0.1	0.10	69.03	0.352	0.146	41%
1/2" Gypsum Board	0.45	0.5	0.60	68.88	0.350	0.137	39%
2x4 Stud	3.3	3.5	4.10	68.24	0.343	0.134	39%
1/2" OSB Sheathing	0.62	0.5	4.60	63.52	0.291	0.132	45%
Peel and Stick Membrane	0.12	0.1	4.70	45.88	0.153	0.131	86%
3" Polyiso	18	3.0	7.70	45.71	0.152	0.028	19%
1" Furring Strips (Vert and Horiz)	0.95	1.0	8.70	19.95	0.050	0.020	40%
Wood Siding	0.84	0.5	9.20	18.66	0.047	0.020	43%
Exterior Airfilm	0.17	0.0	9.20	16.64	0.043	0.013	30%
Outdoor-40% RH, 16.4 degrees							

Winter-Insulation Assembly	R value	Thickness (")	Depth (")	Surface Temperature (F)	Surface Vapor Pressure (psi)	Saturation Vapor Pressure (psi)	Relative Humidity (%)
Indoor-30% RH, 70 degrees F							
Interior Airfilm	0.68	0.00	0.0	70.0	0.146	0.364	40.0%
Latex Paint	0.1	0.10	0.1	69.0	0.146	0.352	41.3%
1/2" Gypsum Board	0.45	0.50	0.6	68.9	0.137	0.350	39.2%
3.5" Rockwool	3.3	3.50	4.1	68.2	0.134	0.343	39.1%
1/2" OSB Sheathing	0.62	0.50	4.6	46.8	0.134	0.158	84.7%
Peel and Stick Membrane	0.12	0.10	4.7	45.9	0.133	0.153	87.0%
3" Polyiso	18	3.00	7.7	45.7	0.029	0.152	18.8%
1" Air	1.5	1.00	8.7	19.9	0.020	0.050	40.5%
Wood Siding	0.84	0.50	9.2	17.8	0.020	0.045	44.8%
Exterior Airfilm	0.17	0.00	9.2	16.6	0.013	0.043	29.7%
Outdoor-40% RH, 16.6 degrees F							

Summer- Framing Assembly	R value	Thickness (")	Depth (")	Surface Temperature (F)	Surface Vapor Pressure (psi)	Saturation Vapor Pressure (psi)	Relative Humidity (%)
Indoor-40% RH, 74 degrees F							
Interior Airfilm	0.68	0.0	0.0	74.3	0.167	0.421	40.0%
Latex Paint	0.1	0.1	0.1	74.4	0.167	0.422	39.6%
1/2" Gypsum Board	0.45	0.5	0.6	74.6	0.178	0.425	42.2%
2x4 Stud	3.3	3.5	4.1	76.0	0.182	0.446	42.9%
1/2" OSB Sheathing	0.62	0.5	4.6	81.6	0.186	0.535	41.6%
Peel and Stick Membrane	0.12	0.1	4.7	81.7	0.187	0.536	34.9%
3" Polyiso	18	3.0	7.7	89.8	0.327	0.695	60.9%
1" Furring (Vert and Horiz)	0.94	1.0	8.7	90.2	0.337	0.704	48.5%
Wood Siding	0.59	0.5	9.2	90.8	0.350	0.719	49.7%
Exterior Airfilm	0.17	0.0	9.2	90.9	0.360	0.720	50.1%
Outdoor-50% RH, 90.9 degrees F							

Summer- Insulation Assembly	R value	Thickness (")	Depth (")	Surface Temperature (F)	Surface Vapor Pressure (psi)	Saturation Vapor Pressure (psi)	Relative Humidity (%)
Indoor-40% RH, 74 degrees F							
Interior Airfilm	0.68	0.00	0.0	74.31	0.167	0.421	39.6%
Latex Paint	0.1	0.10	0.1	74.35	0.179	0.422	42.4%
1/2" Gypsum Board	0.45	0.50	0.6	74.55	0.183	0.425	43.2%
3.5" Rockwool	3.3	3.50	4.1	81.32	0.184	0.531	34.6%
1/2" OSB Sheathing	0.62	0.50	4.6	81.60	0.185	0.535	34.5%
Peel and Stick Membrane	0.12	0.10	4.7	81.65	0.337	0.536	62.8%
3" Polyiso	18	3.00	7.7	89.77	0.349	0.695	50.2%
1" Airspace (furring strip)	1.5	1.00	8.7	90.44	0.349	0.710	49.2%
Fiber-cement Siding	0.59	0.50	9.2	90.82	0.360	0.719	50.1%
Exterior Airfilm	0.17	0.00	9.2	90.90	0.360	0.720	50.0%
Outdoor-50% RH, 90.9 degrees F							

Systems Analysis

Indoor airPLUS Version 1 (Rev. 03)

Verification Checklist

Home Address: 1401-1499 Currie Ave W. **City:** Minneapolis **State:** MN **Zip:** 55405

Section		Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
		Note: **The Rev. 03 checklist has been modified to reflect only the additional Indoor airPLUS requirements and their corresponding section numbers that must be met after completing the ENERGY STAR requirements. ENERGY STAR remains a prerequisite for Indoor airPLUS qualification.**				
ENERGY STAR V3		ENERGY STAR Version 3 Program Requirements must be followed and the home shall be ENERGY STAR certified in conjunction with Indoor airPLUS qualification.	☐		☑	
Moisture Control	1.1	Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.	☐	☑	☑	☐
	1.2	Layer of aggregate or sand (4 in.) with geotextile matting installed below slabs (Exceptions: see spec) AND radon techniques used in EPA Radon Zone 1.	☐	☑	☑	☐
	1.4	Basements/crawlspaces insulated, sealed and conditioned (Exceptions: see spec).	☐	☐	☐	☑
	1.7	Protection from water splash damage if no gutters (Exceptions: see spec).	☐	☑	☑	☐
	1.11	Hard-surface flooring in kitchens, baths, entry, laundry and utility rooms, AND piping in exterior walls insulated with pipe wrap.	☐	☑	☑	
Radon	2.1	Radon-resistant features installed in Radon Zone 1 homes in accordance with Construction Specification 2.1.	☐	☑	☑	☐
Pests	3.2	Corrosion-proof rodent/bird screens installed at all openings that cannot be fully sealed (Exception: dryer vents).	☐	☑	☑	
HVAC Systems	4.1	Equipment selected to keep relative humidity < 60% in "Warm-Humid" climates (Exception: see spec).	☐		☑	☐
	4.2	Duct systems protected from construction debris AND no building cavities used as air supplies or returns.	☐	☑	☑	
	4.3	No air-handling equipment or ductwork installed in garage AND continuous air barrier in adjacent assemblies.	☐		☑	
	4.6	Clothes dryers vented to the outdoors or plumbed to a drain according to manufacturer's instructions.	☐		☑	
	4.7	Central forced-air HVAC system(s) have minimum MERV 8 filter AND no ozone generators in home. Temporary filter installed to protect unit from construction dust.	☐	☑	☑	
Combustion Pollutants	5.1	Emissions standards met for fuel-burning and space-heating appliances.	☐		☑	☐
	5.2	CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	☐		☑	☐
	5.3	Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	☐	☑	☑	☐
	5.4	Attached garages: Door closer installed on all connecting doors AND in homes with exhaust-only whole-house ventilation EITHER a 70 cfm exhaust fan installed in garage OR a pressure test conducted to verify the effectiveness of the garage-to-house air barrier. See spec for details.	☐		☐	☑
Materials	6.1	All composite wood products certified low-emission. See spec.	☐	☑	☑	
	6.2	Interior paints and finishes certified low-emission. See spec.	☐	☑	☑	
	6.3	Carpet, carpet adhesives, and carpet cushion certified low-emission. See spec.	☐	☐	☐	☑
Final	7.1	HVAC system and ductwork verified to be dry and clean AND new filter installed.	☐	☑	☑	
	7.2	Home ventilated before occupancy.	☐	☑	☑	☐
	7.3	Equipment manuals, Indoor airPLUS label, and certificate provided for buyer.	☐	☑	☑	☐

Rater Company: SET
Rater Employee: Matt Dries
Rater Signature: _____ **Date:** 4/4/17

Builder Company: Team Opti-MN
Builder Employee: University of Minnesota
Builder Signature: _____ **Date:** 4/4/17

MANUAL J8$_{AE}$ • SUMMARY REPORT

Project	OptiMN ReGen Attached Housing		Mfg. Equipment Sensible Heat Ratio	0.75	ACCA Manual D CFM
			Manual Overide Entry for Design CFM	600	
Room Name	HEAT LOSS	HTG CFM	HEAT GAIN	CLG CFM	
LL Living Room	2405	97	1120	89	97
LL Mudroom	1443	58	337	27	58
LL Kitchen	1009	41	590	47	47
LL Dining			150	12	12
LL Entry	961	39	246	20	39
SF Bed 1	2082	84	1067	85	85
SF Bed 2	1314	53	548	43	53
SF Bed 3	1582	64	1219	97	97
SF Entry	769	31	541	43	43
TF Future Expansion	3340	134	1750	139	139
Room Envelope Totals	14907	600	7568	600	

Total Area	Construction Components	HEAT LOSS		HEAT GAIN	
224	Windows & Glass Doors	3979	23.29%	2266	23.54%
	Skylights				
28	Wood & Metal Doors	386	2.26%	124	1.29%
1331	Above Grade Walls	3236	18.94%	54	0.56%
	Partition Walls				
	Below Grade Walls				
1640	Ceilings	2338	13.69%	1443	15.00%
	Partition Ceilings				
	Passive Floors				
	Exposed Floors				
60	Slab Floors	846	4.95%		
	Basement Floors				
	Partition Floors				
	Infiltration	4122	24.13%	361	3.75%
	Internal Gains			3320	34.49%
	Duct Loss & Gain				
	Ventilation	2177	12.75%	349	3.63%
	Blower Heat Gain			1707	17.74%
	Total Sensible	17084	100.00%	9625	100.00%
	Total Latent			1611	
	Total Cooling Load			11235	

FORM J1$_{AE}$ • ABRIDGED VERSION of MANUAL J, 8TH EDITION

Project	OptiMN ReGen Attached Housing		Design State & City	Minnesota	Minneapolis/St. Paul AP					
Indoor Design Heating db	70		@ Outdoor (Winter) 99% db	-11			HTD	81		
Indoor Design Cooling db	75		@ Outdoor (Summer) 1% db	88			CTD	13		
Indoor Design Cooling RH	50%		Grains Difference	24			Daily Range	Medium		
Latitude	44		Elevation	834			ACF	0.978	Block Load	

		Glass Direction		Construction Detail	Heating HTM	Cooling HTM	Net Area	Heating BTUH	Cooling BTUH
6A	Windows & Glass Doors	N		Triple Glaze, SHGC = 0.21	16.20	6.50	20	324	130
		N		Triple Glaze, SHGC = 0.21	16.20	6.50	56	907	364
		S		Double Glaze, SHGC = 0.36	19.44	14.00	108	2100	1512
		S		Double Glaze, SHGC = 0.36	19.44	11.24			
		N		Triple Glaze, SHGC = 0.21	16.20	6.50	40	648	260
6B	Skylights								
7	Wood & Metal Doors		a	11Q, Metal, Polyurethane Core with Storm	13.77	4.42	28	386	124
			b						
			c						
8	Above Grade Walls		a	R-18 Polyiso, R-15 Rock wool, Hardiboard Fiber-Cement Siding	2.33		1208	2818	
			b						
			c	RimJoist	3.40	0.44	123	418	54
			d						
			e						
	Partition Walls		f						
			g						
9	Below Grade Walls		a						
			b						
10	Ceilings		a	16B- 56, FHA Vented Attic, R=56, Metal, Dark	1.43	0.88	1640	2338	1443
			b						
			c						
	Partition Ceilings		d						
			e						
11	Passive Floors		a						
			b						
	Exposed Floors		c						
	Slab (Perimeter Ft.)		d	22D-15pm, Concrete Slab on Grade, R15	14.09		60	846	
	Basement Floor		e						
	Partition Floors		f						
			g						
12	Infiltration	Envelope Leakage		Tight	Heated & Cooled Floor Area = Sq. Ft.	2298	Above Grade = Cu. Ft.	25813	4122	361
		No. of Fireplaces								
13	Internal Gains			Number of Bedrooms	3		Occupants	4		920
				Appliance - 2400 BTUH						2400
14	Sub Totals								14907	7568
15	Duct Loss & Gain			7F-Ducts in Conditioned Space						
				R-Value = 2	Leakage Class .06/.06		☒	☒		
				Installed Square Feet of Surface or Default = 1		Supply	18	Return	5	
16	Ventilation	Combustion Air From Conditioned Space		☐ Furnace	☐ Water Heater		25 CFM		25	2177	349
19	Blower Heat Gain			Manufacturer's performance data has no blower heat discount						1707
20	Total Sensible Loss or Gain								17084	9625

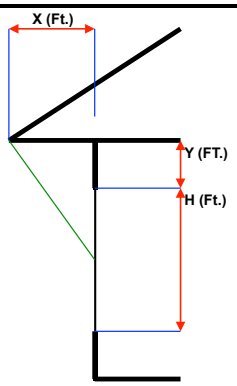
2017 OPTI-MN TEAM
DOE Zero Energy Ready Home Competition
University of Minnesota
Minneapolis, MN 55414

21

Latent Infiltration load for cooling				412
Latent load for occupants				800
Latent load for plants	Small	Medium	Large	
Latent load for duct in unconditioned space				
Latent ventilation load for cooling				399
Total Latent Gain				1611

VERTICAL GLASS

#	Heating Table 2A Construction Numbers and Details that Apply to this Load Estimate	Direction Glass Faces	Height of opening H (Ft)	Overhang Distance X (Ft)	Top of Opening to Overhang Y (Ft)	Adjustment for Projected Window or French Door	Clg HTM Adjustment
#1	Triple Glaze, SHGC = 0.21	N	4.00	1.50	12.00	None	None
#2	Triple Glaze, SHGC = 0.21	N	4.00	1.50	1.50	None	None
#3	Double Glaze, SHGC = 0.36	S	6.00	1.50	13.00	None	None
#4	Double Glaze, SHGC = 0.36	S	4.00	1.50	1.50	None	None
#5						None	None
#6	Triple Glaze, SHGC = 0.21	N	5.00	1.50	1.50	None	None
#7						None	None
#8						None	None
#9						None	None
#10						None	None
#11						None	None
#12						None	None



SKYLIGHTS

#	Heating Table 2A Construction Numbers and Details that Apply to this Load Estimate	Direction Glass Faces
#1		
#2		
#3		
#4		

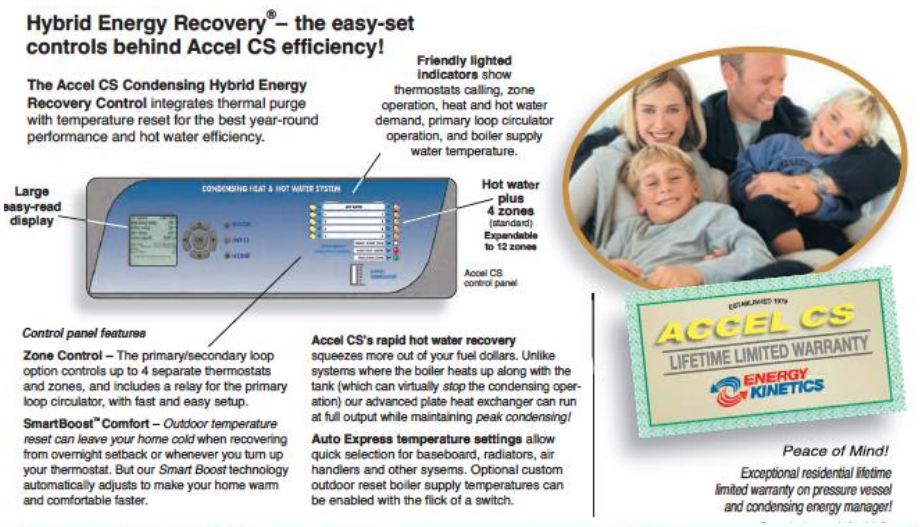
For Heat Loss

* Use the Heating column "look-up" menus to list the windows and glass doors, and to select a projected window / French door adjustment.
* Use the "look-up" menu in the Heating column to list the skylights.
* Enter values for the width and height of the rough opening in decimal feet.

For Heat Gain

* Use the Cooling column "look-up" menus to list the windows and glass doors and to select exposure directions; and to select an insect screen adjustment (the projected window or French door adjustment for heating also applies to cooling).
* Enter values for the width and height of the rough opening and the overhang dimensions (X & Y) in decimal feet.
* Use the "look-up" menu in the Cooling column to list the skylights and to select exposure directions.

Note: For heating-only, leave the cooling column selections blank.



ACCEL CS SPECIFICATIONS	EK1C		EK2C	
Maximum Input, Btu/Hr	90,000	120,000	150,000	200,000
Maximum Output, Btu/Hr	86,000	115,000	143,000	190,000
AFUE	97%		95.3%	
Maximum Supply Temperature	Water 210°F		Water 210°F	
Maximum Pressure	75 PSI		75 PSI	
Weight, Pressure Vessel, dry	70 lbs		90 lbs	
Weight, dry w/o stand	200 lbs		275 lbs	
Weight, w/water and w/ stand	270 lbs		375 lbs	
Water content	5 gallons		6-1/2 gallons	
Supply & Return Piping Size	1"		1-1/4"	
Gas Supply Connection	3/4"		3/4"	
Size with Stand	15"D x 25-7/8"W x 62-7/16" H		17-1/2"D x 28-1/8"W x 69-7/16"H	
Size without Stand	15"D x 25-7/8"W x 50-7/16"H		17-1/2"D x 28-1/8"W x 57-7/16"H	
Maximum Venting and Air intake Lengths	100 ft equiv 3" polypropylene 50 ft equiv 2" polypropylene (intake may be pvc)		100 ft equiv 4" polypropylene 50 ft equiv 3" polypropylene (intake may be pvc)	
Power requirements	120 VAC, minimum of 12 amps		120 VAC, minimum of 12 amps	

A
UP TO

Spec Sheet

Combi Boiler

Our plate heat exchanger vastly out-performs old fashioned coil in tank systems.

Old fashioned tank with coil
This design is inefficient because the tank heats slowly all over, even when you need only a small amount of heat or hot water.

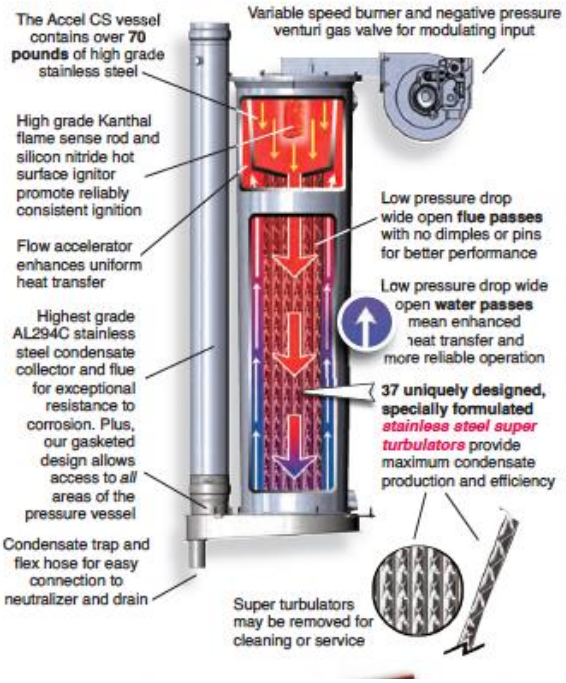
In addition, the temperature of the system's boiler is allowed to rise *above* the tank's temperature, meaning there is an automatic loss of heat energy every time the boiler heat has nowhere to go, which wastes energy.

Plate Heat Exchanger
By comparison, our plate heat exchanger draws cold water from the *bottom* of the tank and feeds hot water from the *top down*. This delivers the highest efficiency through the entire hot water cycle.

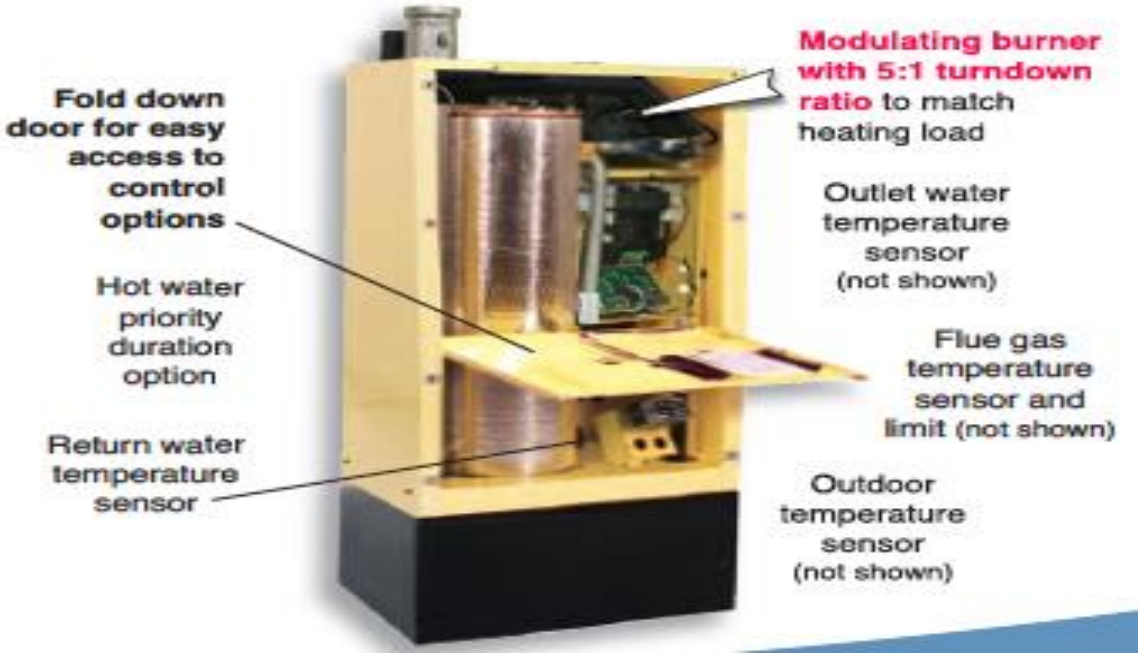
Our hot water plate heat exchanger maximizes condensing – *during every hot water cycle.*

Accel CS features an internal pressure vessel of American made 316L domestic stainless steel

. . . plus the highest grade AL294C stainless steel for its condensate collector and flue (a rugged material originally developed for the nuclear power generating industry).



Accel CS features removable panels for very easy service if the need arises.



Lennox XC21 Air Conditioner

AIR CONDITIONERS

XC21

DAVE LENNOX *SIGNATURE*® COLLECTION

R-410A - Two-Stage Compressor - SilentComfort™ Technology

PRODUCT SPECIFICATIONS

Bulletin No. 210586
February 2017
Supersedes November 2016

DAVE LENNOX signature® COLLECTION

iComfort. So simple. So smart. So comfortable.

SUNSOURCE® Home Energy System

GreenSpec® LISTED

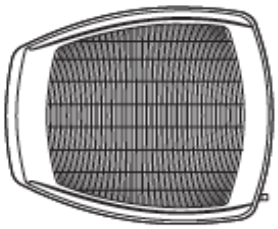
SEER up to 21.00
2 to 5 Tons
Cooling Capacity - 23,000 to 60,500 Btuh

AHRI SYSTEM MATCHES

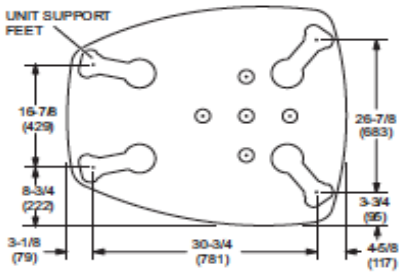
NOTE - For the latest up-to-date system matches please visit the AHRI web site at http://www.ahridirectory.org

Model No.	Expansion Device	Capacity	SEER	EER	Coil or Air Handler	Furnace	AHRI Reference
XC21-024-230	TXV	24,800	17.00	13.00	C33-25		5992360

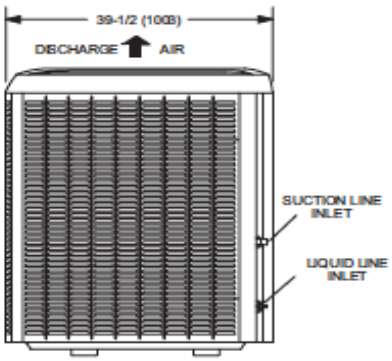
DIMENSIONS - INCHES (MM)



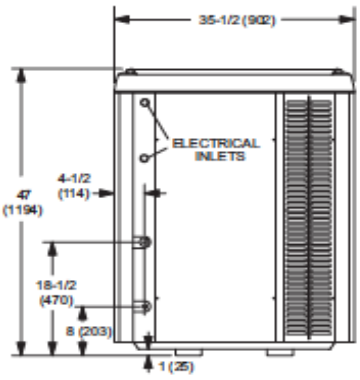
TOP VIEW



TOP VIEW BASE SECTION (Large Base)



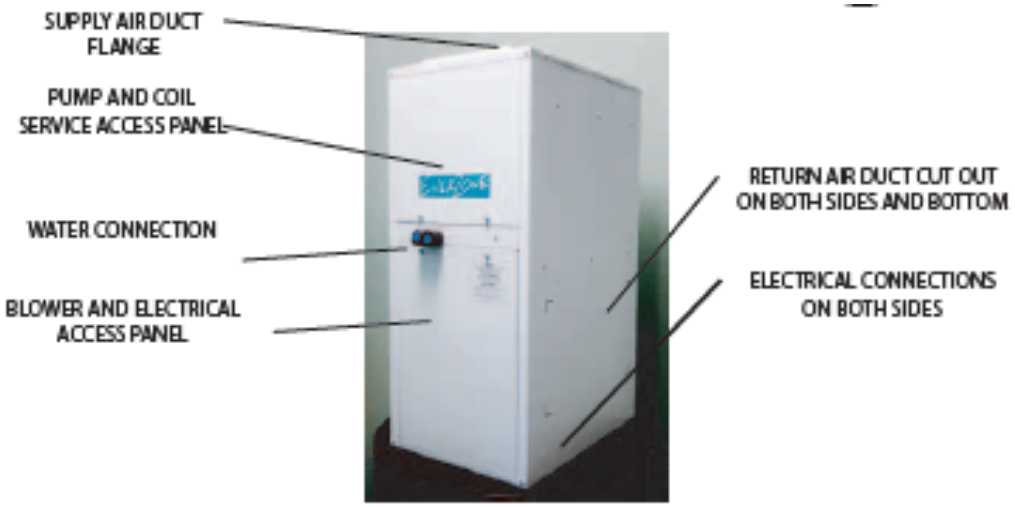
SIDE VIEW

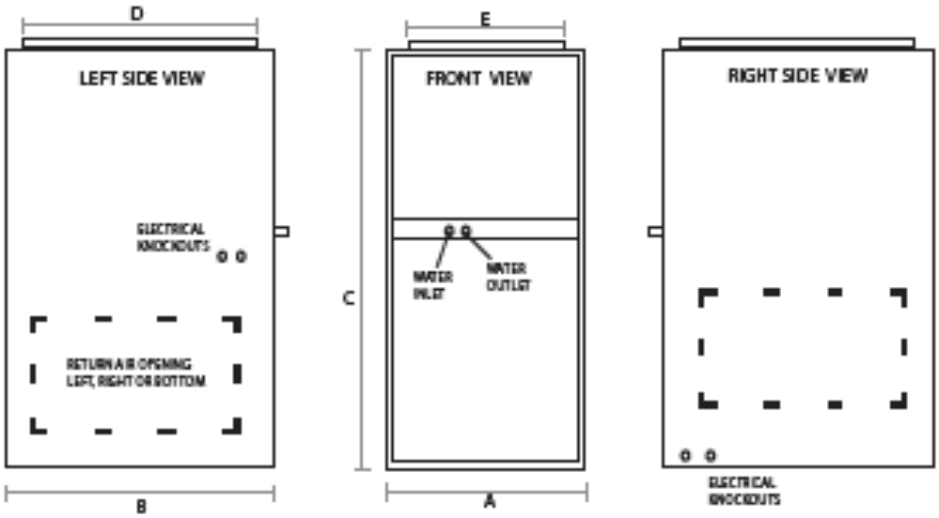


ACCESS VIEW

Enerzone- Model 33

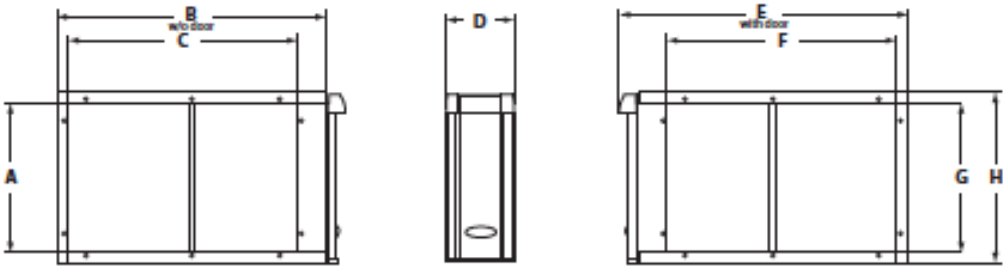
MODELS	AIRFLOW @ 0.4"	OUTPUT @140°F
CAH 33-44-50	600 - 800 - 1000 CFM	33,000 - 50,000 BTU
CAH 49-59-70	1000 - 1200 - 1600 CFM	49,000 - 70,000 BTU





MODEL	A	B	C	D	E
CAH 33-44-50	17"	23"	35.5"	20"	12"
CAH 49-59-70	21.25"	23"	43.75"	20"	16"

APRILAIRE MODEL 2210/2310/2410 MEDIA AIR CLEANERS

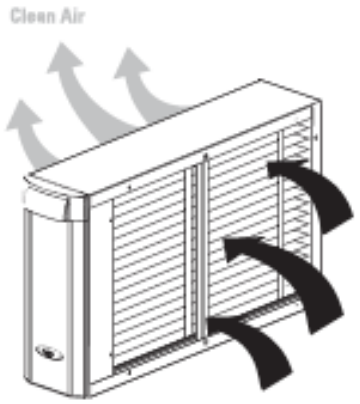


Outlet Side
Furnace Connection

Front

Inlet Side
Return Duct Connection

Dimension	Description	Model 2210	Model 2310	Model 2410
A	Outlet Opening Height	19.75" (502mm)	18.06" (459mm)	15.44" (392mm)
B	Outer Housing Depth Without Door	25.38" (645mm)	20.06" (510mm)	28.06" (713mm)
C	Outlet Opening Width	21.19" (557mm)	15.88" (403mm)	23.88" (625mm)
D	Unit Width	6.75" (254mm)	6.75" (254mm)	6.75" (254mm)
E	Outer Housing Depth With Door	27.38" (679mm)	22.06" (560mm)	30.06" (749mm)
F	Inlet Opening Width	21.19" (502mm)	15.88" (403mm)	23.88" (606mm)
G	Inlet Opening Height	19.75" (546mm)	18.06" (459mm)	15.44" (392mm)
H	Unit Height	22.06" (560mm)	20.38" (518mm)	17.75" (451mm)



REPLACEMENT MEDIA		
MODEL 2210	APRILAIRE PART # 210 APRILAIRE PART # 213	MERV 11 MERV 13
MODEL 2310	APRILAIRE PART # 310 APRILAIRE PART # 313	MERV 11 MERV 13
MODEL 2410	APRILAIRE PART # 410 APRILAIRE PART # 413	MERV 11 MERV 13

APRILAIRE RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT NOTICE.

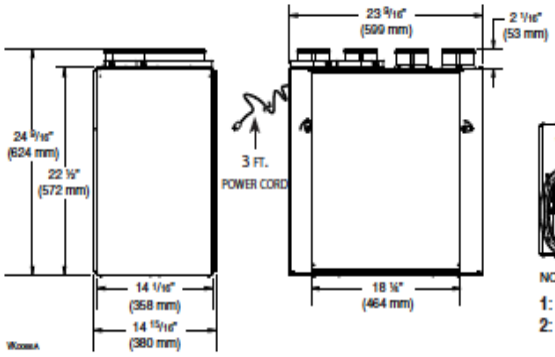
PO Box 1467 • Madison, WI 53701-1467 • Phone 800/334-6011 • Fax 608/257-4357 • www.aprilairepartners.com

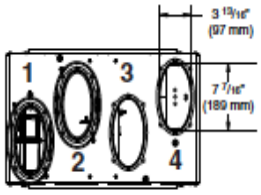
Form No. 2362 1.12

Venmar AVS E15 ECM ERV
Part no. 43911

85 to 140* CFM 40 to 125* CFM
65 to 140* CFM 40 to 80* CFM
55 to 125* CFM **(Factory Set)**
*Maximum speed at 0.4 in. w.g

Dimensions: E15 ECM ERV





NOTE: All units ports were created to be connected to ducts having a minimum of 6" diameter, but if need be, they can be connected to bigger sized ducts by using an appropriate transition (e.g.: 6" diameter to 7" diameter transition).

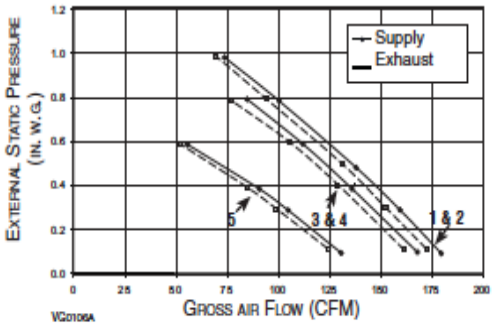
NOTE: Every port fits 6" round duct.

1: Exhaust air to outdoor port **3**: Exhaust air from building port
2: Fresh air from outdoor port **4**: Fresh air to building port

Ventilation Performance

External Static Pressure		Net Supply Air Flow			Gross Air Flow					
					Supply			Exhaust		
Pa	in. w.g.	l/s	cfm	m³/h	l/s	cfm	m³/h	l/s	cfm	m³/h
25	0.1	76	161	274	77	163	277	78	166	282
50	0.2	74	157	267	75	158	268	74	156	265
75	0.3	69	147	250	70	149	253	71	150	255
100	0.4	66	140	238	67	142	241	65	138	234
125	0.5	59	125	212	60	127	216	62	132	224
150	0.6	55	117	199	56	119	202	58	122	207
175	0.7	50	105	178	50	107	182	53	111	189
200	0.8	44	93	158	45	95	161	45	95	161
225	0.9	37	77	131	37	79	134	39	83	141
250	1.0	29	61	104	29	62	105	34	73	124

Fan curves according to speed



Speed Range **1**: 85 to 140* cfm
Speed Range **2**: 65 to 140* cfm
Speed Range **3**: 55 to 125* cfm (Factory Set)
Speed Range **4**: 40 to 125* cfm
Speed Range **5**: 40 to 80* cfm

*Maximum speed at 0.4 in. w.g.

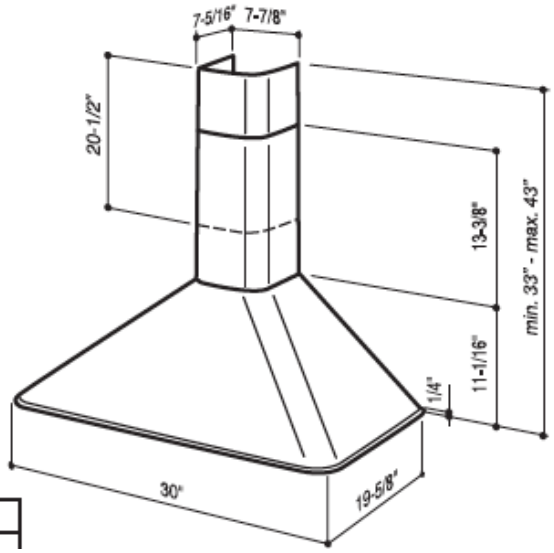
Energy Performance

Supply Temperature		Net Air Flow			Power consumed watts	Sensible recovery efficiency	Apparent sensible effectiveness	Latent recovery/ moisture transfer
°C	°F	l/s	cfm	m³/h				
Heating								
0	32	24	52	88	24	67	73	0.59
0	32	31	65	110	30	67	72	0.55
0	32	39	83	141	36	65	71	0.52
0	32	57	122	207	60	62	67	0.46
-25	-13	33	70	119	39	60	75	0.61
35	95	24	51	87	24	52**	71	0.51

**Total recovery efficiency

NOTE: All specifications are subject to change without notice.

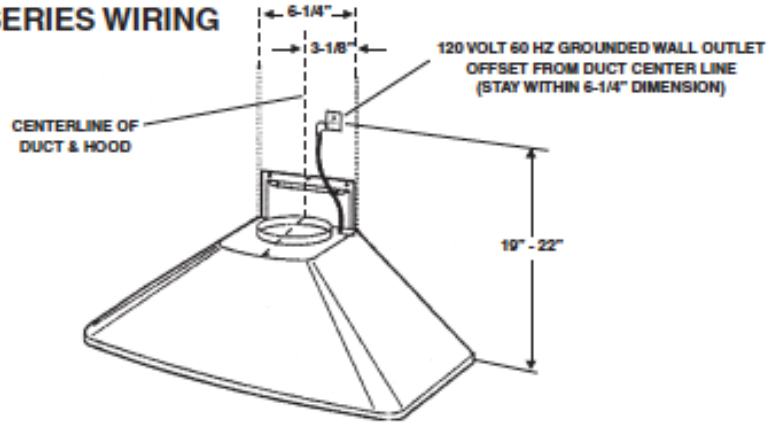
Range Hood



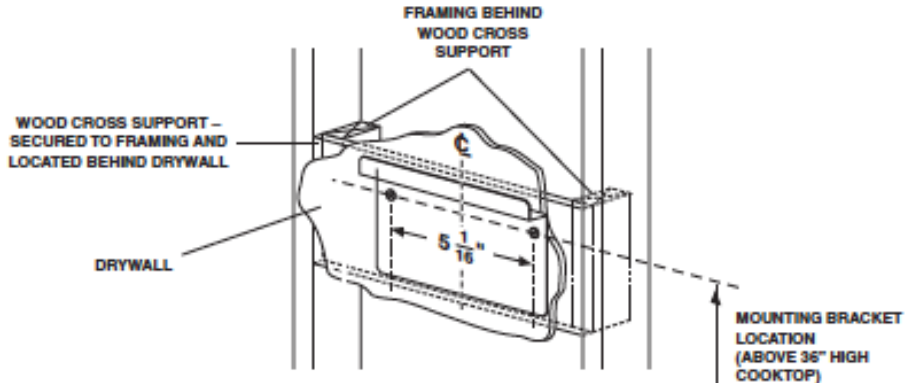
SPECIFICATIONS

VOLTS	HZ	AMPS	CFM		SONES		DUCT
			MAX.	NORM.	MAX.	NORM.	
120	60	2.86	290	135	5.5	0.5	6" round

RME50000 SERIES WIRING



RME50000 SERIES MOUNTING



CEILING HEIGHT	DUCT METHOD	MOUNTING DISTANCE ABOVE 36" HIGH COOKTOP (SEE NOTE 1)						
		24"	25"	26"	27"	28"	29"	30"
		MOUNTING BRACKET LOCATION ABOVE 36" HIGH COOK TOP						
8 FEET	DUCTED	37"	38"	39"	40"			
9 FEET	DUCTED						42"	43"
10 FEET	DUCTED (SEE NOTE 2)				40"	41"	42"	43"

NOTES:
1. Minimum hood distance above cook-top must not be less than 24".
   A maximum of 30" above the cooktop is highly recommended for best capture of cooking impurities.
   Distances over 30" above the cooktop are at the installer's and user's discretion - providing that ceiling height and flue length permit.
2. Requires optional 10-foot flue extension model RFXS004.

WhisperGreenSelect™ VENTILATION FAN

Adjustable Airflow for Maximum Performance

FV-05-11VK1

Specification Submittal Data / Panasonic Ventilation Fan

Description

Customizable Ventilation Fan shall be low sone ceiling mount rated for continuous run. Fan shall be ENERGY STAR® rated and certified by the Home Ventilating Institute (HVI). Evaluated by Underwriters Laboratories and conform to both UL and cUL safety standards.

Motor/Blower:

- Enclosed DC brushless motor technology rated for continuous run.
- Fan ventilation rates shall be manually adjustable for 50-80-110 CFM.
- Power rating shall be 120 volts and 60 Hz.
- Fan shall be UL listed for tub/shower enclosure when used with a GFCI protected circuit and used in insulated ceiling (TYPE I.C.).
- Fan equipped with a thermal cutoff fuse
- Removable, permanently lubricated, plug–in motor.

Housing:

- Rust proof epoxy and polyester resin coating, 26 gauge galvanized steel body.
- Integrated dual 4" or 6" diameter duct adapter.
- Built-in metal flange provides blocking for penetrations through drywall as an Air Barrier, and assists with the decrease in leakage in the Building Envelope during blower door testing.
- Built in backdraft damper.
- Articulating and expandable installation bracket up to 24".

Grille:

- Attractive design using Poly Pro material.
- Attaches directly to housing with torsion springs.
- Includes a motion sensor cap for use as a cover when motion sensor Plug 'n Play™ module has not been selected.

Warranty:

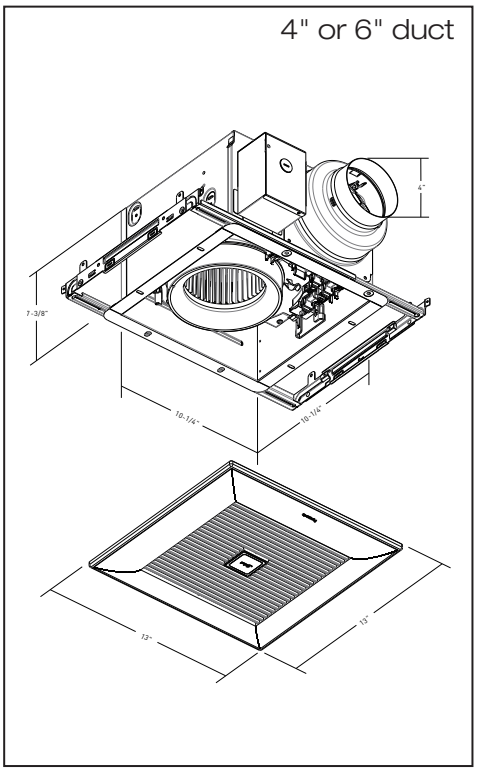
- ALL Parts: 3 Years from original purchase date.
  DC Motor: 6 Years from original purchase date.

Architectural Specifications:

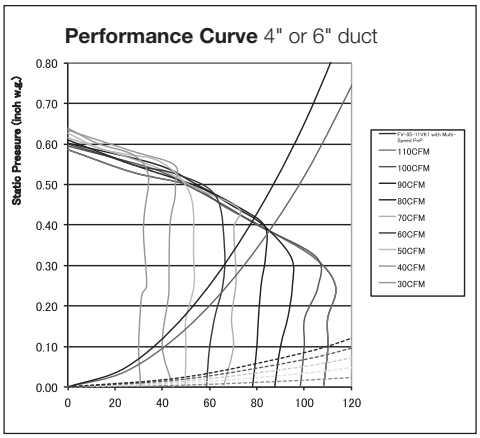
Customizable Ventilation Fan shall be ceiling mount, ENERGY STAR® rated type with built-in speed selector. Select from 50/80/110 CFM and no more than <0.3 sone as certified by the Home Ventilating Institute (HVI) at 0.1 w.g. with no less than 53/82/113 CFM and no more than <0.3/0.4/0.8 sones at .25 w.g. Power Consumption shall be no greater than 3.2/5.4/9.8 watts at 0.1 w.g. and 6.5/10.2/16.1 watts at 0.25 w.g. ENERGY STAR® rated with efficiency of no less than 15.1/15.3/11.5 CFM/watt at 0.1 w.g. and than 8.1/8.4/7.2 CFM/watt at 0.25 w.g. The motor shall be enclosed with brushless DC motor engineered to run continuously. DC motor speed shall automatically increase when the fan senses static pressure to maintain selected CFM. Power rating shall be 120v/60Hz. Duct diameter shall be no less than 4", inclusive of an integrated dual 4" or 6" duct adapter. **Plug 'N Play™ modules** provide up to three additional features. Select from Multi-Speed with Time Delay, Condensation Sensor, LED Night Light and Motion Sensor. Fan shall be UL and cUL listed for tub/shower enclosure when used with a GFCI protected circuit. Fan can be used to comply with ASHRAE 62.2, LEED, ENERGY STAR® IAP, EarthCraft, California Title-24 and WA Ventilation Code.

DC Motor Technology:

When fan senses static pressure, its speed is automatically increased to ensure that the desired CFM is not compromised, which allows the fan to perform as rated.



FV-05-11VK1



Model	Quantity	Comments	Project:
			Location:
			Architect:
			Engineer:
			Contractor:
			Submitted by:
			Date:

For complete Installation Instructions visit **us.panasonic.com/ventfans**

DOE Zero Energy Ready Home

Projected Rating: Based on Plans - Field Confirmation Required.

Energy Performance	
House Type	**DOE Zero Energy Ready Home Builder Partner ID#**
Townhouse, inside unit	412321
Year built	**Square footage of Conditioned Space including Basement**
2017	2289.0
Number of Bedrooms	**Square footage of Conditioned Space without Basement**
4	2289.0
Site address (if not available, list the site Lot #)	**Registered Builder**
1401-1499 Currie Ave. W	University of Minnesota
Minneapolis	**Certified Rater**
MN, 55405	
HERS Index without On-site Generation	**Date of Rating**
31	3/30/2017
HERS Index with On-site Generation	**Rating Software**
-1	REM/Rate - v15.3
HERS Index of the Target Home using size adjustment factor	**Estimated annual energy costs($)**
57	81
Estimated annual energy use	**Estimated annual energy savings**
Electric: -4012 kWh \ Natural Gas: 311 Therms	Electric: 13429 kWh \ Natural gas: 1105 Therms
Energy cost rates	**Estimated annual emissions reductions**
Electric: 0.07 $/kWh \ Natural Gas: 0.74 $/Therms	CO2: 16.0 tons / SO2: 28.5 lbs / NOx: 39.2 lbs

DOE Zero Energy Ready Home Certification

As the certified Rater for this house, I certify this house meets/complies with all mandatory requirments of the DOE Zero Energy Ready home guidelines, including the following:

X	Compliance with all ENERGY STAR Qualified Homes Version 3 requirements and checklists
X	Compliance with Mandatory Fenestration Requirements
X	Compliance with Mandatory Insulation Requirements
X	Compliance with Mandatory Duct Location Requirements
X	Compliance with Mandatory Appliance Requirements
X	Compliance with Mandatory Lighting Requirements
X	Compliance with Mandatory Fan Efficiency Requirements
X	Compliance with Mandatory EPA Indoor airPLUS
X	Compliance with Mandatory Water Efficieny Requirements
X	Compliance with Mandatory Renewable Energy Ready Solar Electric Requirements
	This home was qualified via sampling in lieu of testing, in accordance with allowable sampling provisions as stated in the DOE Zero Energy Ready Home National Program Requirements

Optional Compliance for Builder Recognition

I further certify that the following also apply to this house:

YES	NO	DON'T KNOW	Optional Home Builder Commitments for Recognition

*Certification under the DOE Zero Energy Ready Home permits limited exceptions to full compliance with Indoor airPLUS. Builders seeking the Indoor airPLUS label must achieve full compliance with the Indoor airPLUS Verification Checklist.

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Property/Builder Information

Building Name	Regen Homes
Owner's Name	Team Opti-MN
Property Address	1401-1499 Currie Ave. W
City, St, Zip	Minneapolis, MN 55405
Phone Number	
Builder's Name	University of Minnesota
Phone Number	
Email Address	
Plan/Model Name	Interior Unit
Community/Development	Bassett Creek
Permit Date/Number	

Organization Information

Organization Name	Simple Energy Testing
Address	
City, St, Zip	, MN 55414
Phone Number	
Website	

Rating/RESNET Information

Provider ID	____-___
Sample Set ID	00000000
Registry ID	
Rater's Name	
Rater's ID	
Rater's Email	
Rating Date	3/30/2017
Rating Type	Projected Rating
Reason for Rating	New Home
Rating Number	

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

General Building Information

Area of Conditioned. Space(sq ft)	2289
Volume of Conditioned. Space	25813
Year Built	2017
Housing Type	Townhouse, inside unit
Level Type(Apartments Only)	None
Floors on or Above-Grade	3+
Number of Bedrooms	4
Foundation Type	Slab
Enclosed Crawl Space Type	N/A
Number of Stories Including Conditioned Basement	3
Thermal Boundary Location	N/A

Slab Floor Information

Name	Library Entry	Area(sq ft)	Depth Below Grade(ft)	Full Perimeter(ft)	Exposed Perimeter(ft)	On-Grade Perimeter(ft)
FPSF Slab	FPSF R15UnderR15per0	960	0.0	128	60	60

Slab Floor Library List

Slab Floor: FPSF R15UnderR15per0

Slab Covering	Tile
Perimeter Insulation (R-Value)	15.0
Perimeter Insulation Depth (ft)	4.0
Under-Slab Insulation (R-Value)	15.0
Under-Slab Insulation Width (ft)	24.0
Slab Insulation Grade	1
Radiant Slab	Yes
Note	

Rim and Band Joist Information

Name	Location	Area(sq ft)	Continuous Ins	Framed Cavity Ins	Cavity Ins Thk(in)	Joist Spacing	Insulation Grade	Uo Value
Ambient	Cond -> ambient	127.50	18.0	15.0	3.5	24.0	1	0.029

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Rim and Band Joist Information

Name	Location	Area(sq ft)	Continuous Ins	Framed Cavity Ins	Cavity Ins Thk(in)	Joist Spacing	Insulation Grade	Uo Value
Party	Cond -> another cond unit	144.50	18.0	15.0	3.5	24.0	1	0.029

Above-Grade Wall

Name	Library Entry	Location	Exterior Color	Area(sq ft)	Uo Value
Ambient	Regen Hybrid R18R150	Cond -> ambient	Medium	1284.10	0.029
Party	R-15 Party	Cond -> another cond unit	Medium	1594.70	0.058

Above-Grade Wall Library List

Above-Grade Wall: Regen Hybrid R18R150

Information From Quick Fill Screen	
Wall Construction Type	Standard Wood Frame
Continuous Insulation (R-Value)	18.0
Frame Cavity Insulation (R-Value)	15.0
Frame Cavity Insulation Thickness (in)	3.5
Frame Cavity Insulation Grade	1
Stud Size (w x d, in)	1.5 x 3.5
Stud Spacing (in o.c.)	24.0
Framing Factor - (defined)	0.0500
Gypsum Thickness (in)	0.5
Note	

Above-Grade Wall: R-15 Party

Information From Quick Fill Screen	
Wall Construction Type	Standard Wood Frame
Continuous Insulation (R-Value)	0.0
Frame Cavity Insulation (R-Value)	15.0
Frame Cavity Insulation Thickness (in)	3.5
Frame Cavity Insulation Grade	1
Stud Size (w x d, in)	1.5 x 3.5
Stud Spacing (in o.c.)	24.0
Framing Factor - (defined)	0.0000

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Above-Grade Wall Library List

Gypsum Thickness (in)	0.5
Note	

Window Information

						Overhang			Interior		Adjacent	
Name	Wall Assignment	Orient	U-Value	SHGC	Area (sqft)	Depth (ft)	To Top (ft)	To Btm (ft)	Winter Shading	Summer Shading	Winter Shading	Summer Shading
Front-South	AGWall 1	South	0.240	0.360	118.00	2.0	2.0	15.0	0.85	0.70	None	Some
Back-North	AGWall 1	North	0.200	0.210	118.00	2.0	2.0	16.0	0.85	0.70	None	Some

Door Information

Name	Library Entry	Wall Assignment	Opaque Area(sq ft)	Uo Value	R-Value of Opaque Area	Storm Door
Front	Fiberglass R5	AGWall 1	9.9	0.144	5.0	Yes
Back	Fiberglass R5	AGWall 1	9.9	0.144	5.0	Yes

Roof Information

Name	Library Entry	Ceiling Area(sq ft)	Roof Area(sq ft)	Exterior Color	Radiant Barrier	Type	Uo Value	Cement or Clay Tiles	Roof Tile Ventilation
Hybrid Roof	**R36 Poly R23 Rock0	1176.00	1176.00	Light	No	Vaulted	0.017	No	Yes

Ceiling: **R36 Poly R23 Rock0

Information from Path Layer

Layers	Paths		
	Framing	Cavity	Grade
Inside Air Film	0.680	0.680	0.680
Gyp board	0.550	0.550	0.550
Cavity Ins/Frm	10.500	23.000	0.000
Continuous ins	36.000	36.000	36.000
OSB	0.620	0.930	0.930
Shingles	0.590	0.400	0.400
	0.000	0.000	0.000
Outside Air Film	0.170	0.170	0.170

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Total R-Value	49.11	61.73	38.73
U-Value	0.020	0.016	0.026
Relative Area	0.110	0.890	0.000
UA	0.002	0.014	0.000

Total Component UA: 0.017
Total Component Area: 1.0

Component Uo: 0.017

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Mechanical Equipment

Number of Mechanical Systems	2
Heating SetPoint(F)	68.00
Heating Setback Thermostat	Present
Cooling SetPoint(F)	74.00
Cooling Setup Thermostat	Present

INTG: ReGen Combi 90K

SystemType	Combined Appliance
DistributionType	Hydronic w/ air
Fuel Type	Natural gas
Rated Output Capacity (kBtuh)	90.0
Space Heating Efficiency	0.96 CAafue
DHW Heating Efficiency	0.96 CAef
Auxiliary Electric	620 Eae
Note	
Number Of Units	1
Location	Conditioned area
Performance Adjustment	100
Percent Space Heat Load Served	100
Percent DHW Heat Load Served	100

Cool: 2 Ton 17 SEER ReGen**

System Type	Air conditioner
Fuel Type	Electric
Rated Output Capacity (kBtuh)	2.5
Seasonal Equipment Efficiency	17.0 SEER
Sensible Heat Fraction (SHF)	0.75
Note	
Number Of Units	1
Location	Conditioned area
Performance Adjustment	100
Percent Load Served	100

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

DHW Efficiencies

All bath faucets & showers <= 2gpm	true
All DHW pipes fully insulated >= R-3	false
Recirculation type	Demand (presence sensor)
Longest branch to recirc loop	18
Supply+return for Loop (plan view)	30
TOTAL Pipelength for recirculation loop	70
Recirculation pump power	40
DWHR unit present?	false

DHW Diagnostics	
dhwGpd	44.27
peRatio	0.47
dishwasherGpd	1.84
clothesWasherHotWaterGPD	-0.16
EDeff	1.04
ewaste	38.81
tmains	51.90
dwhrWhInletTempAdj	0.00
pumpConsKwh	6.00
pumpConsMmbtu	0.02

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Duct Systems

Name	Ducts
Conditioned Floor Area(sq ft)	2289.0
# of Returns	5
Heating System	ReGen Combi 90K
Cooling System	2 Ton 17 SEER ReGen**
Supply Duct Surface Area(sq ft)	505.2
Return Duct Surface Area(sq ft)	467.8
Duct Leakage	
Qualitative Assessment	LtO Test Exemption claimed
Duct Leakage to Outside	
Supply+Return	Not Applicable
Supply Only	Not Applicable
Return Only	Not Applicable
Total Duct Leakage	Not Applicable

Type	Location	Percent Location	R-Value
Supply	Conditioned space	100.0	0.0
Return	Conditioned space	100.0	0.0

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Infiltration and Mechanical Ventilation

Whole House Infiltration

Measurement Type	Blower door test
Heating Season Infiltration Value	1.00 ACH @ 50 Pascals
Cooling Season Infiltration Value	1.00 ACH @ 50 Pascals
Shelter Class	4
Code Verification	Tested

Mechanical Ventilation for IAQ

Type	Balanced
Rate(cfm)	80
Sensible Recovery Efficiency(%)	84.00
Total Recovery Efficiency(%)	13.00
Hours per Day	24.0
Fan Power (watts)	36.00
ECM Fan Motor	true

Ventilation Strategy for Cooling

Cooling Season Ventilation	Natural Ventilation

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Lights and Appliances

Rating/RESNET audit	
Ceiling Fan CFM / Watt	84.00
Refrigerator kWh/yr	615
Refrigerator Location	Conditioned
Range/Oven Fuel Type	Natural gas
Induction Range	No
Convection Oven	No
Dishwasher	
Energy Factor	0.00
Dishwasher kWh/yr	260
Place Setting Capacity	15
Clothes Dryer	
Fuel Type	Natural gas
Location	Conditioned
Moisture Sensing	Yes
Energy Factor	2.00
Gas Energy Factor	2.67
Clothes Washer	
Location	Conditioned
LER (kWh/yr)	88
MEF	3.410
Capacity (CU.Ft)	4.500
Electricity Rate	0.11
Gas Rate	1.22
Annual Gas Cost	11.00
Qualifying Light Fixtures	
Interior CFLs %	100.0
Interior Fluorescent %	0.0
Exterior Lights %	100.0
Garage Lights %	0.0

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Mandatory Requirements

IECC Requirements	
Verified IECC 04	true
Verified IECC 06	true
Verified IECC 09	true
Verified IECC 12	true
Verified IECC 15	true
Verified NY-ECCC 2010	true
Verified IECC MI	true
EPA Requirements	
Rater certifies that the home complies with the following requirements for:	ENERGY STAR V 3.1
Rater Design Review Checklist	
Rater Field Checklist	
HVAC Design Report	
HVAC Commissioning Checklist (optional)	
ENERGY STAR Version 3 Appliances	Amount
Refrigerators	1
Ceiling Fans	3
Exhaust Fans	1
Dishwashers	1
ENERGY STAR Version 3 Basements	
Basement Wall Area 50% Below Grad:	false
Basement Floor Area	0.00
2009 IECC Prescriptive Requirements for ENERGY STAR v3.0	false
Slab Insulation Exemption:	false
Indoor airPlus Verification Checklist	true
EPA Field App ID	

Building Summary

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

DOE Zero Energy Ready Home

Home Builder ID Number	412321
Mandatory Requirements	
Verified Fenestration	true
Verified Insulation	true
Verified Duct Location	true
Verified Appliance	true
Verified Lighting	true
Verified Fan Efficiency	true
Verified Water Efficiency	true
Verified EPA Indoor airPLUS	true
Verified Renewable Energy Ready Solar Electric	true
Optional Home Builder Commitments for Recognition	
Certified under the EPA WaterSense for New Homes Program	Yes
Certified under the IBHS fortified for Safer Living Program	Yes
Followed the DOE Zero Energy Ready Home Quality Management Guidelines	Yes
The buyer of this home signed a waiver giving DOE Zero Energy Ready Home access to utility bill data for one year.	Yes

Active Solar

System Type	None
Collector Loop Type	None
Collector Type	None
Collector Orientation	None
Area(sq ft)	0.0
Tilt(degrees)	0.0
Volume(cu ft/gal)	0.0

Photovoltaics

Name	Collector Orientation	Collector Area(sq ft)	PV Panel Peak Power(Watts)	Collector Tilt(degrees)	Inverter Efficiency(%)
18 Panel- 440W	South	508.0	7920.0	30.3	96.0

Component Loads

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

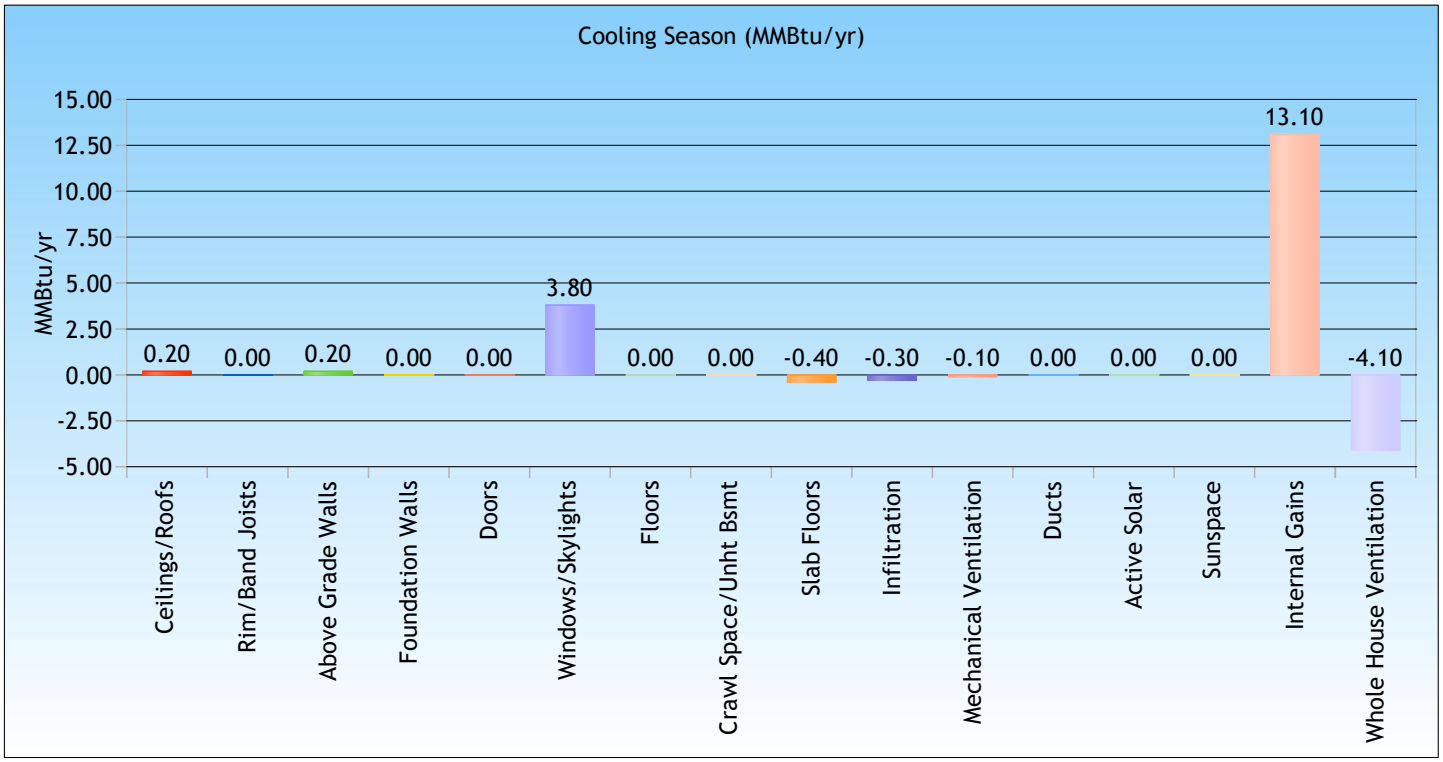
Weather:Minneapolis, MN
Regen Homes
Regen homes Inter

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
ID:

Cooling Season	MMBtu/yr
Ceilings/Roofs	0.2
Rim/Band Joists	-0.0
Above Grade Walls	0.2
Foundation Walls	0.0
Doors	-0.0
Windows/Skylights	3.8
Floors	0.0
Crawl Space/Unht Bsmt	0.0
Slab Floors	-0.4
Infiltration	-0.3
Mechanical Ventilation	-0.1
Ducts	0.0
Active Solar	0.0
Sunspace	0.0
Internal Gains	13.1
Whole House Ventilation	-4.1
Total	12.3



Performance Report

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Annual Load	MMBtu/yr
Heating	13.9
Cooling	12.3
Water Heating	9.8
Water Heating w/out Tank Loss	9.8

Annual Consumption	MMBtu/yr
Heating	14.9
Cooling	2.7
Water Heating	10.7
Lights & Appliances	23.3
Photovoltaics	-35.0
Total	**16.7**

Annual Energy Cost	$/yr
Heating	115
Cooling	56
Water Heating	79
Lights & Appliances	408
Photovoltaics	-717
Service Charges	132
Total	**73**

Design Loads	kBtu/hr
Space Heating	13.0
Space Cooling	9.3

Utility Rates

Electricity	Xcel Energy Elec
Gas	Xcel Energy Gas

Performance Report

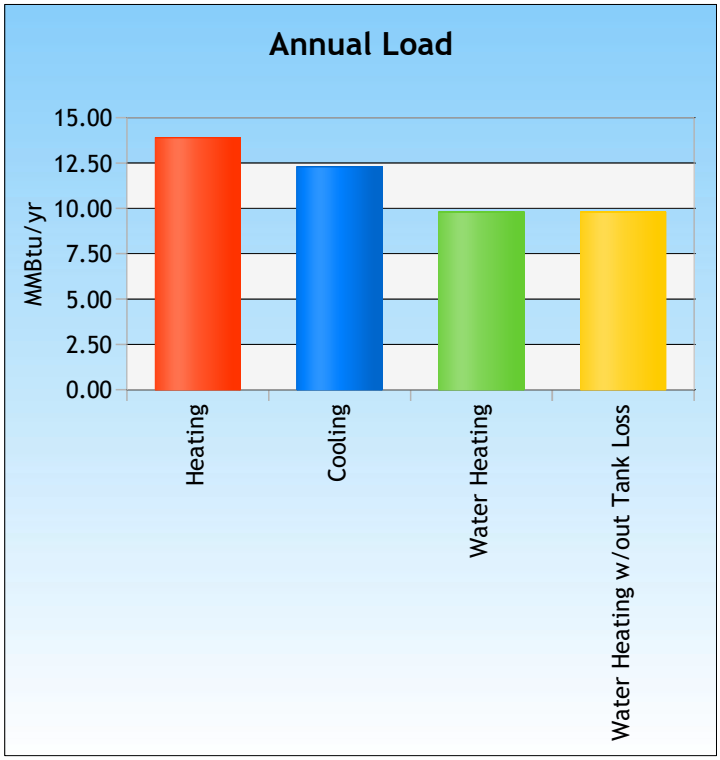
Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

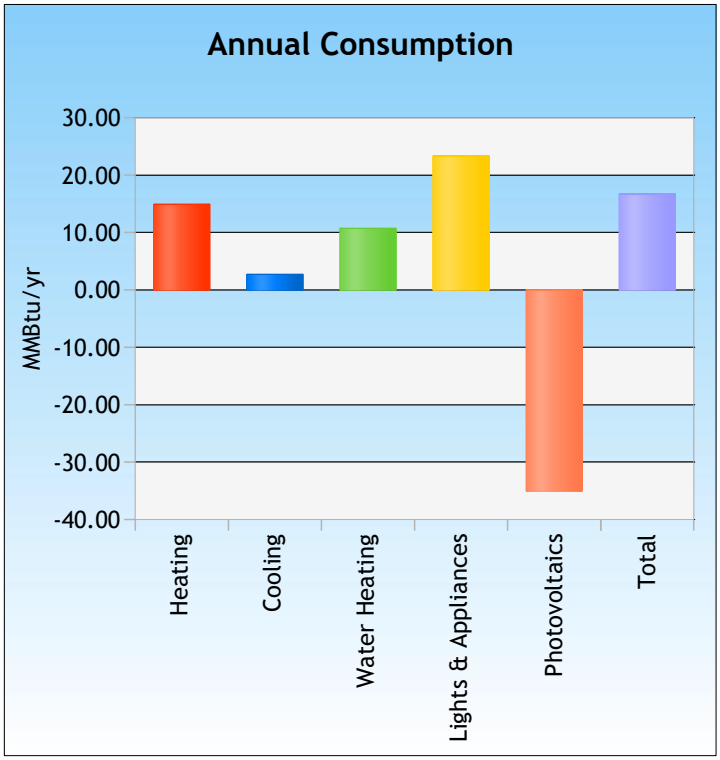
Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg





Performance Report

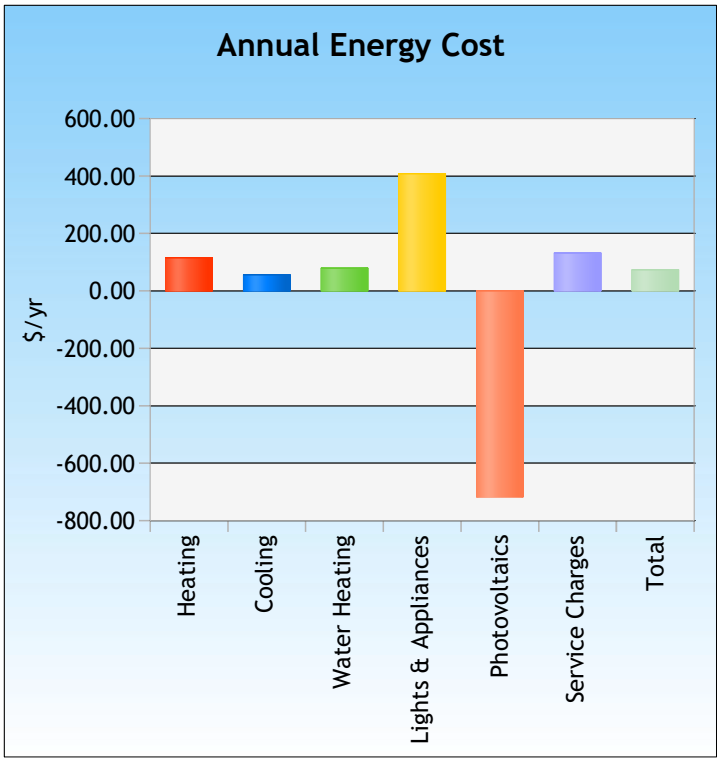
Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

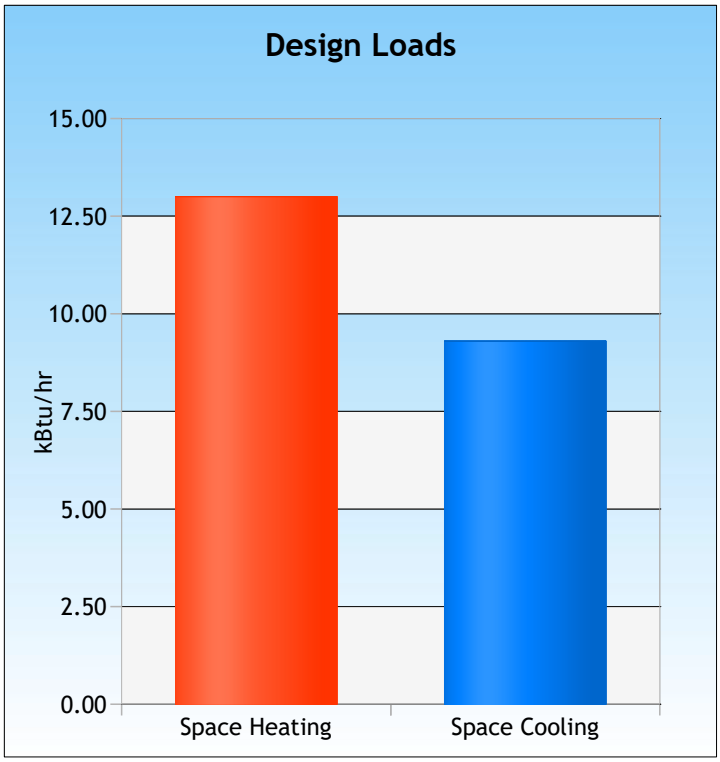
Weather:Minneapolis, MN
Regen Homes
Regen homes Interior Unit_REM
Takeoff Final Revised.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:





Performance Report

Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

Weather:Minneapolis, MN
Regen Homes
Regen homes End Unit_REM
Takeoff Final.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:

Annual Load	MMBtu/yr
Heating	14.6
Cooling	14.0
Water Heating	10.0
Water Heating w/out Tank Loss	10.0

Annual Consumption	MMBtu/yr
Heating	15.6
Cooling	3.2
Water Heating	10.2
Lights & Appliances	21.8
Photovoltaics	-35.0
Total	**15.8**

Annual Energy Cost	$/yr
Heating	120
Cooling	65
Water Heating	76
Lights & Appliances	423
Photovoltaics	-717
Service Charges	132
Total	**98**

Design Loads	kBtu/hr
Space Heating	13.0
Space Cooling	9.2

Utility Rates

Electricity	Xcel Energy Elec
Gas	Xcel Energy Gas

Performance Report

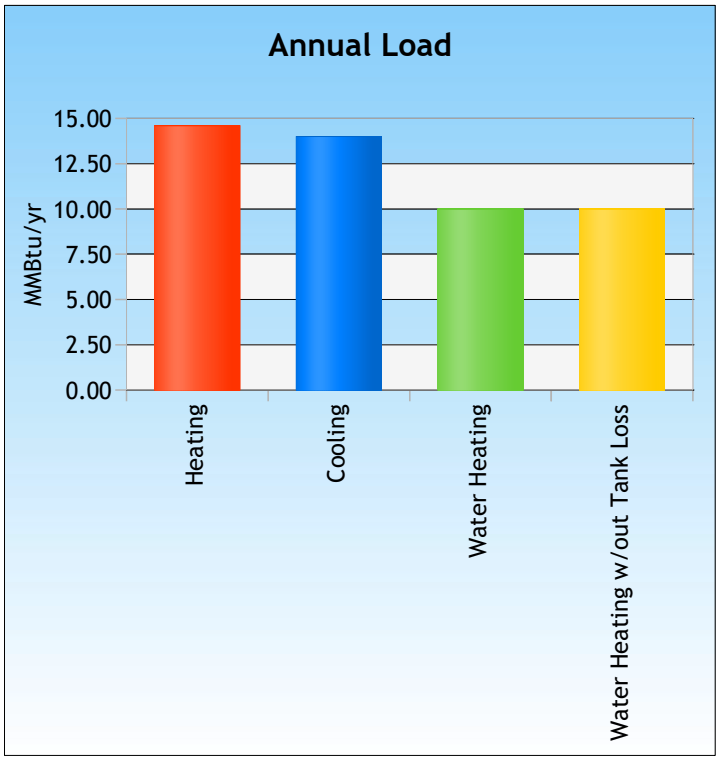
Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

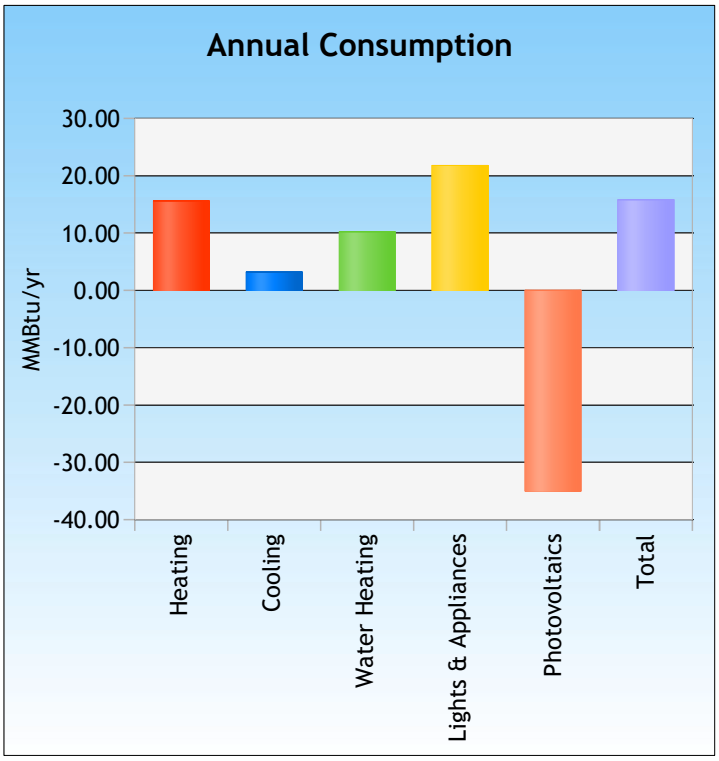
Weather:Minneapolis, MN
Regen Homes
Regen homes End Unit_REM
Takeoff Final.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:





Performance Report

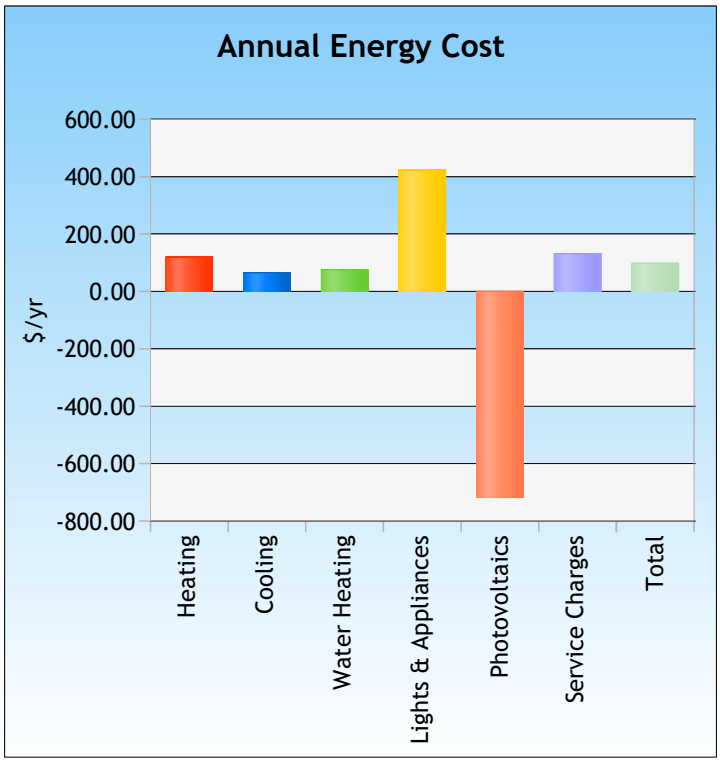
Property
Team Opti-MN
1401-1499 Currie Ave. W
Minneapolis, MN 55405

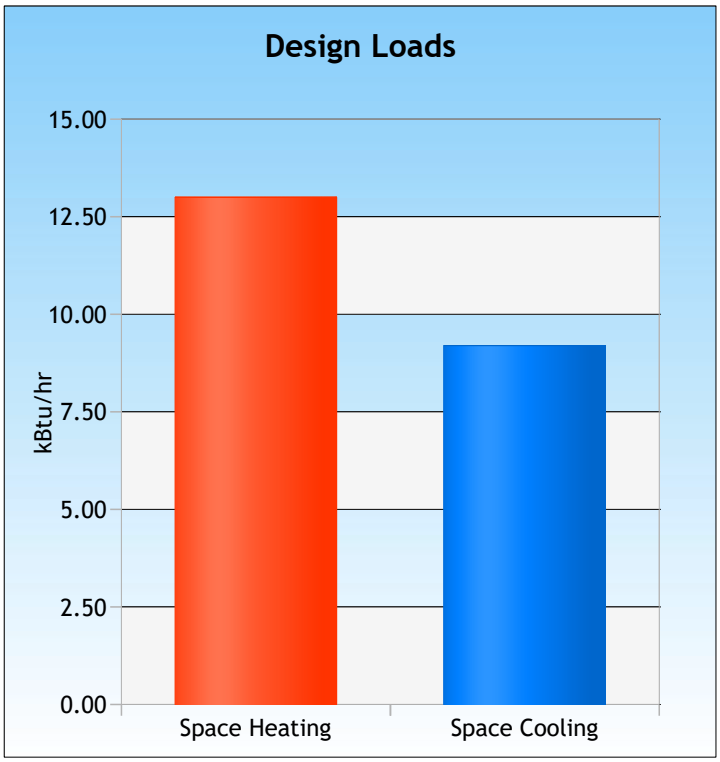
Weather:Minneapolis, MN
Regen Homes
Regen homes End Unit_REM
Takeoff Final.blg

Organization
Simple Energy Testing

Builder
University of Minnesota

HERS
Projected Rating
3/30/2017
Rater ID:





Room	Area (sq)	Illuminance (lm/sq)	Lumens/ room (lm/sq)	Lumens of bulbs (lm)	Number of Bulbs	Watts (W)	Usage (hrs/day)	Watts/day	kW	Net Energy Consumption (kWh/yr)
Dining	120	10.83	1300	1300	2	21	10	210	0.21	77
Kitchen	178	10.67	1900	1900	4 R+3 P	48	10	480	0.48	175
Living Room	196	22.19	4350	4350	3 R + 3 L	69	15	1035	1.035	378
Bedroom 3	123	18.29	2250	2250	1 R+2 L	28.5	10	285	0.285	104
Bedroom 2	120	18.75	2250	2250	1 R +2 L	28.5	10	285	0.285	104
Master Bedroom	167	13.47	2250	2250	1 R +2 L	28.5	10	285	0.285	104
Hallway (1st floor)	186	6.99	1300	1300	2	21	15	315	0.315	115
Bathroom (1st floor)	38	17.11	650	650	1	10.5	5	52.5	0.0525	19
Bathroom (2nd floor)	35	18.57	650	650	1	10.5	5	52.5	0.0525	19
Toilet	18	36.11	650	650	1	10.5	5	52.5	0.0525	19
Sink	32	20.31	650	650	1	10.5	5	52.5	0.0525	19
Washroom	35	18.57	650	650	1	10.5	5	52.5	0.0525	19
Storage	22	29.55	650	650	1	10.5	5	52.5	0.0525	19
Hallway (2nd floor)	80	16.25	1300	1300	2	10.5	15	157.5	0.1575	57
Mech Room	53	12.26	650	650	1	10.5	2	21	0.021	8
Mudroom	60	10.83	650	650	1	10.5	10	105	0.105	38
Closet	5	130.00	650	650	1	10.5	2	21	0.021	8
Storm Shelter	8	81.25	650	650	1	10.5	0	0	0	
Total	1476									

lamp= 9 watts = 800 lumons
recessed= 10.5 watts= 650 lumons
pendant light= 2 watts= 200 lumens

Solar Array Payback Calculations							
Year	KWh Produced	MiM Rebate	Electricity Costs (3.2% Escalation)	Annual PV Savings ($)	Total Annual Savings ($)	Accruing Savings	Payback
0	11260	$1,576	$0.11	$1,239	$2,815	$2,815	-$24,905
1	11260	$1,576	$0.11	$1,278	$2,855	$5,670	-$22,050
2	11260	$1,576	$0.12	$1,319	$2,896	$8,566	-$19,154
3	11260	$1,576	$0.12	$1,361	$2,938	$11,503	-$16,217
4	11260	$1,576	$0.12	$1,405	$2,981	$14,485	-$13,235
5	11260	$1,576	$0.13	$1,450	$3,026	$17,511	-$10,209
6	11260	$1,576	$0.13	$1,496	$3,073	$20,584	-$7,136
7	11260	$1,576	$0.14	$1,544	$3,121	$23,705	-$4,015
8	11260	$1,576	$0.14	$1,594	$3,170	$26,875	-$845
Payback Year-9	11260	$1,576	$0.15	$1,645	$3,221	$30,096	$2,376

Renewable Energy Analysis

DOE Zero Energy Ready Home PV-Ready Checklist

DOE Zero Energy Ready Home National Program Requirements Mandatory Requirement 7 (Renewable Ready) shall be met by any home certified under the DOE Zero Energy Ready Home program, only where **all three conditions** of the following conditions are met. If any of these three conditions is not met, the home is exempt from requirements contained in the PV-Ready checklist.

1. Location, based on zip code has at least 5 kWh/m^2/day average daily solar radiation based on annual solar insolation using PVWatts online tool: http://gisatnrel.nrel.gov/PVWatts_Viewer/index.html **AND**;

2. Location does not have significant natural shading (e.g., trees, tall buildings on the south-facing roof, **AND**;

3. Home as designed has adequate free roof area within +/-45° of true south as noted in the table below.

Conditioned Floor Area of the House (sq. ft.)	Minimum Roof Area within +/- 45◦ of True South for PV-Ready Checklist to Apply (ft^2)
≤ 2000	110
≤ 4000	220
≤ 6000	330
> 6000	440

Note:

- If a solar photovoltaic system is included with the home, then compliance with the Consolidated RERH checklist is not required.

These requirements were adapted from the EPA's Renewable Energy Ready Home Solar Photovoltaic Specification Guide (RERHPV Guide). For further guidance on any of the above items, this checklist notes the section of the guide. This guide can be accessed on the DOE Zero Energy Home program website at http://www1.eere.energy.gov/buildings/residential/pdfs/rerh_pv_guide.pdf

Designate a proposed array location and square footage on architectural diagram: **PV** _____509_____ sq.ft. *(RERHPV Guide 1.1)*	X
Identify orientation (Azimuth) of proposed array location: **PV** _____180_____ degrees. *(RERHPV Guide 1.2)*	X
Identify Inclination of proposed array location: **PV**_____30.9_____ degrees. *(RERHPV Guide 1.3)*	X
Provide code-compliant documentation of the maximum allowable dead load and live load ratings of the existing roof; recommended: allowable dead load rating can support an additional 6 lbs/sq. ft. for future solar system. *(RERHPV Guide 2.1)*	X
Provide architectural drawing of solar PV system components. *(RERHPV Guide 3.5)* **Alternative**: Provide home buyer with the following information: ➢ List of renewable-ready features ➢ Available free roof area within +/- 45° of true south ➢ Location of panel or blocking for future mounting of PV system components ➢ Location of Breaker or slot for future breaker in electrical service panel ➢ Copy of the PV-Ready Checklist ➢ A copy of the RERH Solar PV Specification Guide	X
Install a 1” metal conduit for the DC wire run from the designated array location to the designated inverter location (cap and label both ends). *(RERHPV Guide 3.2)*	X
Install a 1” metal conduit from designated inverter location to electrical service panel (cap and label both ends). *(RERHPV Guide 3.3)*	X
Install and label a 4’ x 4’ plywood panel area for mounting an inverter and balance of system components. *(RERHPV Guide 3.1)* **Alternative:** Blocking is permitted to be used as an alternative to the 4’ x 4’ panel. The area designated for the future panel to mount PV components shall be clearly noted in the system documentation.	X
Install a 70-amp dual pole circuit breaker in the electrical service panel for use by the PV system (label the service panel) *(RERHPV Guide 3.4)* **Alternative:** Provide a labeled slot for a double-pole breaker in the electrical service.	X

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

11,260 kWh per Year *

System output may range from 10,688 to 11,516kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	3.30	734	84
February	4.22	828	95
March	4.72	1,003	115
April	5.03	994	114
May	6.12	1,213	139
June	6.42	1,209	139
July	6.36	1,234	142
August	5.87	1,138	131
September	5.15	991	114
October	4.02	823	94
November	2.68	549	63
December	2.46	543	62
Annual	4.70	11,259	$ 1,292

Location and Station Identification

Requested Location	1401-1499 Currie ave. W Minneapolis, MN 55405
Weather Data Source	(TMY2) MINNEAPOLIS, MN 7.3 mi
Latitude	44.88° N
Longitude	93.22° W

PV System Specifications *(Residential)*

DC System Size	7.92 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	30.3°
Array Azimuth	180°
System Losses	11.86%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Economics

Average Cost of Electricity Purchased from Utility	0.11 $/kWh

Performance Metrics

Capacity Factor	16.2%

Ten K SOLAR

APEX™ PV MODULE

PRODUCT DATA SHEET

Mechanical Specifications

Module Size	2018 × 1298 mm
Frame Extension	48.5 mm
Weight	69 lb
Cells	200 Half Cells
Bypass Diode	None
Front Glass	3.2 mm Tempered
Backsheet Material	PET-covered Aluminum
Frame Material	Aluminum
Load Capacity	50 PSF / 2400 Pa
Connector Type	Utility-Grade Tap
Wire Type	#1 or #2 AWG USE-2
Hail Impact	1.8" direct at 68 mph

Warranty

Product	25-Year
Power	3% First Year. 0.2% Linear Degradation per year after; 92.2% year-25 minimum.

Shipping Information

Max per Pallet	31
Pallet Size	88" × 55"
Pallet Weight	2300 lb

Module Type	Apex 440	Apex 500
Performance Specifications (with integrated electronics)		
Peak Power (PMAX)	440 W	500 W
Cell Type	Poly-Crystalline	Mono-Crystalline (PERC)
Power Tolerance	± 3%	± 3%
Module Efficiency	16.8%	19.1%
Max Current Output (Imp)	7.5 A	9.1 A
Operating DC Voltage (Vmp)	35 – 59 V	35 – 59 V
Temperature Characteristics (before electronics)		
Operating Temperature Range	-40 to 85 °C	-40 to 85 °C
Module NOCT	46 °C	46 °C
Temperature Coefficient (Pmp)	-0.42% / °C	-0.42% / °C
Safety Characteristics		
Ground-Fault Detect	Integrated (Compatible w/Inverter GFDI)	
Arc-Fault Detect	Integrated	
Internal Ground Fault Limit	500 mA	
NEC 2014 690.12	Integrated Rapid Shutdown	
UL 1703 Fire Rating	Type 1 Module	Type 1 Module
Certifications and Listings		
Model Listing Name	XT-A-440	XT-M-500
UL 1741, UL 1703	Certified	Certified
IEC 61215, EN 61730	Pending	Pending

Redundant Inverter Bus Specifications			
AC Output Voltage	240 V 1Φ or 3Φ	**DC Input Conductor**	#2 USE–2
DC Distribution/Disconnect	Included	**Mounting System**	Included
Distribution Box Model	MNPV12	**Full RIB Weight**	111 lb
Inverter Specifications			
Inverter Model	LS700TS–240	**Output Fault Current**	18.19 Apk, 0.86 ms
Inverter Max Continuous Power	700 W	**Total Harmonic Distortion**	<4%
Max System Input Voltage (DC)	60 V	**Standby Power (Night time power consumption)**	<300 mW *(per inverter)*
AC Output Frequency	60 Hz	**Enclosure Rating**	NEMA 4
Power Factor	>0.95	**Grid Connection**	IEEE 1547
Ambient Operating Temperature	-40 to 131 °F *(-40 to 55 °C)*	**Emissions & Immunity (EMC)**	FCC PART 15; ANSI C63.4 2003; ICES-003
Storage Temperature	-40 to 185 °F *(-40 to 85 °C)*	**Safety Class**	UL 1741; CSA C22.2 No. 107.1-01

Shipping Information	
Max Quantity/Pallet	8 Inverter Buses
Pallet Dimensions	82" × 55" × 30"
Fully Loaded Pallet Weight	984 lb

Specifications and design are subject to change without notice.
Read operating instructions carefully before using this product.

Patents Pending

TKS MKT 40109.04

Team OptiMN's Bassett Creek ReGen Homes

Financial Analysis

Financial Analysis Summary

Team: Team Opti MN (Minnesota)
Contest Category: Attached Housing (AH)

Home Cost	Default Estimate	Value	Justification/Notes
Construction Costs		**$ 201,459**	
Total Home Costs		**$ 336,394**	
Property Tax			
Property Tax Rate	1.15%	1.35%	Current Hennepin County Property Tax
Annual Property Tax	$ 3,986	$ 4,524	
Financing			
Annual Interest Rate	4.50%	4.50%	
Years		30 years	
Payments per Year		12	
Number of Payments		360	
Down payment	$ 69,316	$ 100,918	30% of Home Cost with Habitat for Humanity Assistance
Principle Amount		$ 235,476	
Monthly Payment		$ (1,193)	
Affordability			
Estimated Target Family Income	$ 52,250	$ 48,000	Based on ESRI and Harrison Neighborhood Association Data
Monthly Utility Costs			
Electricity	$ 111	$ 23	REM/Rate Analysis for ReGen Homes
Natural Gas	$ 31	$ 43	REM/Rate Analysis for ReGen Homes
Water	$ 18	$ 12	Low flow fixtures in house reduce water consumption
Other	$ -	$ -	
Total	$ 160	$ 78	
Debt to Income Ratio			
Monthly Household Debt (0.5% MFI)	$ 261	$ 240	
Operations and Maintenance Costs	$ 196	$ 120	
Monthly Utility Costs	$ 160	$ 78	
Property Tax	$ 332	$ 377	
Insurance	$ 79	$ 79	
Mortgage Payment	$ 1,405	$ 1,193	
Calculated Debt to Income Ratio	56%	52%	Homeownership Affordability Target is 38%

Construction Cost Summary

Team: Team Opti MN (Minnesota)
Contest Category: Attached Housing (AH)

NAHB 2013 Average Sq. Ft.: 2607 sq.ft.
Team sq.ft.: 2298 sq.ft.
NAHB Lot Size Sq. Ft.: 14359 sq.ft.
Lot Size Sq. Ft.: 2980 sq.ft.

If a cell in column H is colored 'green', justification/notes is required.

Construction Cost Breakdown	NAHB 2013 Value Share of Construction Value	Per sq.ft.	Team Default Estimate for Share of Construction Value	Team Estimate Share of Construction Value	Team Estimate Per sq.ft.	Notes Required?	Justification/Notes (Required for Values different than Default Value)
Site Work (sum of A to E)	**$ 16,825**	$ 6.45	**$ 14,831**	**$ 14,830.78**	$ 5.69		
A Building Permit Fees	$ 3,647	$ 1.40	$ 3,215	$ 3,214.73	$ 1.40	NO	Reviewed city permit fees for new single family.
B Impact Fee	$ 3,312	$ 1.27	$ 2,919	$ 2,919.44	$ 1.27	NO	Estimate provided by local developer to team.
C Water & Sewer Fees Inspections	$ 4,346	$ 1.67	$ 3,831	$ 3,830.88	$ 1.67	NO	Estimate provided by local developer to team.
D Architecture, Engineering	$ 3,721	$ 1.43	$ 3,280	$ 3,279.96	$ 1.43	NO	Custom design has higher fees than typical builder.
E Other	$ 1,799	$ 0.69	$ 1,586	$ 1,585.77	$ 0.69	NO	Using default estimate.
Foundations (sum of F to G)	**$ 23,401**	**$ 8.98**	**$ 20,627**	**$ 29,699**	**$ 11.39**		
F Excavation, Foundation, Concrete, Retaining walls, and Backfill	$ 23,028	$ 8.83	$ 20,299	$ 29,699	$ 12.92	YES	See Team OptiMN Estimate in Volume II.
G Other	$ 373	$ 0.14	$ 329	$ -	$ -	YES	Incorporated into above costs.
Framing (Sum of H to L)	**$ 47,036**	**$ 18.04**	**$ 41,461**	**$ 24,668**	**$ 9.46**		
H Framing (including roof)	$ 36,438	$ 13.98	$ 32,119	$ 12,711	$ 5.53	YES	See Team OptiMN Estimate in Volume II.
I Trusses (if not included above)	$ 5,461	$ 2.09	$ 4,814	$ 7,155	$ 3.11	YES	See Team OptiMN Estimate in Volume II.
J Sheathing (if not included above)	$ 2,332	$ 0.89	$ 2,056	$ 4,802	$ 2.09	YES	See Team OptiMN Estimate in Volume II.
K General Metal, Steel	$ 1,604	$ 0.62	$ 1,414		$ -	YES	None used.
L Other	$ 1,201	$ 0.46	$ 1,059		$ -	YES	Incorporated into above costs.
Exterior Finishes (sum of M to P)	**$ 35,473**	**$ 13.61**	**$ 31,268**	**$ 31,034**	**$ 11.90**		
M Exterior Wall Finish	$ 16,867	$ 6.47	$ 14,868	$ 22,571	$ 9.82	YES	See Team OptiMN Estimate in Volume II.
N Roofing	$ 7,932	$ 3.04	$ 6,992	$ 3,092	$ 1.35	YES	See Team OptiMN Estimate in Volume II.
O Windows and Doors (including garage door)	$ 10,117	$ 3.88	$ 8,918	$ 5,371	$ 2.34	YES	See Team OptiMN Estimate in Volume II, use of local window companies.
P Other	$ 557	$ 0.21	$ 491		$ -	YES	Incorporated into above costs.
Major Systems Rough-ins (sum of Q to T)	**$ 32,959**	**$ 12.64**	**$ 29,052**	**$ 23,147**	**$ 8.88**		
Q Plumbing (except fixtures)	$ 11,823	$ 4.54	$ 10,422	$ 774	$ 0.34	YES	See Team OptiMN Estimate in Volume II, Plumbing costs incorporated into HVAC costs.
R Electrical (except fixtures)	$ 9,967	$ 3.82	$ 8,786	$ 1,872	$ 0.81	YES	See Team OptiMN Estimate in Volume II, Electrical costs incorporated into lighting costs.
S HVAC	$ 10,980	$ 4.21	$ 9,679	$ 20,500	$ 8.92	YES	See Team OptiMN Estimate in Volume II.
T Other	$ 189	$ 0.07	$ 167		$ -	YES	Incorporated into above costs.
Interior Finishes (sum of U to AE)	**$ 72,241**	**$ 27.71**	**$ 63,678**	**$ 73,073**	**$ 28.03**		
U Insulation	$ 4,786	$ 1.84	$ 4,219	$ 3,018	$ 1.31	YES	See Team OptiMN Estimate in Volume II, Insulation incorporated into Exterior Wall Finish and Roofing Sections
V Drywall	$ 9,376	$ 3.60	$ 8,265	$ 10,819	$ 4.71	YES	See Team OptiMN Estimate in Volume II.
W Interior Trims, Doors, and Mirrors	$ 10,536	$ 4.04	$ 9,287	$ 2,848	$ 1.24	YES	See Team OptiMN Estimate in Volume II.
X Painting	$ 8,355	$ 3.20	$ 7,365	$ 5,232	$ 2.28	YES	See Team OptiMN Estimate in Volume II.
Y Lighting	$ 3,008	$ 1.15	$ 2,651	$ 7,779	$ 3.38	YES	See Team OptiMN Estimate in Volume II, Electrical costs incorporated here.
Z Cabinets, Countertops	$ 12,785	$ 4.90	$ 11,270	$ 16,371	$ 7.12	YES	See Team OptiMN Estimate in Volume II.
AA Appliances	$ 4,189	$ 1.61	$ 3,692	$ 6,608	$ 2.88	YES	See Team OptiMN Estimate in Volume II.
AB Flooring	$ 12,378	$ 4.75	$ 10,911	$ 16,910	$ 7.36	YES	See Team OptiMN Estimate in Volume II.
AC Plumbing Fixtures	$ 4,265	$ 1.64	$ 3,759	$ 3,487	$ 1.52	YES	See Team OptiMN Estimate in Volume II.
AD Fireplace	$ 2,057	$ 0.79	$ 1,813		$ -	YES	No fireplace.
AE Other	$ 506	$ 0.19	$ 446		$ -	YES	Incorporated into above costs.
Final Steps (sum of AF to AJ)	**$ 16,254**	**$ 6.23**	**$ 14,327**	**$ 5,009**	**$ 1.92**		
AF Landscaping	$ 5,744	$ 2.20	$ 5,063	$ 2,315	$ 1.01	YES	See Team OptiMN Estimate in Volume II.
AG Outdoor structures (deck, patio, porches)	$ 2,891	$ 1.11	$ 2,548	$ 2,693	$ 1.17	YES	See Team OptiMN Estimate in Volume II.
AH Driveway	$ 3,741	$ 1.43	$ 3,298		$ -	YES	No Driveway
AI Clean up	$ 2,261	$ 0.87	$ 1,993		$ -	YES	Incorporated into above costs.
AJ Other	$ 1,617	$ 0.62	$ 1,425		$ -	YES	Incorporated into above costs.
Other	**$ 2,265**	**$ 0.87**	**$ 1,997**	**$ -**	**$ -**		
AK Other	$ 2,265	$ 0.87	$ 1,997		$ -	YES	Incorporated into above costs.
AL Renewable Energy Systems (Optional)	$ -	$ -	$ -		$ -	NO	Separate cost analysis in Volume II.
Total	**$ 246,454**	**$ 94.54**	**$ 217,243**	**$ 201,459**	**$ 87.67**		

NAHB Sales Price Breakdown	2013 Value	Team Default Estimate	Team Adjusted Estimate		Justification/Notes (Required for Values different than Default Value)
Finshed Lot Cost (including financing costs):	$ 74,509	$ 65,678	$ 65,678	NO	
Financing Costs	$ 5,479	$ 4,830	$ 4,830	NO	
Overhead and General Expenses	$ 17,340	$ 15,285	$ 15,285	NO	
Marketing Cost	$ 4,260	$ 3,755	$ 3,755	NO	
Sales Commission	$ 14,235	$ 12,548	$ 12,548	NO	
Profit	$ 37,255	$ 32,839	$ 32,839	NO	
Total Sales Price	**$ 399,532**	**$ 352,177**	**$ 336,394**		

ITEM & SPECIFICATION BASIS	Length/Area	Width	Height	Each	Unit Basis	TOTAL QUANTITY	Labor	Labor Extension	Material	Material Extension	TOTAL EXTENSION
Site Work											
A Building Permit Fees											$ 19,288.39
B Impact Fee											$ 17,516.63
C Water & Sewer Fees Inspections											$ 22,985.29
D Architecture, Engineering											$ 19,679.77
E Other											$ 9,514.62
Foundations											
F Excavation, Foundation, Concrete, Retaining walls, and Backfill											
Excavation											
Bulldozer by day				2	E.A.	2	$270.00	$ 540.00	$ -		$ 604.80
Excavation by small dozer for small area - Building Footprint	31245		1.08		C.Y.	1379	$3.21	$ 4,426.67	$0.00	$ -	$ 4,957.86
" - Building Perimeter Foundation Drop	3.93			457.53	C.Y.	73	$3.21	$ 235.09	$0.00	$ -	$ 263.30
" - Building Partition Wall Foundation Drop	6.09			182.88	C.Y.	45	$3.21	$ 145.59	$0.00	$ -	$ 163.06
" - Building Perimeter Insulation	14.94			457.53	C.Y.	278	$3.21	$ 893.78	$0.00	$ -	$ 1,001.04
General Site Grading	10415				S.F.	10936	$0.38	$ 4,155.59	$0.00	$ -	$ 4,654.26
Backfill with compaction	14.94			457.53	C.Y.	259	$15.75	$ 4,086.38	$0.00	$ -	$ 4,576.74
Foundation											
Filter Fabric	8986				S.F.	8986	$0.45	$ 4,043.87	$0.15	$ 1,347.96	$ 6,038.84
Underslab Class 3 Drainage 6" Depth	6661				S.F.	6662	$1.04	$ 6,928.92	$0.51	$ 3,397.83	$ 11,565.96
Underslab Class 3 Drainage 4" Depth	2325				S.F.	2441	$0.96	$ 2,343.60	$0.34	$ 830.03	$ 3,554.46
Drain Tile	734				L.F.	752	$4.18	$ 3,144.82	$1.91	$ 1,436.99	$ 5,131.63
Rigid Insulation, Extruded 3" Below Grade Insulation	6661			2	S.F.	13656	$1.57	$ 21,439.62	$0.00	$ -	$ 24,012.37
Rigid Insulation, Extruded 5" Depth Wing Insulation	2325			3	S.F.	7149	$1.57	$ 11,224.52	$0.00	$ -	$ 12,571.46
Rigid Insulation, Extruded 3" Foundation Exterior	458		2	2	S.F.	1876	$1.57	$ 2,945.12	$0.00	$ -	$ 3,298.54
5000 PSI Concrete - 4" Base	6261		0.33		C.Y.	81.17	$20.25	$ 1,643.61	$140.00	$ 11,363.23	$ 14,567.66
5000 PSI Concrete - Perimeter Base	3.75			457.53	C.Y.	66.72	$20.25	$ 1,351.14	$140.00	$ 9,341.24	$ 11,975.47
5000 PSI Concrete - Party Wall Base	4.17			182.88	C.Y.	29.65	$20.25	$ 600.39	$140.00	$ 4,150.83	$ 5,321.36
Wire Mesh	6185				S.F.	6185	$0.29	$ 1,793.68	$0.14	$ 865.92	$ 2,978.75
Footing Heating	6185				S.F.	6185	$5.00	$ 30,925.58	$3.00	$ 18,555.35	$ 55,418.63
Footing Reinforcement Grade 60 - #4 Rebar Footing Drop	457.53	0.67		4	TON	0.6437	$990.00	$ 637.31	$1,380.00	$ 888.37	$ 1,708.76
Footing Reinforcement Grade 60 - #4 Rebar Party Wall Drop	198.88	0.67			TON	0.0700	$990.00	$ 69.26	$1,380.00	$ 96.54	$ 185.69
" - #4 Rebar Footing Perimeter Stirrups	57.19	0.67			TON	0.0201	$990.00	$ 19.92	$1,380.00	$ 27.76	$ 53.40
" - #4 Rebar Footing Party Wall Stirrups	24.86	0.67			TON	0.0087	$990.00	$ 8.66	$1,380.00	$ 12.07	$ 23.21
" - #4 Rebar Perimeter Temperature Steel	8.58	0.67		114.38	TON	0.3453	$990.00	$ 341.89	$1,380.00	$ 476.57	$ 916.68
" - #4 Rebar Party Wall Temperature Steel	8.25	0.67		99.44	TON	0.2886	$990.00	$ 285.68	$1,380.00	$ 398.22	$ 765.98
Anchor Bolts - 1/2" Dia. 8" long 24" o.c.				228.77	EA.	240	$1.50	$ 360.30	$5.50	$ 1,321.12	$ 1,883.19
											$ 178,193.09
G Other											
Framing											
H Framing (including roof)											
2x4 - 24" o.c. Wall Framing Exterior	9417				S.F.	9887.85	$0.78	$ 7,712.52	$0.27	$ 2,669.72	$ 11,628.11
2x4 - 24" o.c. Wall Framing Partition Wall	4334			2	S.F.	9101.40	$0.78	$ 7,099.09	$0.27	$ 2,457.38	$ 10,703.25
2x4 - 24" o.c. Wall Framing Interior Framing ADA Unit 1st Floor	102.08		9.09		S.F.	974.70	$0.78	$ 760.27	$0.27	$ 263.17	$ 1,146.25
2x4 - 24" o.c. Wall Framing Interior Framing TYP Unit 1st Floor	63.11		9.09	5	S.F.	3013.01	$0.78	$ 2,350.15	$0.27	$ 813.51	$ 3,543.30
2x4 - 24" o.c. Wall Framing Interior Framing TYP Unit 2nd Floor	110.04		8.09	6	S.F.	5611.01	$0.78	$ 4,376.59	$0.27	$ 1,514.97	$ 6,598.55
2x4 - 24" o.c. Wall Framing Interior Framing TYP Unit 3rd Floor	546.23			6	S.F.	3441.25	$0.99	$ 3,406.84	$0.78	$ 2,684.17	$ 6,821.93
Open Web Floor Truss 2nd Floor	5569				S.F.	5847.70	$0.99	$ 5,789.22	$0.78	$ 4,561.21	$ 11,592.48
Open Web Floor Truss 3nd Floor	4286				S.F.	4500.78	$0.99	$ 4,455.78	$0.78	$ 3,510.61	$ 8,922.35
Stair Framing Per Riser 1st Floor	17			6	EA.	102.00	$29.00	$ 2,958.00	$38.00	$ 3,876.00	$ 7,654.08
Stair Framing Per Riser 2nd Floor	17			6	EA.	102.00	$29.00	$ 2,958.00	$38.00	$ 3,876.00	$ 7,654.08
											$ 76,264.38
I Trusses (if not included above)											
I Joist 11.5" - 24" o.c. 7-in-12 pitch Roof Framing South	1404			6	S.F.	8845.20	$1.11	$ 9,818.17	$1.22	$ 10,791.14	$ 23,082.43
I Joist 11.5" - 24" o.c. 10-in-12 pitch Roof Framing North	948			6	S.F.	5972.40	$1.03	$ 6,151.57	$1.27	$ 7,584.95	$ 15,384.90
I Joists Horizontal	2143				S.F.	2250.39	$0.99	$ 2,227.89	$0.78	$ 1,755.31	$ 4,461.18
											$ 42,928.51
J Sheathing (if not included above)											
1/2" OSB Exterior Wall Sheathing	9417				S.F.	9887.85	$0.78	$ 7,712.52	$0.42	$ 4,152.90	$ 13,289.27
1/2" OSB Party Wall Sheathing	8668				S.F.	9101.40	$0.78	$ 7,099.09	$0.42	$ 3,822.59	$ 12,232.28
1/2" OSB Roof Sheathing	2352				S.F.	2469.60	$0.77	$ 1,901.59	$0.42	$ 1,037.23	$ 3,291.48
											$ 28,813.03
K General Metal, Steel											
L Other											
Exterior Finishes											
M Exterior Wall Finish											
Cedar Tongue and groove Siding, 1x6 (07-5)	9789				S.F.	10034	$2.75	$ 27,592.74	$4.69	$ 47,058.17	$ 83,609.02
1x3 Furring 24" o.c.	9789			2	S.F.	20557	$1.05	$ 21,584.75	$0.35	$ 7,194.92	$ 32,233.22
Rigid Insulation, Extruded 3" Exterior Insulation	9789				S.F.	10034	$0.00	$ -	$1.57	$ 15,752.95	$ 17,643.30
Through Wall Flashing	458		0.5		S.F.	240	$4.61	$ 1,107.34	$2.60	$ 624.53	$ 1,939.69
											$ 135,425.23
N Roofing											
2x4 Furring 24" o.c.	1176			2	S.F.	2470	$1.37	$ 3,383.35	$0.64	$ 1,580.54	$ 5,559.56
Asphalt Shingles	1176				S.Q.	12.348	$55.00	$ 679.14	$90.00	$ 1,111.32	$ 2,005.32
Tar Paper 1/16" Thick	1176				S.F.	1205.4	$1.13	$ 1,362.10	$0.79	$ 952.27	$ 2,592.09
Building Paper Membrane	1176				S.F.	1205.4	$1.81	$ 2,181.77	$1.27	$ 1,530.86	$ 4,158.15
Rigid Insulation, Extruded 6" Exterior Insulation	1176			2	S.F.	2411	$0.00	$ -	$1.57	$ 3,784.96	$ 4,239.15
											$ 18,554.27
O Windows and Doors (including garage door)											
3 Leaf Window	2			6	E.A.	12	$72.00	$ 864.00	$680.00	$ 8,160.00	$ 10,106.88
2 Lead Window	3			6	E.A.	19	$72.00	$ 1,368.00	$435.00	$ 8,265.00	$ 10,788.96
Double Hung Window	3			6	E.A.	18	$72.00	$ 1,296.00	$130.00	$ 2,340.00	$ 4,072.32
Front Door	1			6	E.A.	6	$140.00	$ 840.00	$500.00	$ 3,000.00	$ 4,300.80
Back Door	1			6	E.A.	6	$140.00	$ 840.00	$300.00	$ 1,800.00	$ 2,956.80
											$ 32,225.76
P Other											
Major Systems Rough-ins											
Q Plumbing (except fixtures)											
PEX Piping	213.46			6	L.F.	1313	$1.76	$ 2,310.49	$1.40	$ 1,837.89	$ 4,646.19
											$ 4,646.19
R Electrical (except fixtures)											
Double Outlets	42			6	EA.	252	$14.75	$ 3,717.00	$1.60	$ 403.20	$ 4,614.62
Ceiling Fan	3			6	EA.	18	$130.00	$ 2,340.00	$78.00	$ 1,404.00	$ 4,193.28
Single Switch	15			6	EA.	90	$11.75	$ 1,057.50	$1.62	$ 145.80	$ 1,347.70
Double Switch	12			6	EA.	72	$11.75	$ 846.00	$1.62	$ 116.64	$ 1,078.16
											$ 11,233.76
S HVAC											
Combination Boiler with DHW Tank				6	EA.	6	$2,000.00	$ 12,000.00	$4,000.00	$ 24,000.00	$ 36,000.00
AHU with Ductwork				6	EA.	6	$3,000.00	$ 18,000.00	$3,000.00	$ 18,000.00	$ 36,000.00
Energy Recovery Ventilator				6	EA.	6	$1,500.00	$ 9,000.00	$2,000.00	$ 12,000.00	$ 21,000.00
Air Filtration				6	EA.	6	$500.00	$ 3,000.00	$500.00	$ 3,000.00	$ 6,000.00
Air Conditioning				6	EA.	6	$2,500.00	$ 15,000.00	$1,500.00	$ 9,000.00	$ 24,000.00
											$ 123,000.00
T Other											
Interior Finishes											

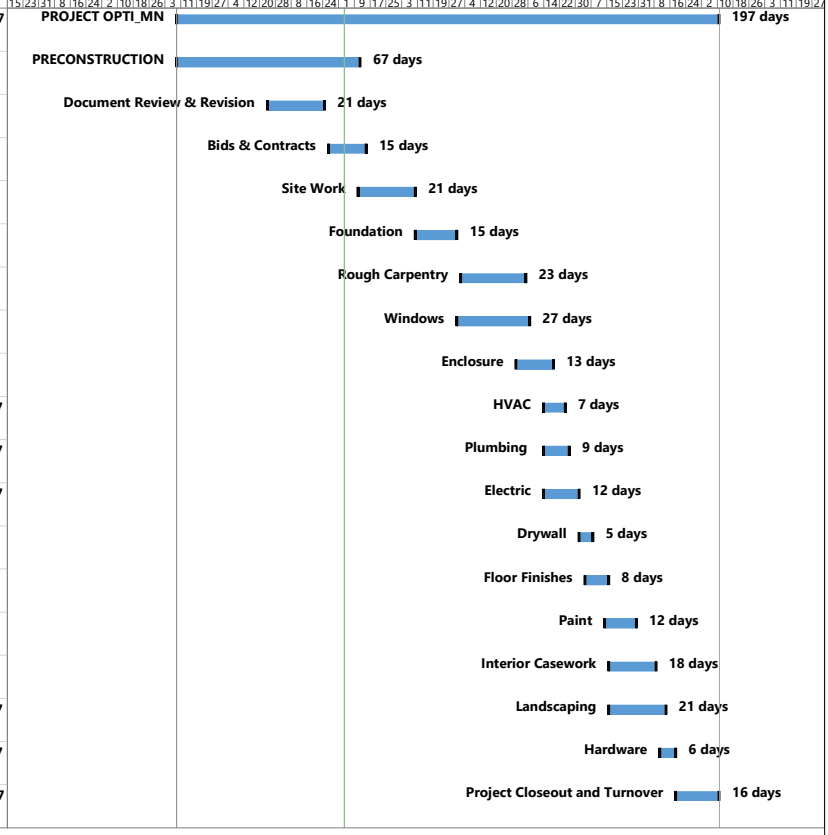
U Insulation											
Cavity Party Wall Insulation	4334		2	S.F.	8884.7	$0.53	$ 4,708.89	$0.49	$ 4,353.50	$	10,149.88
Batt Insultaion Party Wall	4334		2	S.F.	8884.7	$0.50	$ 4,442.35	$0.30	$ 2,665.41	$	7,960.69
										$	18,110.57
V Drywall											
Gypsum Board 1/2" Clipped to Walls Exterior Walls	9417			S.F.	9652	$0.57	$ 5,501.88	$0.35	$ 3,378.35	$	9,945.86
Gypsum Board 1/2" Clipped to Walls Party Wall	8668			S.F.	8885	$0.57	$ 5,064.28	$0.35	$ 3,109.65	$	9,154.79
Gypsum Board 1/2" Clipped to Walls Interior ADA Unit 1st Floo	204.16	9.09		S.F.	1903	$0.57	$ 1,084.71	$0.35	$ 666.05	$	1,960.85
Gypsum Board 1/2" Clipped to Walls Interior TYP Unit 1nd Floc	126.22	9.09	5	S.F.	5883	$0.57	$ 3,353.05	$0.35	$ 2,058.89	$	6,061.37
Gypsum Board 1/2" Clipped to Walls Interior TYP Unit 2nd Floc	220.08	8.09	6	S.F.	10955	$0.57	$ 6,244.25	$0.35	$ 3,834.19	$	11,287.85
Gypsum Board 1/2" Clipped to Walls Interior TYP Unit 3rd Floo	1092.46		6	S.F.	6719	$0.57	$ 3,829.62	$0.35	$ 2,351.52	$	6,922.88
Gypsum Board 1/2" Clipped to Walls Interior Ceiling 1st Floor	5916			S.F.	6064	$0.57	$ 3,456.63	$0.35	$ 2,122.49	$	6,248.62
Gypsum Board 1/2" Clipped to Walls Interior Ceiling 2nd Floor	5569			S.F.	5708	$0.57	$ 3,253.83	$0.35	$ 1,997.96	$	5,882.01
Gypsum Board 1/2" Clipped to Walls Interior Ceiling 3nd Floor	1176		6	S.F.	7232	$0.57	$ 4,122.47	$0.35	$ 2,531.34	$	7,452.26
										$	64,916.49
W Interior Trims, Doors, and Mirrors											
Interior Door 2'-6" Wide			85	E.A.	85	$72.00	$ 6,120.00	$90.00	$ 7,650.00	$	15,422.40
Mirror	2		6	E.A.	12	$29.00	$ 348.00	$95.00	$ 1,140.00	$	1,666.56
										$	17,088.96
X Painting											
Exterior Water Preservative Finish	9789			S.F.	9887	$0.22	$ 2,175.12	$0.15	$ 1,483.03	$	4,097.13
Interior Painting	63001			S.F.	63631	$0.23	$ 14,635.19	$0.15	$ 9,735.58	$	27,295.27
										$	31,392.40
Y Lighting											
Recessed Light	22		6	EA.	132	$110.00	$ 14,520.00	$140.00	$ 18,480.00	$	36,960.00
Wall Mounted Light	2		6	EA.	12	$49.25	$ 591.00	$100.00	$ 1,200.00	$	2,005.92
Pendant Light	11		6	EA.	66	$49.25	$ 3,250.50	$55.00	$ 3,630.00	$	7,706.16
										$	46,672.08
Z Cabinets, Countertops											
Kitchen Base Cabinets	20		6	L.F.	119	$29.00	$ 3,439.98	$230.00	$ 27,282.60	$	34,409.29
Kitchen Corner Cabinets	6		6	L.F.	36	$35.00	$ 1,260.00	$250.00	$ 9,000.00	$	11,491.20
Kitchen Wall Cabinets	5		6	L.F.	30	$23.25	$ 697.50	$82.00	$ 2,460.00	$	3,536.40
Kitchen Countertop Soapstone	38		6	S.F.	229	$110.00	$ 25,218.60	$80.00	$ 18,340.80	$	48,786.53
										$	98,223.42
AA Appliances											
Refrigerator			6	EA.	6	$400.00	$ 2,400.00	$500.00	$ 3,000.00	$	6,048.00
Microwave			6	EA.	6	$100.00	$ 600.00	$300.00	$ 1,800.00	$	2,688.00
Dishwasher			6	EA.	6	$300.00	$ 1,800.00	$440.00	$ 2,640.00	$	4,972.80
Range			6	EA.	6	$150.00	$ 900.00	$980.00	$ 5,880.00	$	7,593.60
Rangehood			6	EA.	6	$200.00	$ 1,200.00	$530.00	$ 3,180.00	$	4,905.60
Washer			6	EA.	6	$250.00	$ 1,500.00	$500.00	$ 3,000.00	$	5,040.00
Dryer			6	EA.	6	$250.00	$ 1,500.00	$1,000.00	$ 6,000.00	$	8,400.00
										$	39,648.00
AB Flooring											
1st Floor Tile Floor	5960			S.F.	6020	$5.10	$ 30,699.96	$4.00	$ 24,078.40	$	61,351.76
2nd Floor Finished 1 1/8" OSB	5292			S.F.	5345	$0.95	$ 5,077.67	$1.46	$ 7,803.58	$	14,427.01
2nd Floor Sanding, Finish and Wax	5292			S.F.	5345	$1.44	$ 7,696.68	$0.60	$ 3,206.95	$	12,212.07
2nd Floor Finished 1 1/8" OSB	2676			S.F.	2703	$0.95	$ 2,567.62	$1.46	$ 3,946.03	$	7,295.29
2nd Floor Sanding, Finish and Wax	2676			S.F.	2703	$1.44	$ 3,891.97	$0.60	$ 1,621.66	$	6,175.27
										$	101,461.40
AC Plumbing Fixtures											
Toilet			11	EA.	11	$160.00	$ 1,760.00	$330.00	$ 3,630.00	$	6,036.80
Handicapped Toilet			1	EA.	1	$210.00	$ 210.00	$370.00	$ 370.00	$	649.60
Bath Tub 5' Long			7	EA.	7	$210.00	$ 1,470.00	$530.00	$ 3,710.00	$	5,801.60
Shower			7	EA.	7	$110.00	$ 770.00	$110.00	$ 770.00	$	1,724.80
Bathroom Faucet			11	EA.	11	$110.00	$ 1,210.00	$83.00	$ 913.00	$	2,377.76
Handicapped Faucet			1	EA.	1	$130.00	$ 130.00	$120.00	$ 120.00	$	280.00
Kitchen Faucet			6	EA.	6	$110.00	$ 660.00	$83.00	$ 498.00	$	1,296.96
Kitchen Sink			6	EA.	6	$130.00	$ 780.00	$280.00	$ 1,680.00	$	2,755.20
Water Heaters (15-7)											
										$	20,922.72
AD Fireplace											
AE Other											
Final Steps											
AF Landscaping											
Area Preparation, seeding, raking, cleaning	1200			S.Y.	140	$0.36	$ 50.40	$	-	$	56.45
Topsoil 6" Deep	300	0.5	6	C.Y.	35.00	$13.75	$ 481.25	$20.00	$ 700.00	$	1,323.00
Seeding	500		6	S.Y.	3150	$0.11	$ 346.50	$0.19	$ 598.50	$	1,058.40
Landscaping Rock	526	0.17	6	C.Y.	20.46	$45.50	$ 930.73	$32.25	$ 659.69	$	1,781.27
Irrigation	2000		6	ACRE	0.2755	$0.00	$ -	$15,940	$ 4,391.18	$	4,918.13
Little Blue Stem Schizachyrium scoparium	6		6	EA.	36	$2.50	$ 90.00	$5.00	$ 180.00	$	302.40
Walker's Low Catmint Nepeta racemosa 'Walker's Low'	8		6	EA.	48	$2.05	$ 98.40	$8.00	$ 384.00	$	540.29
Alpine Strawberry Fragaria vesca	22		6	EA.	132	$1.78	$ 234.96	$2.79	$ 368.28	$	675.63
Inkberry Iilex glabra 'shamrock'	3		6	EA.	18	$5.45	$ 98.10	$34.00	$ 612.00	$	795.31
Purple Conflower Echinacea purpurea	5		6	EA.	30	$1.05	$ 31.50	$2.96	$ 88.80	$	134.74
Daylilly Hermocallis 'Rosy Returns'	9		6	EA.	54	$1.25	$ 67.50	$8.65	$ 467.10	$	598.75
Hosta Hosta sieboldiana elegans	2		6	EA.	12	$2.15	$ 25.80	$5.45	$ 65.40	$	102.14
Clematis Vine Clematis hybrids	1		6	EA.	6	$3.32	$ 19.92	$10.00	$ 60.00	$	89.51
Wild Grape Vine Vitis riparia	6		6	EA.	36	$3.68	$ 132.48	$4.28	$ 154.08	$	320.95
Assorted Annuals Anything	4		6	EA.	24	$1.10	$ 26.40	$7.70	$ 184.80	$	236.54
Hakonechloa Hakonechloa macra 'aureola'	9		6	EA.	54	$1.85	$ 99.90	$11.70	$ 631.80	$	819.50
Service Berry Amelanchier laevis	2		6	EA.	12	$3.10	$ 37.20	$7.30	$ 87.60	$	139.78
										$	13,892.79
AG Outdoor structures (deck, patio, porches)											
Brick Patio	120		6	S.F.	720	$6.14	$ 4,420.80	$4.16	$ 2,995.20	$	8,305.92
Concrete Sidewalk	90		6	S.F.	553.5	$1.84	$ 1,018.44	$2.95	$ 1,632.83	$	2,969.42
Stone Pavers	30		6	S.F.	184.5	$15.75	$ 2,905.88	$7.88	$ 1,453.86	$	4,882.90
										$	16,158.24
AH Driveway											
AI Clean up											
AJ Other											
Other											
AK Other											
AL Renewable Energy Systems (Optional)											

Construction Management

Construction Quality Assurance	
Preconstruction	Constant communication between general contractor and architects will ensure high-quality execution and a high-perfromance building. A complete set of detailed construction drawings will assure that all materials specified are correct and amounts specified are appropriate.
	Consulations with building science and certification professionals to ensure energy efficiency and high performance across all elements
Site Work	A geological survey preempts site work, and alerts us to conflicting existing conditions.
	Soil contamination is a great residential concern, and remediation work may be required.
	Soil has structural considerations as well, so well graded, inorganic gavel and sand is ideal.
	Proper compaction of the soil must begin prior to laying and compactive gravel.
	Slopes of the foundation are designed to be 45 degree angles for easy workability.
Foundation	Filter fabric is installed between earth and gravel to prevent compaction into soil.
	Proper gravel compaction must occur before rigid insulation is used for formwork.
	Minimize gaps between XPS insulation and install temporary support for vertical XPS.
	Stagger underslab XPS into two layers, 1" and 2"
	Use stucco coated XPS for exterior rigid insulation and wing insulation to protect the insulation from breaking.
	Use high compressive strength XPS (40 psi) for under footing insulation
	Install drain tile in gravel underneath slab and slope towards sump pump.
	Exterior drainage layer must slope away from foundation.
	Sump pump opening in slab must be air sealed
	Install flashing between walls and foundation and sill sealer beneath the sill plate for capillary break and wall drainage.
Rough Carpentry	Gaps between framing and sheathing must be minimized by using graded 2x4 studs, selected specifically for straightness and structural capacity.
	OSB sheathing must be weatherproofed with continuous peel and stick membrane soon to prevent warping or swelling.
	FSC certified wood must be used
	Framing inspection for gaps between sheathing and framing by HERS Rater
Windows	Oversize window rough opening to allow for sloped sill and expanding foam sealant between window and rough opening.
	Peel and stick membrane, and flashing must be established prior to window installation.
	The sides of the peel and stick membrane will be flashed in, and there will be a pan flash must be installed.
	Sealant between trim and cladding to minimize water penetration.
	Use beveled siding to create slope sill and flashing installed under window and integrated with peel and stick membrane
Weatherproofing	Furring strips are installed over the rigid installation to provide back ventilation of siding.
	Roof rigid installation installed in 2 layers and staggered to minimize thermal bridging.
	Install furring strips over rigid insulation to provide ventilation for shingles.
Cavity Insulation	Install cavity insulation without compression or voids
	Insulation Inspection by HERS Rater
HVAC	Assure all ducts are properly sealed with mastic during installation.
	Inspection of HVAC appliances occur after rough ins.
Plumbing	Plumbing rough inspection and final inspection for proper pressure and flow
Electrical	Electrical inspection rough in and final inspection for proper wiring and fire stops
Landscaping	Exterior perimeter of site surrounded by silt fence, and bioswale in middle of site surrounded by silt fence
Final Approval & Certification	*Blower door test and infrared analysis for infiltration levels by HERS Rater*
	Duct Blaster test for duct leakage assessment by HERS Rater
	Ventilation flow verification by HERS Rater
	Hot water test- no more than 0.5 gal to achieve a 10 degree rise by HERS Rater

Construction Schedule

ID	Task Mode	Task Name	Duration	Start	Finish
1		**PROJECT OPTI_MN**	**197 days**	**Mon 1/9/17**	**Tue 10/10/17**
2		**PRECONSTRUCTION**	**67 days**	**Mon 1/9/17**	**Tue 4/11/17**
26		**Document Review & Revision**	**21 days**	**Fri 2/24/17**	**Fri 3/24/17**
33		**Bids & Contracts**	**15 days**	**Mon 3/27/17**	**Fri 4/14/17**
37		**Site Work**	**21 days**	**Tue 4/11/17**	**Tue 5/9/17**
53		**Foundation**	**15 days**	**Wed 5/10/17**	**Tue 5/30/17**
63		**Rough Carpentry**	**23 days**	**Fri 6/2/17**	**Tue 7/4/17**
100		**Windows**	**27 days**	**Wed 5/31/17**	**Thu 7/6/17**
114		**Enclosure**	**13 days**	**Fri 6/30/17**	**Tue 7/18/17**
148		**HVAC**	**7 days**	**Fri 7/14/17**	**Mon 7/24/17**
152		**Plumbing**	**9 days**	**Fri 7/14/17**	**Wed 7/26/17**
158		**Electric**	**12 days**	**Fri 7/14/17**	**Mon 7/31/17**
177		**Drywall**	**5 days**	**Tue 8/1/17**	**Mon 8/7/17**
190		**Floor Finishes**	**8 days**	**Fri 8/4/17**	**Tue 8/15/17**
221		**Paint**	**12 days**	**Mon 8/14/17**	**Tue 8/29/17**
234		**Interior Casework**	**18 days**	**Wed 8/16/17**	**Fri 9/8/17**
253		**Landscaping**	**21 days**	**Wed 8/16/17**	**Wed 9/13/17**
261		**Hardware**	**6 days**	**Mon 9/11/17**	**Mon 9/18/17**
265		**Project Closeout and Turnover**	**16 days**	**Tue 9/19/17**	**Tue 10/10/17**



11

Bassett Creek ReGen Homes

Homeowner Guide

Welcome Home!

Congratulations, you are a homeowner!

Owning a home is a big investment and a big responsibility. It's important to identify key maintenance tasks and take care of important safety issues right away so you can prevent problems before they occur.

Small maintenance expenses can save you big bucks in the long run. Regular maintenance ensures everything that looks fine is also working fine.

It is important to mention that as part of a Homeowner Association, you won't be required to do maintenance on exterior features of your unit. The Homeowers Association will take care of the maintenance of the exterior facade and the upkeep of the landscape.

Table of Contents

A. Safety
B. Hazards: Protect People
C. Electricity, Water and Gas
D. Basic ongoing Maintenance
E. Seasonal Maintenance

A. Safety

In order to make your home as safe as possible by checking these four important things:

Smoke & Carbon Monoxide Detectors

Smoke detectors are crucial! About 62% of home-related fire deaths occur because the home did not have working smoke alarms. Fire safety experts recommend you have a smoke detector on every floor of your home and at the top of your stairs. Also, make sure every room with a fuel-burning appliance (e.g. furnace, boiler, water heater) has a smoke detector nearby. Finally, we recommend you put a detector inside each bedroom (or directly outside). When you mount the alarm, remember that smoke rises. Place the alarm on the ceiling or as high as possible on the wall.

Ground Fault Circuit Interrupters

A GFCI (ground fault circuit interrupter) will immediately stop the flow of electricity if it senses the slightest change in the current, which prevents electrocution. Make sure GFCI outlets are installed near sinks — both bathroom and kitchen — and in the laundry room.

B. Hazards: Protect People

A number of substances that are toxic to humans may be present without you knowing it. Take the time to check for these substances as soon as possible.

Radon

Radon comes from the natural decay of uranium, which is found in most soils. It usually enters houses through cracks or holes in the foundation. Radon itself is actually a harmless gas, but as it decays it releases radioactive particles that are absorbed into your lungs and can cause lung cancer. Radon is estimated to be the second highest cause of lung cancer in the U.S., and is a potential problem in every state.

Your house is equipped with a radon a passive sub-slab depressurization system is being proposed to mitigate radon and other soil gases. This system will produce a slight negative pressure below the slab, especially in winter months, to create a suction point for soil gas removal. Inspect the outside exhaust vents from your system to make sure that leaves and other debris are not clogging the pipe.

Mold and mildew

Mold and mildew isn't just a problem found in old homes. Mold loves to grow in warm, wet spaces. There are about 50 species of mold that are toxic to humans and lead to respiratory problems and fungal infections. Mold can be difficult to find because it often grows in areas you can't see, like inside your walls. Do a quick check for mold in spaces that may have consistent contact with water (under the sink, around the bathtub). Your house comes with exhaust fans on each bathroom. It's a good idea to use your bath fan after each shower to remove damp air from the bathroom and avoid mold and mildew. It's important to consider that exhaust fans can typically collect dust, reducing their efficiency. Simply dusting or replacing if damaged can increase its efficiency.

C. Electricity, Water and Gas

There are a number of critical systems in your home (such as the main electrical panel and water meter) that are important to understand. Make sure everyone in your family is aware of what these systems do and—if appropriate—know how to turn them on and off.

Electrical Panel (Fuse Box)

The fuse box protects your electrical circuits by cutting off the power if the current becomes too high (commonly known as a "blown fuse"). The most common reason to interact with your electrical panel is because you blew a fuse or need to turn off all power to your home. It's a good idea to figure out which outlet each circuit connects with. The map of the panels will be attached to it. The main disconnect breaker or fuse is usually marked "main" and located near the top of the box. Turning it off shuts off all power to the house. If a circuit breaker or a fuse keeps "blowing" then something is wrong with your electrical system and you should call an electrician as soon as possible.

Water Meter

You can usually find the water meter wherever water service enters your entire unit. Usually there are shut-off valves on either side of the water meter. To turn your water off, either turn the valve so that it's perpendicular to the pipe (which is the "off" position) or turn it clockwise until it won't turn anymore. This valve will shut off the water to your entire unit. This is necessary if you are doing major plumbing work, such as a frozen pipe repair, or you are leaving your house for an extended period of time. For plumbing fixes to specific fixtures (such as the sink or toilet) there will be a local shutoff valve you can use. Take a look at each local shut off valve for your sinks and toilets. Make sure you can turn them on and off easily. If they are extremely rusty, wet to the touch, or won't turn off, they should be replaced.

C. Basic ongoing Maintenance

Now, it's time to cover some smaller issues that require a basic check or consistent maintenance. This is not intended to be a comprehensive maintenance list! We just want to highlight the routine maintenance tasks that can have the biggest impact on your health, safety and budget.

Furnace and HVAC System - Service and Filter

Make sure you change your furnace filter regularly to keep the air in your house clean and your furnace running properly. Different filters need changing at different times. Dirt causes over 80% of premature furnace failures. According to the EPA, indoor air is generally found to be 2-5 times more polluted than outdoor air due to the presence of chemicals found in many household such as cleaners. HVAC systems require regular check-ups. Catching HVAC problems early will save you from needing a costly replacement.

D. Seasonal Maintenance

Most of the ongoing maintenance tasks we've mentioned can be done at any time of year, as long as they're done consistently. However, there are a few issues that are season specific, like gutters.

Gutters and roof valleys

Gutters should be cleaned twice a year: Once in mid to late fall (when most of the leaves have already fallen) and again in early spring (to clear any debris that may have accumulated during winter). Clogged gutters can ruin them if left untouched, and may lead to water entry through the foundation or roofing. Simply removing debris with a trowel and then rinsing with a hose can prolong the gutter's life greatly. Check to make sure the flashing on the roof is in good condition as well.

PV maintenance
Once your PV array is installed, little system maintenance is required. The modules have no moving parts and usually carry a warranty of at least 20 years. Regular rainfall is often sufficient to eliminate dirt accumulation, but where rain is infrequent, occasionally rinsing the modules off with water will restore power operation and optimal sun exposure. During winter months, snow should be able to slide off or melt.

Inspect/Replace Bathtub and Toilet Caulking
Caulking prevents leaking water from escaping from creases in the bathtub and toilet. Replacing cracked or peeling caulking can prevent mold and other damages to the bathroom. Replace cracked caulking with polyurethane caulk around the edge of tub, points where faucets protrude from the wall, and the toilet seal.
Clean/Replace Kitchen Exhaust Fan Filters
Kitchen filters typically become clogged with grease every month and will cause the system to run less efficiently. Cleaning can be as simple as putting the filters in the dishwasher.

Flush Water Heater
To prolong the lifetime of the water heater, sediment must be flushed twice a year. The sacrificial rod should also be inspected every 2 years and replaced if worn. Specific flushing instructions can be found in the user manual.

Programmable Thermostat
Programmable thermostats can do wonders in decreasing utility bills by decreasing heating and cooling at certain times and places in the house. This replacement is quick and easy but programming must be checked periodically.

Shorten Showers
Shortening showers can be relative to the user but will conserve water and reduce water bills. Also, low flow shower heads can be used to add to energy savings. These can be replaced simply by twisting off and replacing.

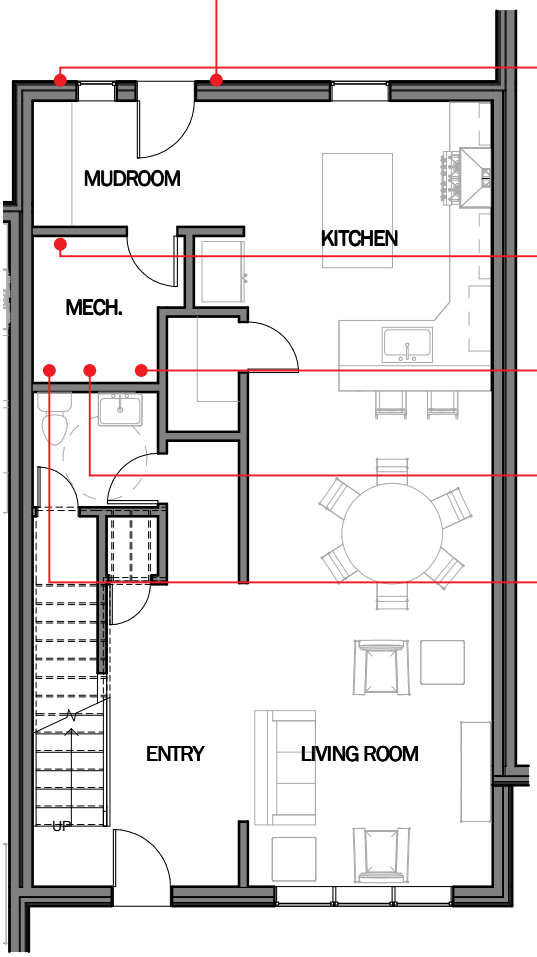
Inspect/Replace Window Caulking
A lot of heat is lost through cracks on the casing and sill of a window. Replacing the caulk with caulking with high joint movement can be more durable in the long term. When replacing, make sure surfaces are clean and dry and begin when the temperature is leveled out in the afternoon.

Touch-up Exterior Painting
Exterior paint can serve as a protective barrier from rust for gutters and wood siding. Sand, prime, and paint over any noticeable cracked or peeling paint to ensure a beautiful and protective coating.

Seal Paving
Patching cracks will prevent future potholes by preventing water seepage. Caulk any cracks using a patching gun and smooth with a putty knife. Reseal the driveway every five years using a bucket of sealant and a driveway brush.

Install Efficient Appliances/ Power Strips
Power strips must be used with appliances to limit the energy used during the appliance's standby mode. This can save a lot of energy and decrease bills. LED or CFL light bulbs and ENERGY STAR appliances can also save money on the energy bill because they are more efficient.

Task	Instructions	As Needed	Monthly	Yearly	Spring	Summer	Fall	Winter
Smoke and Carbon Monoxide Detectors	Inspect and Test			■				
Ground Fault Circuit Interrupters (GFCI)	Inspect			■				
Radon Depresurization System	Inspect and Clean Vent	■						
Mold and Mildew	Inspect	■						
Electrical Panel	Inspect	■						
Water Meter	Inspect	■						
Furnace and HVAC Systems	Service and Clean			■			■	
Furnace and HVAC Filters	Inspect and Replace		■					
Gutters and Roof Valleys	Inspect and Clean				■	■	■	■
PV Maintenance	Inspect and Clean	■						
Bathtub and Toilet Caulking	Inspect and Replace			■				
Kitchen and Bathroom Exhaust Fans	Inspect and Clean		■					
Water Heater	Flush					■		■
Programmable Thermostat	Inspect and Reprogram	■						
Showers	Shorten	■						
Window Caulking	Inspect and Replace			■				
Seal Paving	Inspect and Replace			■				
Efficient Appliances & Power Strips	Inspect	■						



Air intake
The air intake for your ventilation system will require occational cleaning. Look for this intake about 10 feet off the ground.

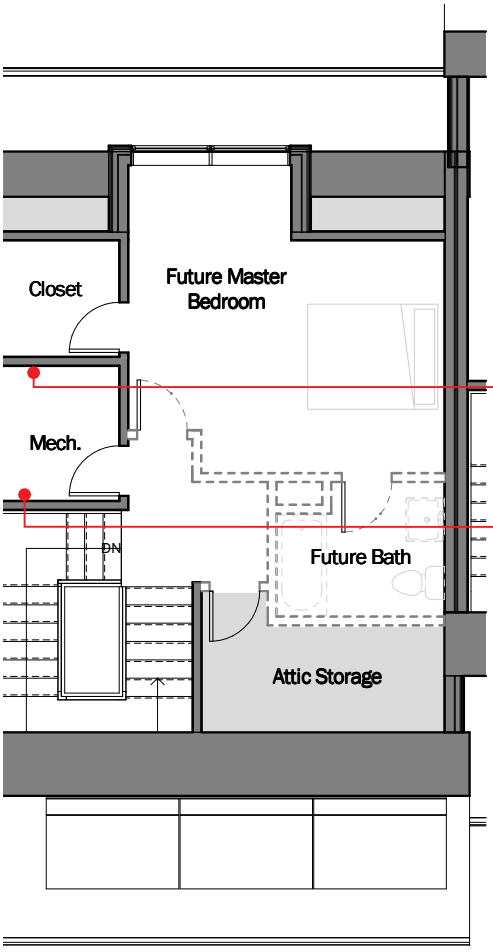
Water service
Water service will enter the building here.

Electrical box
Look for the electrical box on the wall of the mechanical room.

Energy Recovery Ventilator (ERV)
This is critical to the air quality of your home. Filters must be checked and replaced every season.

Water heater
The water heater is located inside the mechanical room. It should be flushed every 6 months

Boiler
The boiler needs to be serviced by a professional every 1-2 years.



Mechanical room
The air handler which provides warm and cool are to your home is located here. The is an air filter that will need to be replaced every 6 months.

PV panels
Your home is equipped with Solar Panels. There is an electrical box which provides a shutoff for maintenance in this attic.