

Robert Metcalf House

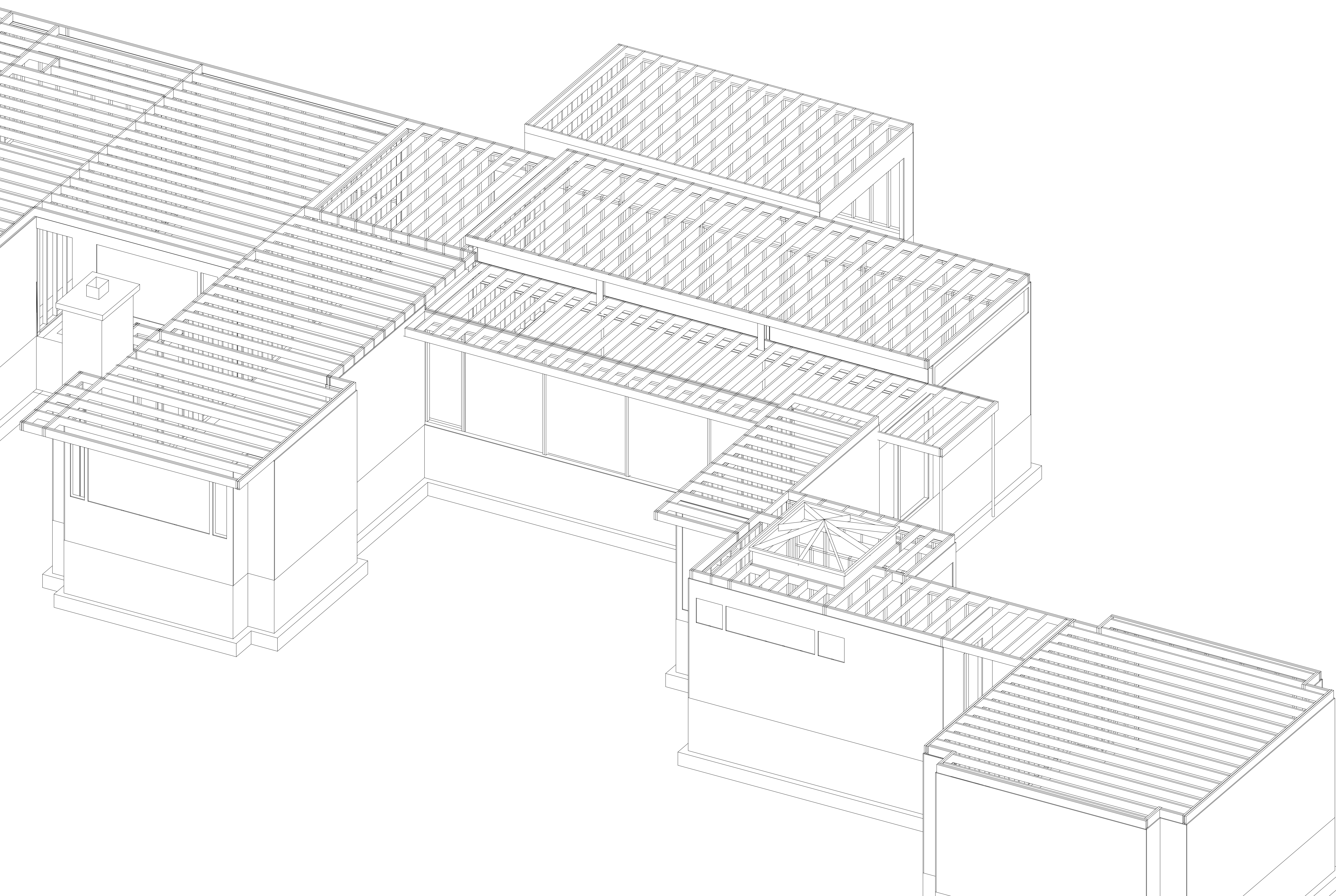
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Ann Arbor, MI 48104

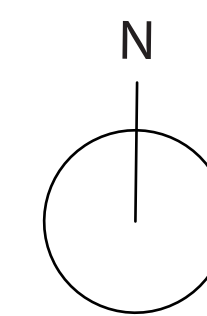
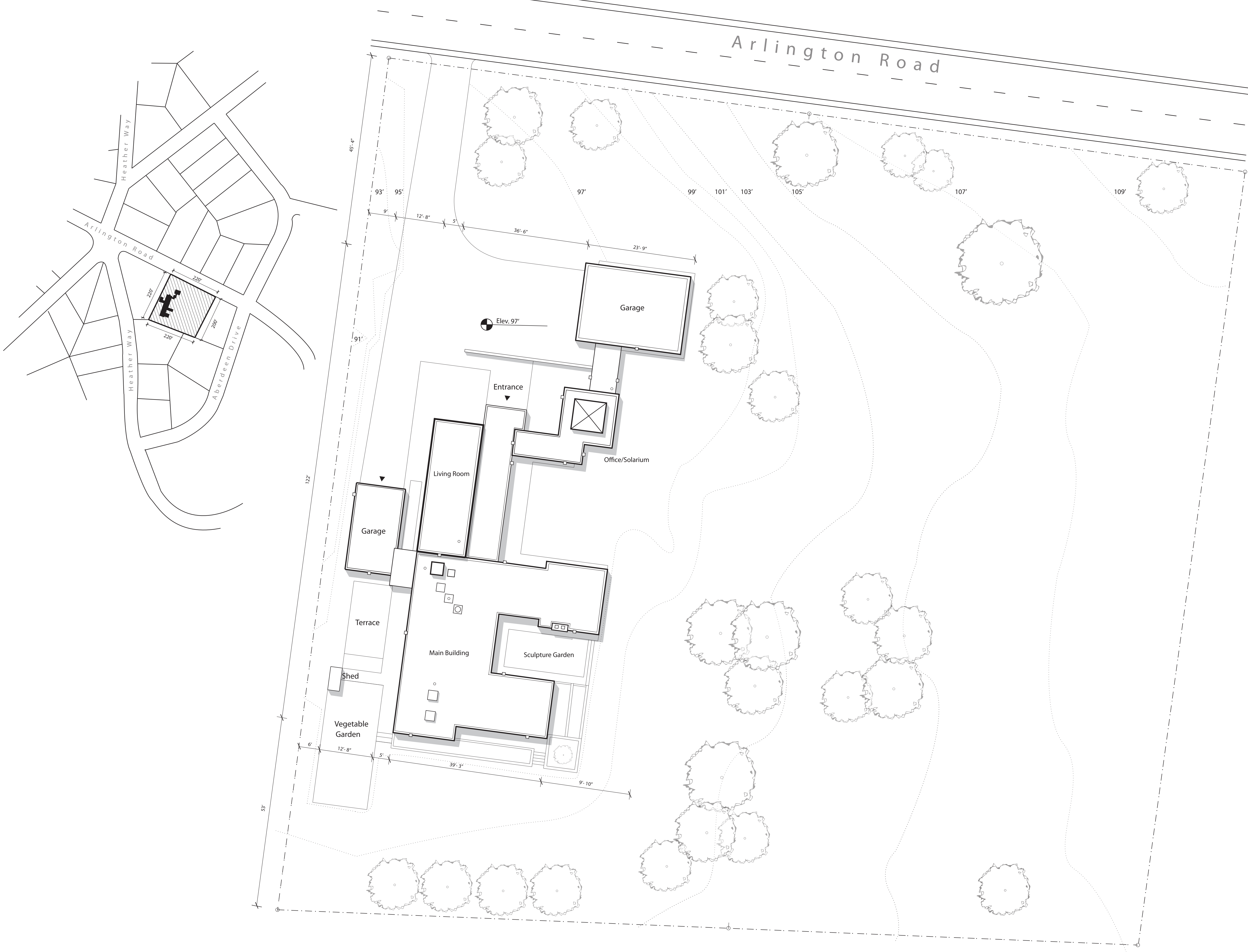
The Graebner Group

Alexander Ayres
Anthony Chan
Nikki Elman
Ross Kuchin
Phil Lockwood
Yojairo Lomeli
Katie Morris
Paul Provenza
Kelsey Reynolds
Victoria Rice
Kyle Schram
Andrea Yoas

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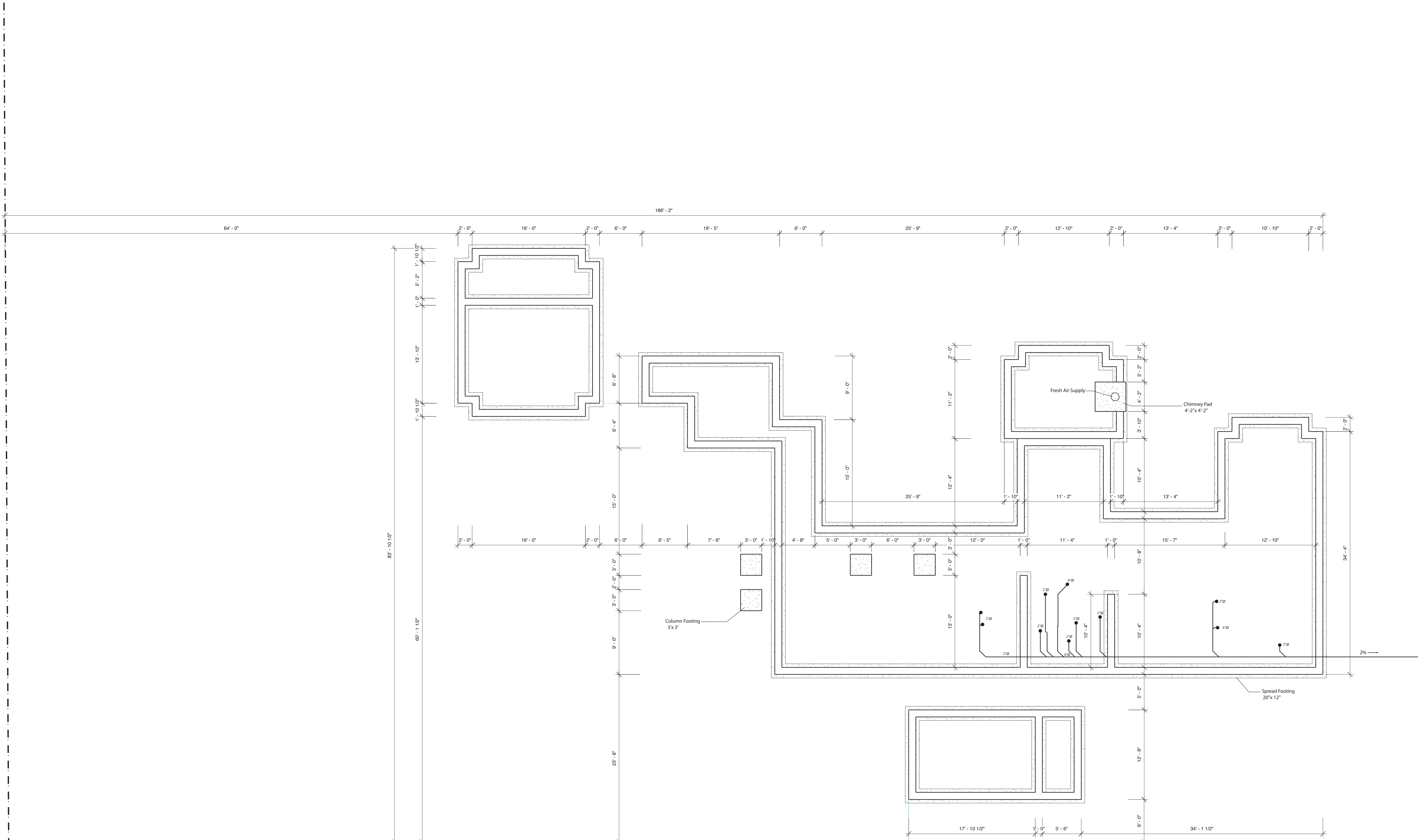


Site Plan
1" = 10'-0"

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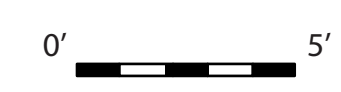


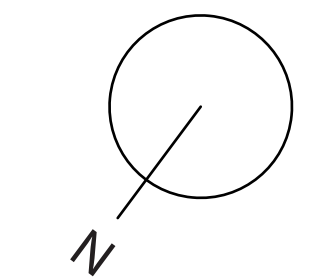
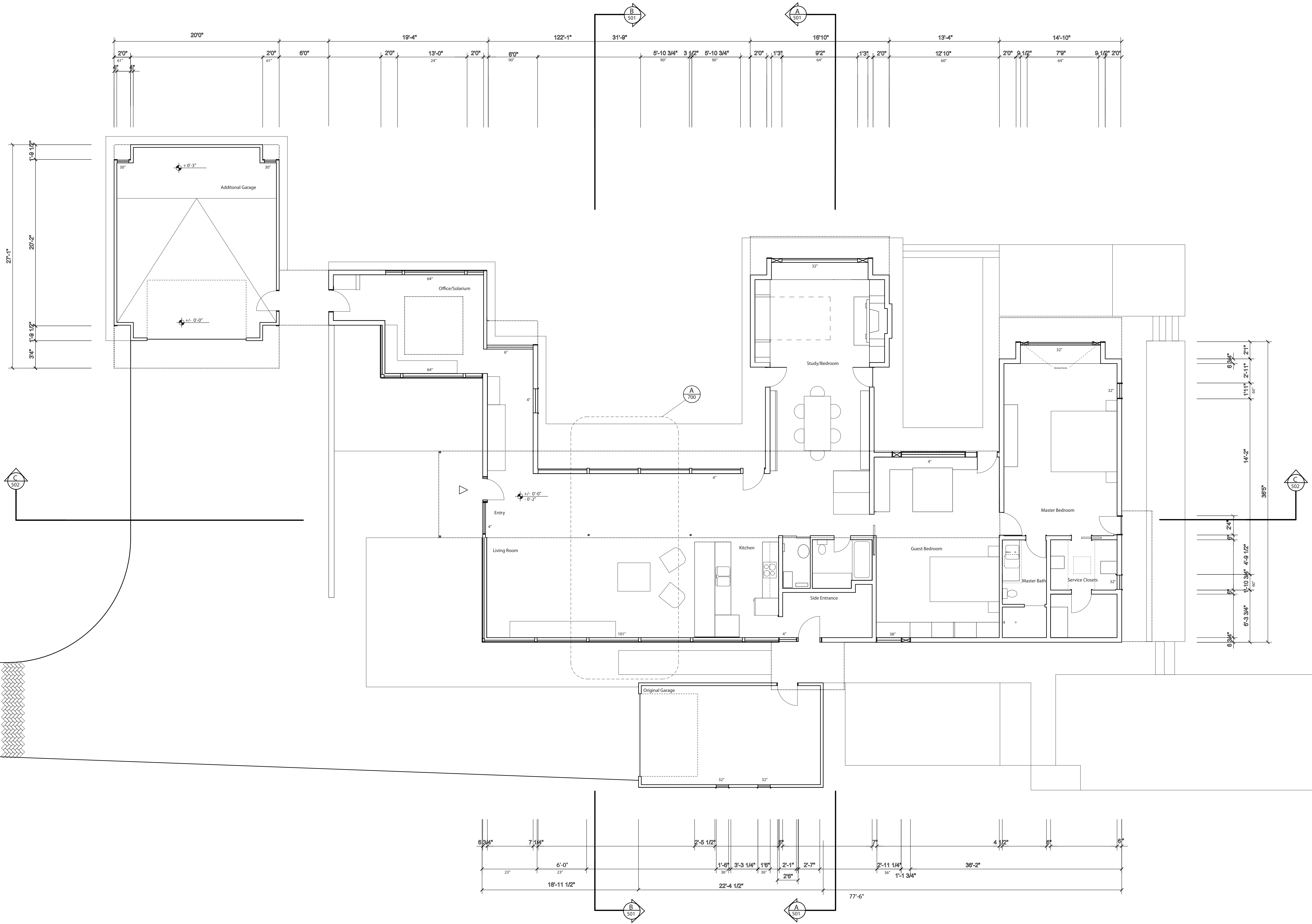
Foundation Plan

3/16" = 1'-0"

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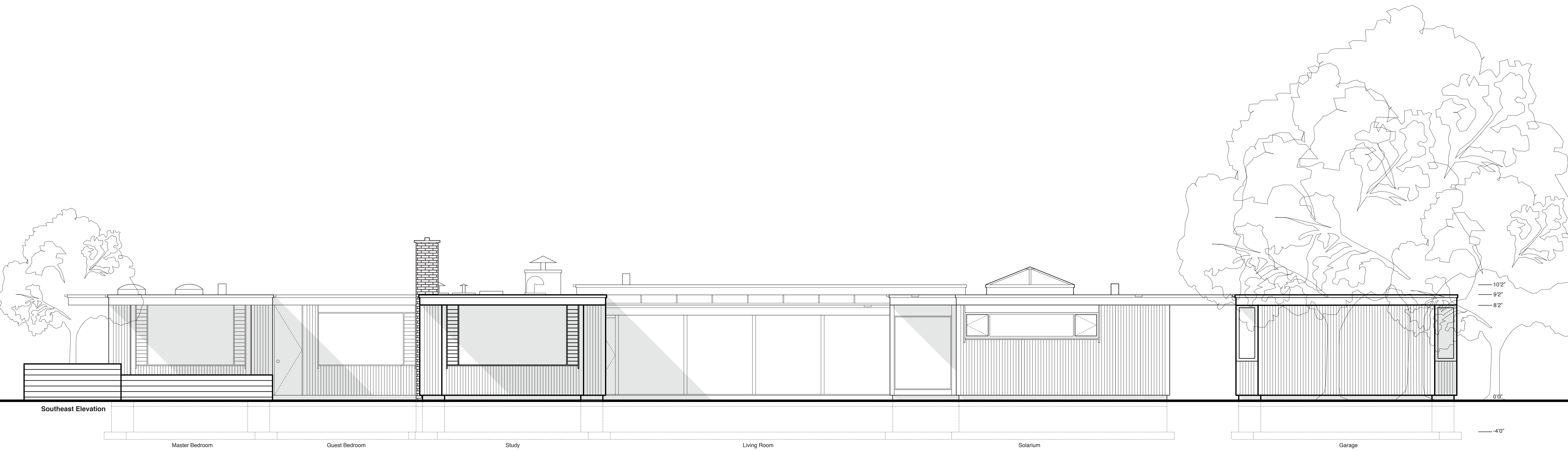


Floor Plan
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Southeast Elevation

Master Bedroom

Guest Bedroom

Study

Living Room

Solarium

Garage

-4'0"

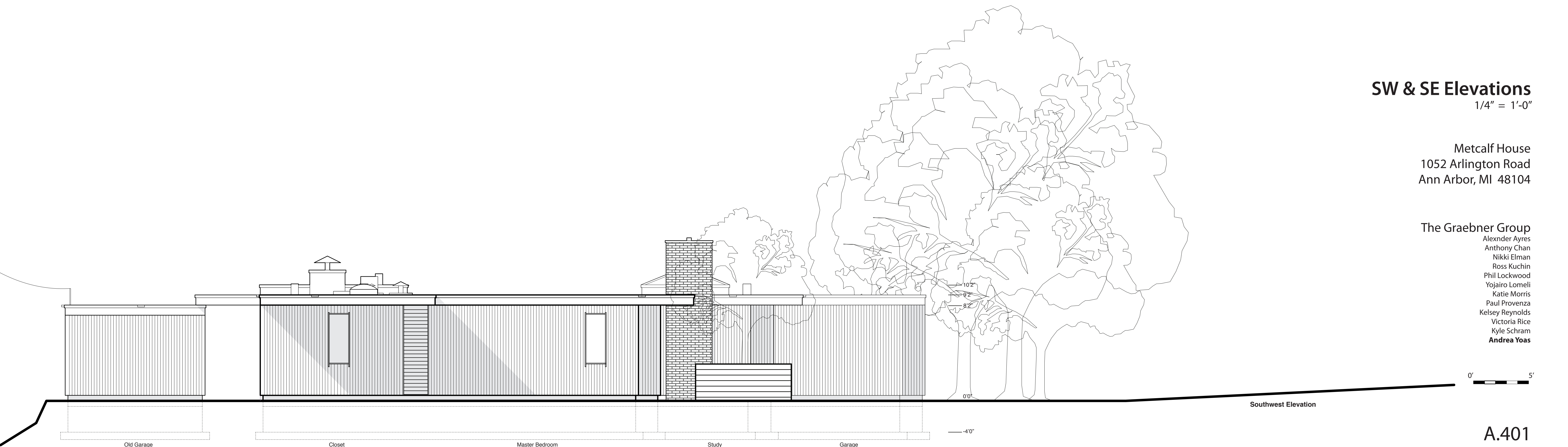
SW & SE Elevations

1/4" = 1'-0"

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Southwest Elevation

Old Garage

Closet

Master Bedroom

Study

Garage

-4'0"



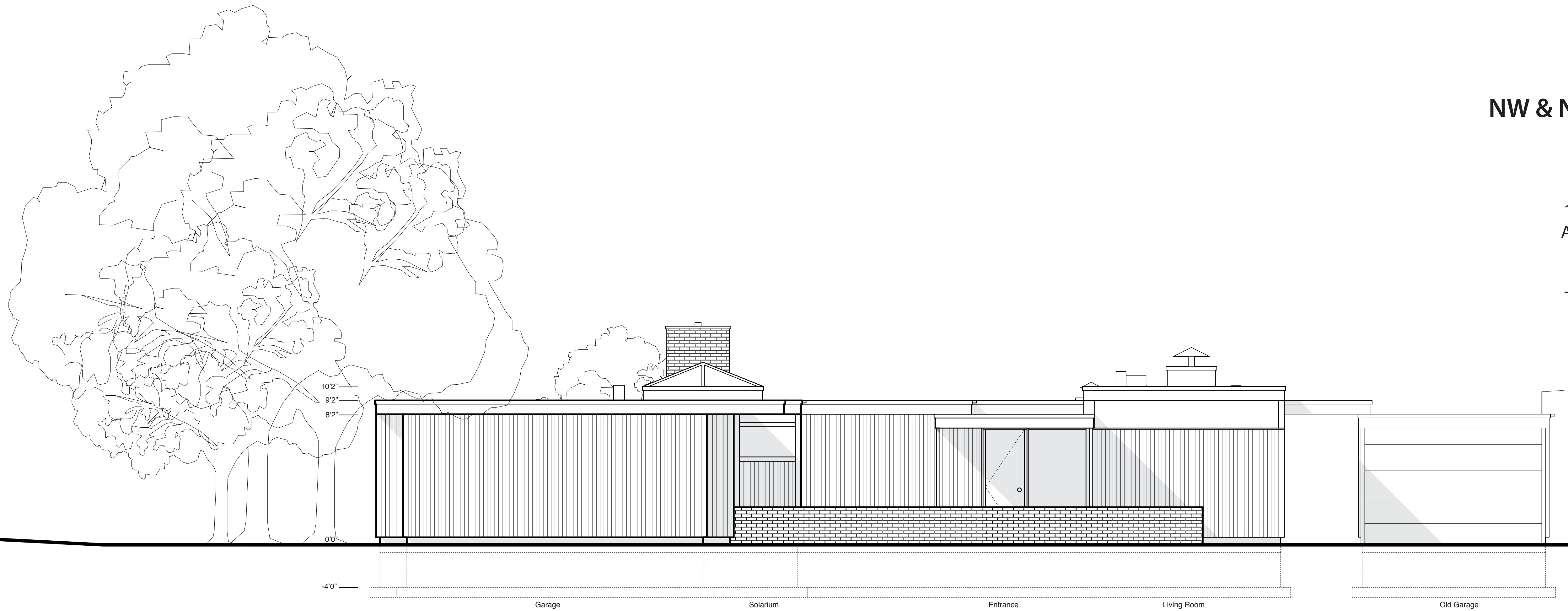


NW & NE Elevations
 1/4" = 1'-0"

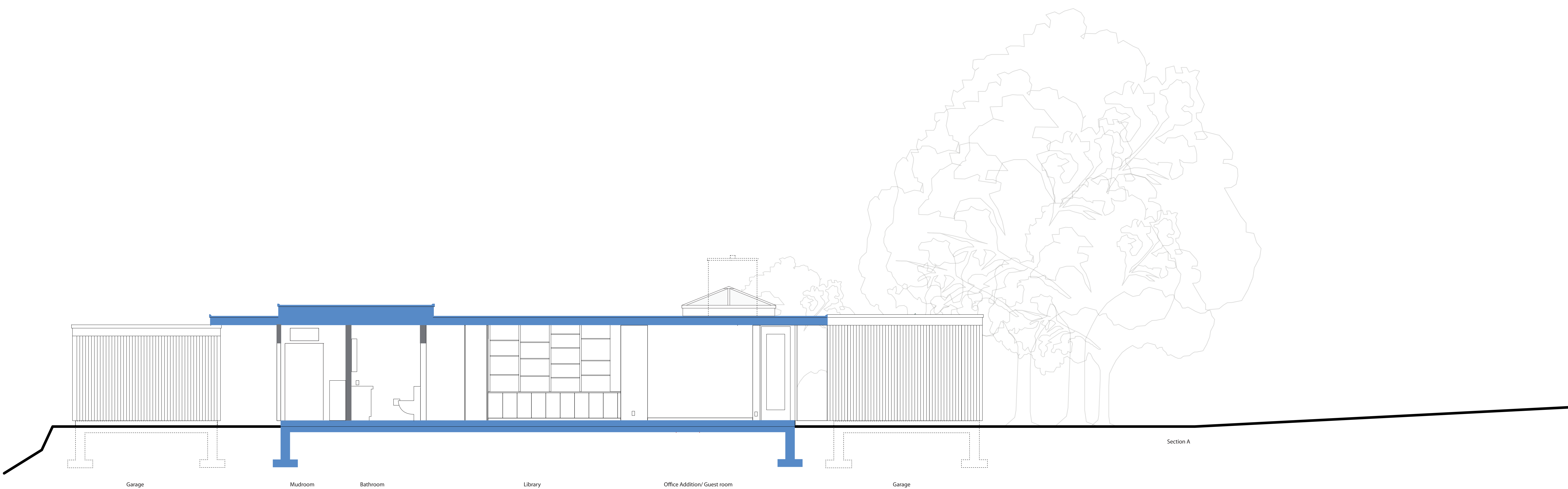
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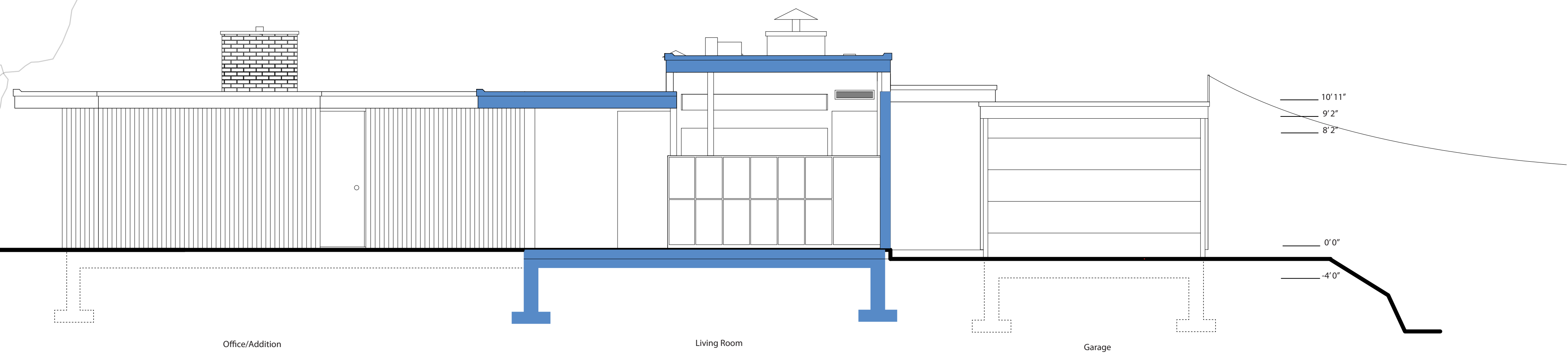


10'11"
9'2"
8'2"
0'0"
-4'0"



Garage Mudroom Bathroom Library Office Addition/ Guest room Garage

Section A



Section B

Office/Addition Living Room Garage

10'11"
9'2"
8'2"
0'0"
-4'0"

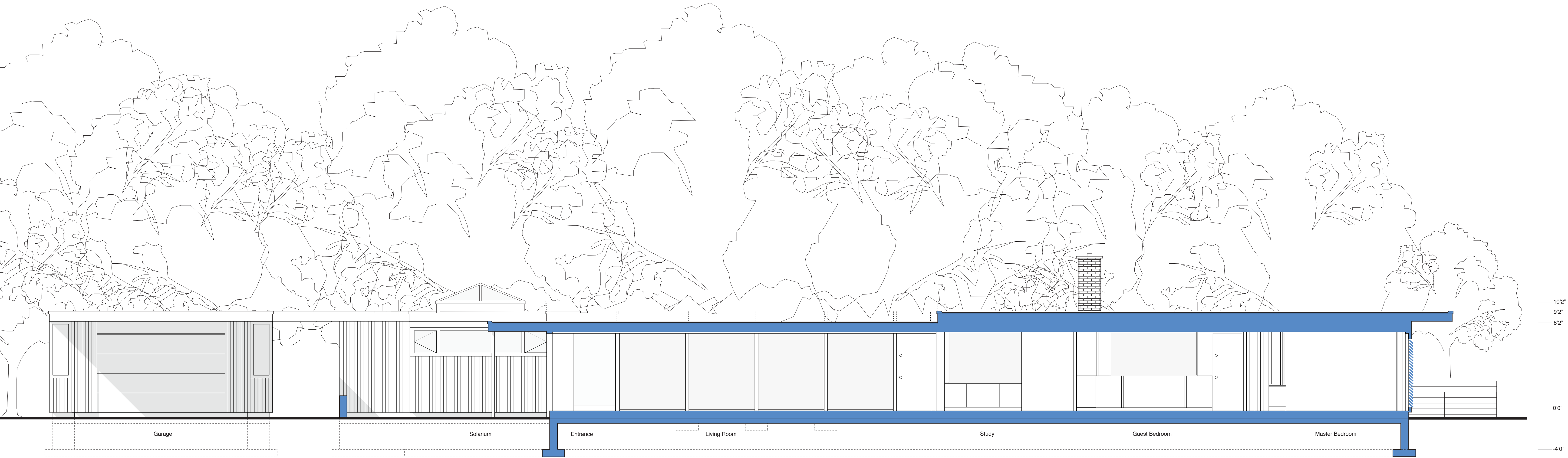
Sections A & B

1/4" = 1'-0"

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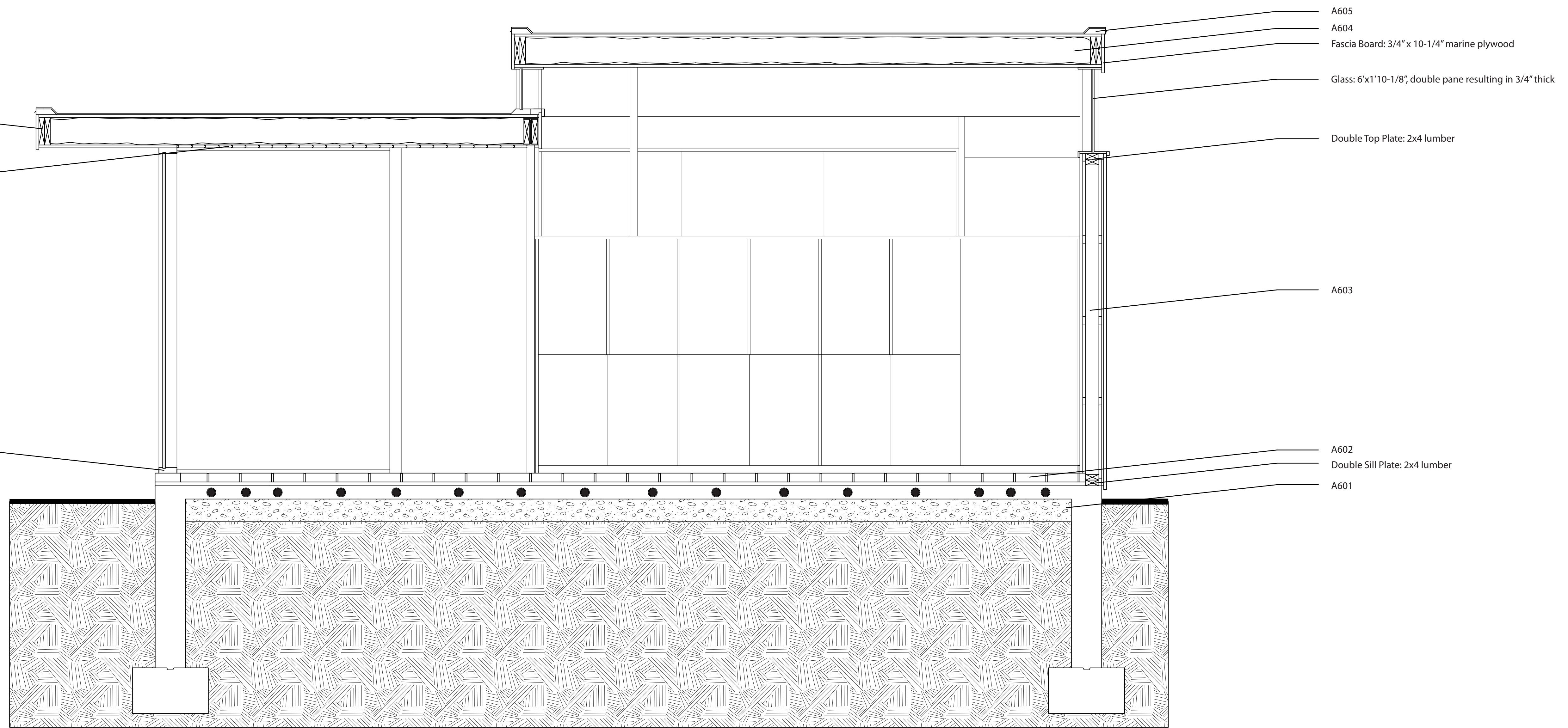


Section C
1/4" = 1'-0"

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Rim Joist: x2, 2x8 lumber

Wood Panelling: Tongue and groove, 3-1/2" x 3/4"

Metal Sill: 1-1/2" x 4-3/4"

A605

A604

Fascia Board: 3/4" x 10-1/4" marine plywood

Glass: 6'x1'10-1/8", double pane resulting in 3/4" thick

Double Top Plate: 2x4 lumber

A603

A602

Double Sill Plate: 2x4 lumber

A601

Wall Section
3/4" = 1'-0"

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A601: Foundation
Soil
Spread Footing: Concrete, 1' x 1'8"
Foundation Wall: Concrete, 4' depth
Gravel: 6" thick
Foundation Slab: Concrete, 3-1/2" thick
Floor Heating Pipes: Iron, 2" diameter

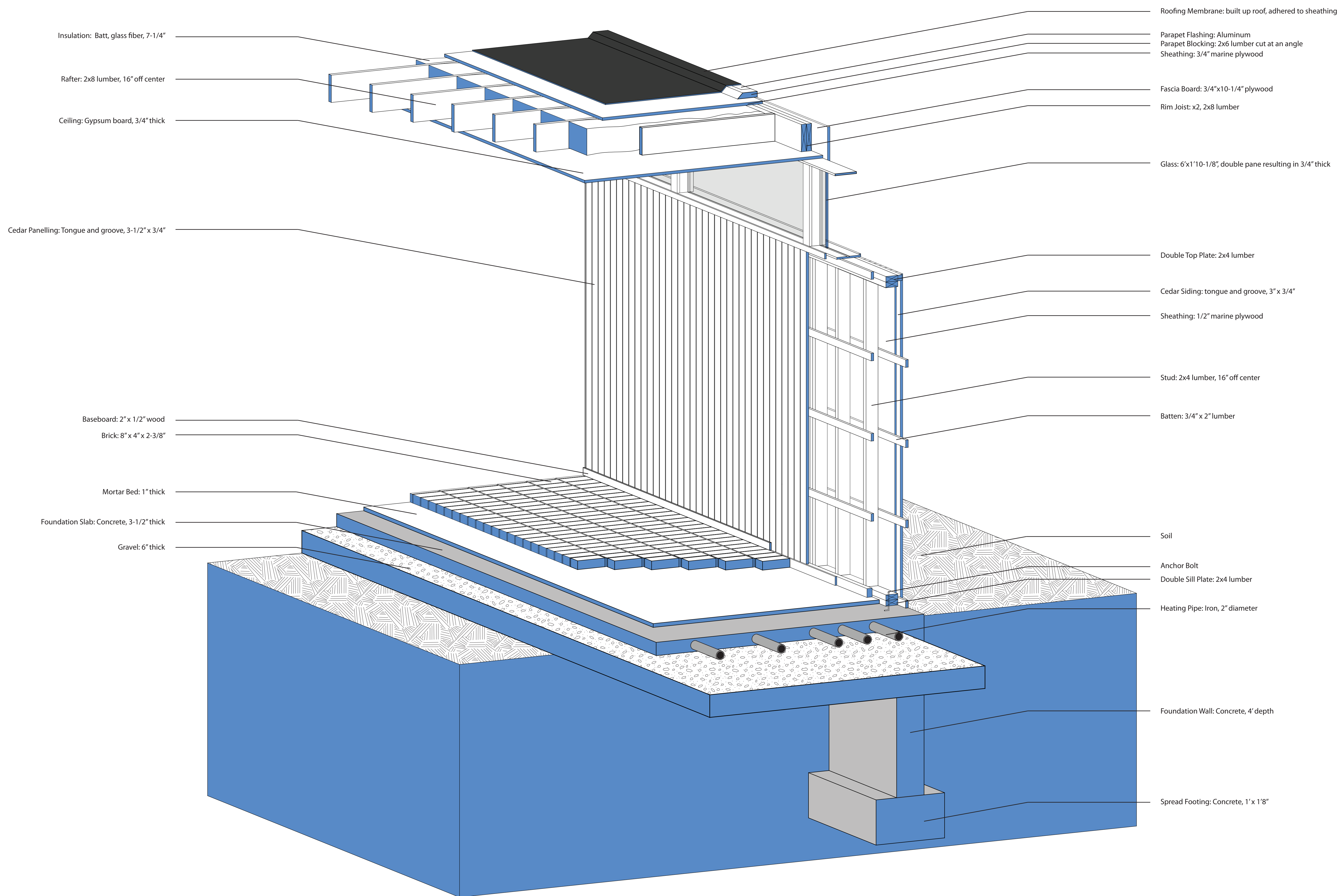
A602: Flooring
Mortar Bed: 1" thick
Brick: 8" x 4" x 2-3/8"

A603: Wall Construction
Cedar Panelling: Tongue and groove, 3-1/2" x 3/4"
Battens: 3/4" x 2" lumber
Studs: 2x4 lumber, 16" off center
Insulation: Aluminum
Sheathing: 1/2" marine plywood
Cedar Panelling: tongue and groove, 3" x 3/4"

A604: Roof Construction
Roofing Membrane: built up roof, adhered to sheathing
Sheathing: 3/4" marine plywood
Insulation: Batt, glass fiber, 7-1/4"
Rafters: 2x8 lumber, 16" off center
Ceiling: Gypsum board, 3/4" thick

A605: Parapet Construction
Parapet Flashing: Aluminum
Parapet Blocking: 2x6 lumber cut at an angle





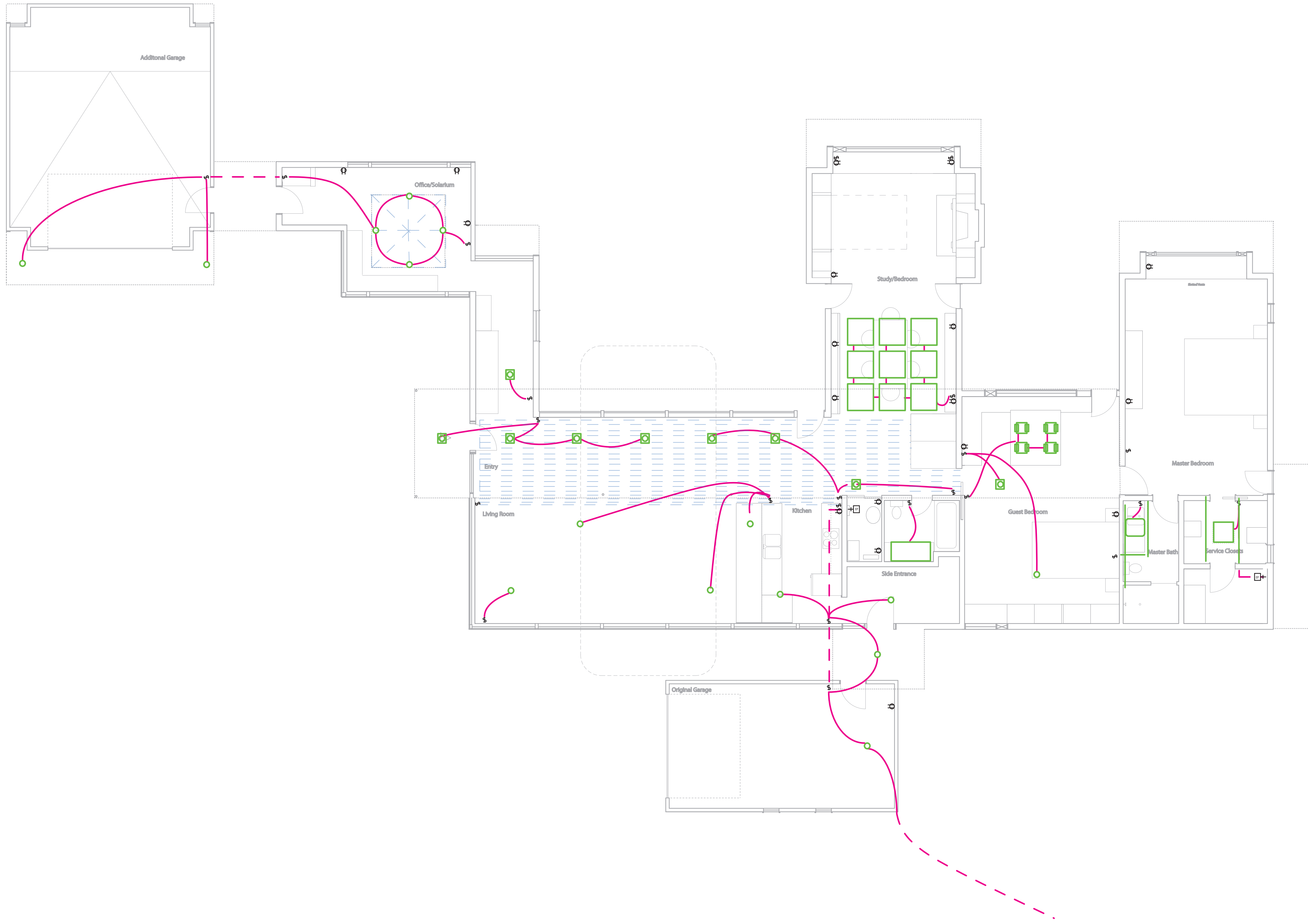
Wall Section Axonometric
1"=1'

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- Legend**
- Outlet
 - ⊞ Light switch
 - ⊞ Electrical Panel
 - Connections
 - Fixtures
 - Overhead



Electrical Plan and Reflected Ceiling Plan

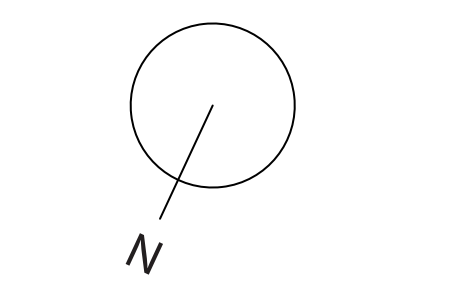
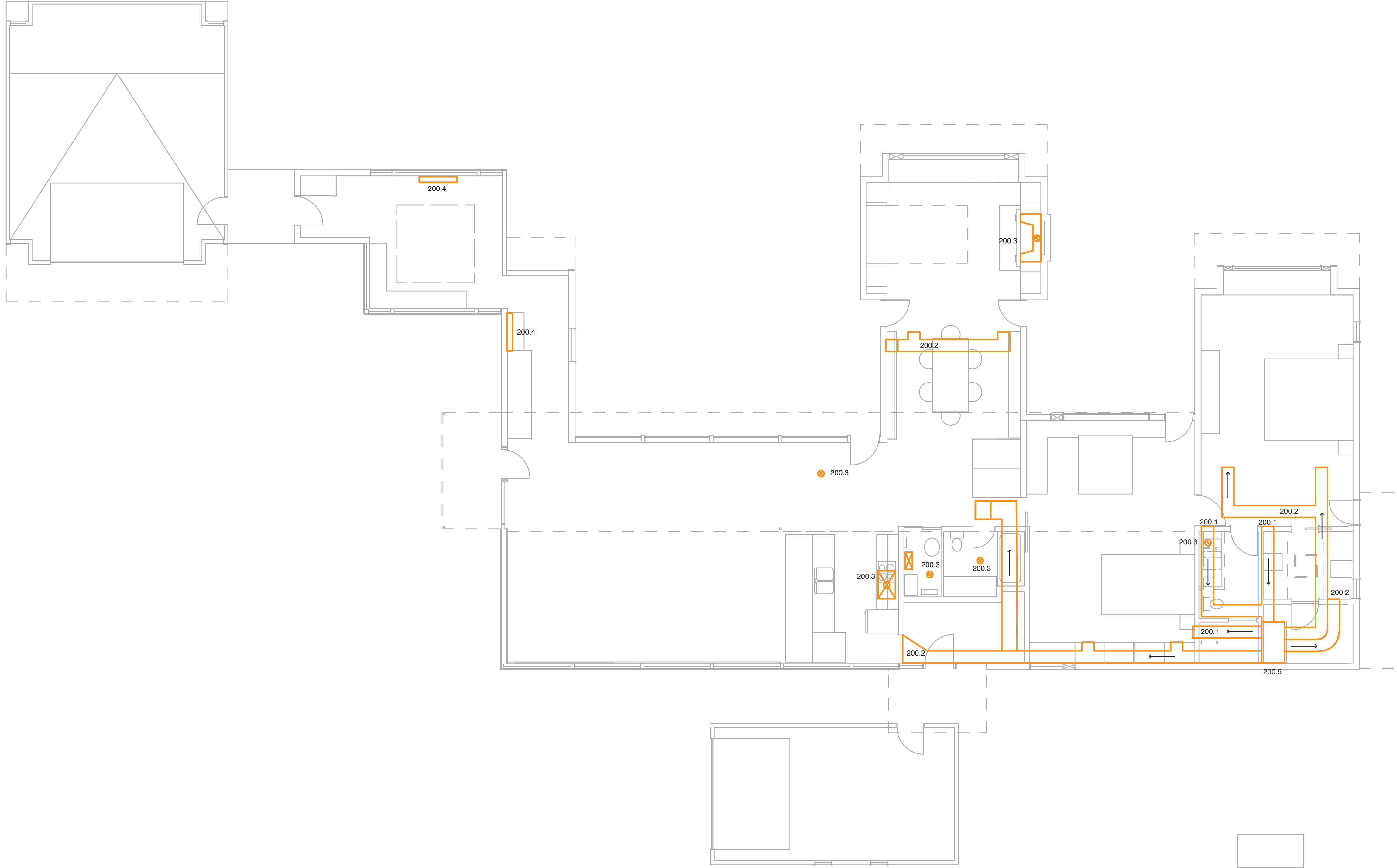
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- Legend**
- 200.1 Circulation Duct
 - 200.2 Delivery Duct
 - 200.3 Roof Vent
 - 200.4 Electric Heater
 - 200.5 Furnace
 - Duct Work**



HVAC Plan
3/16" = 1'-0"

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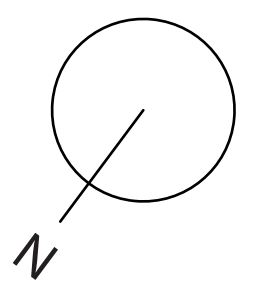
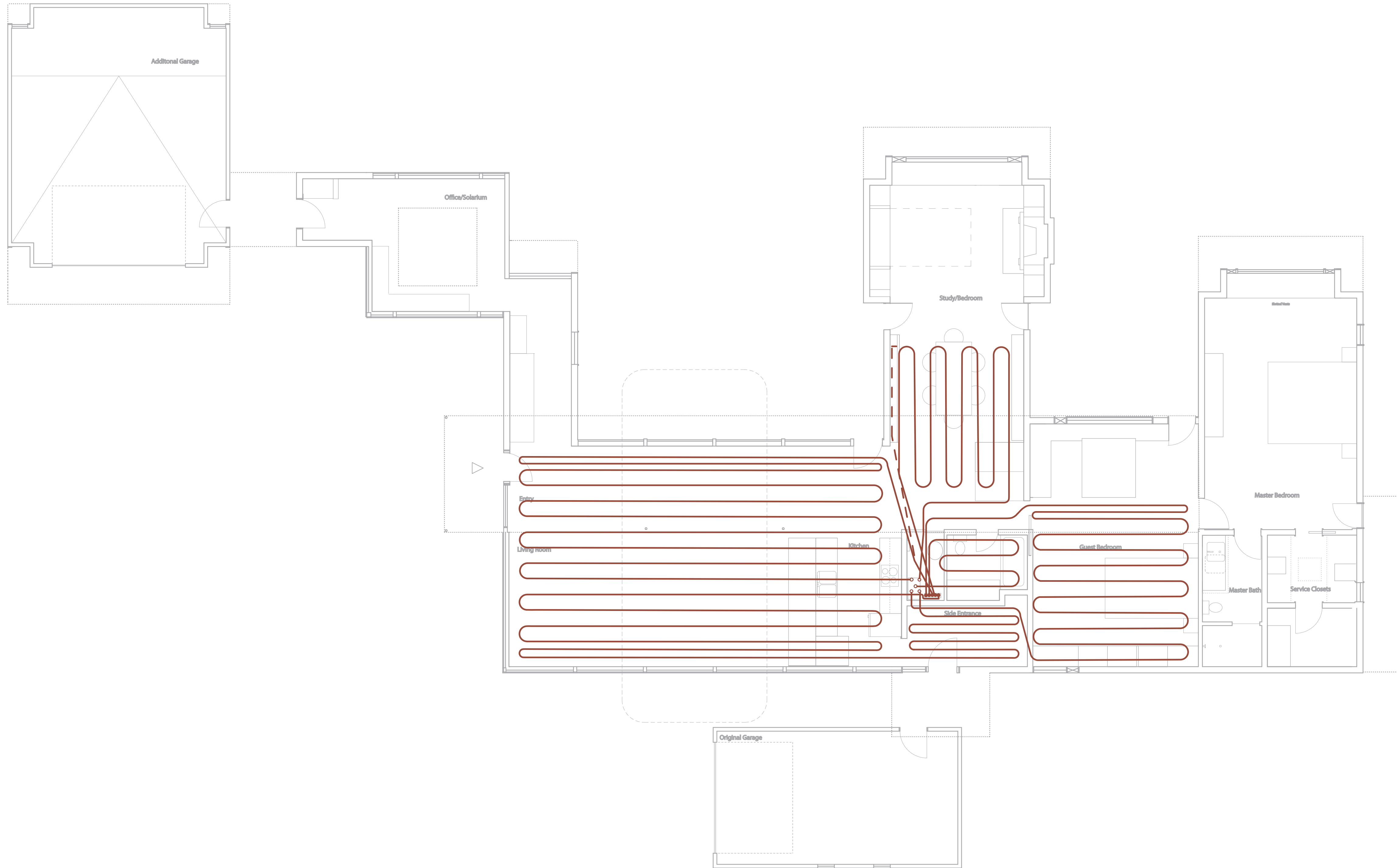


Legend

Floor Heating

● Return

○ Supply



Floor Heating Plan
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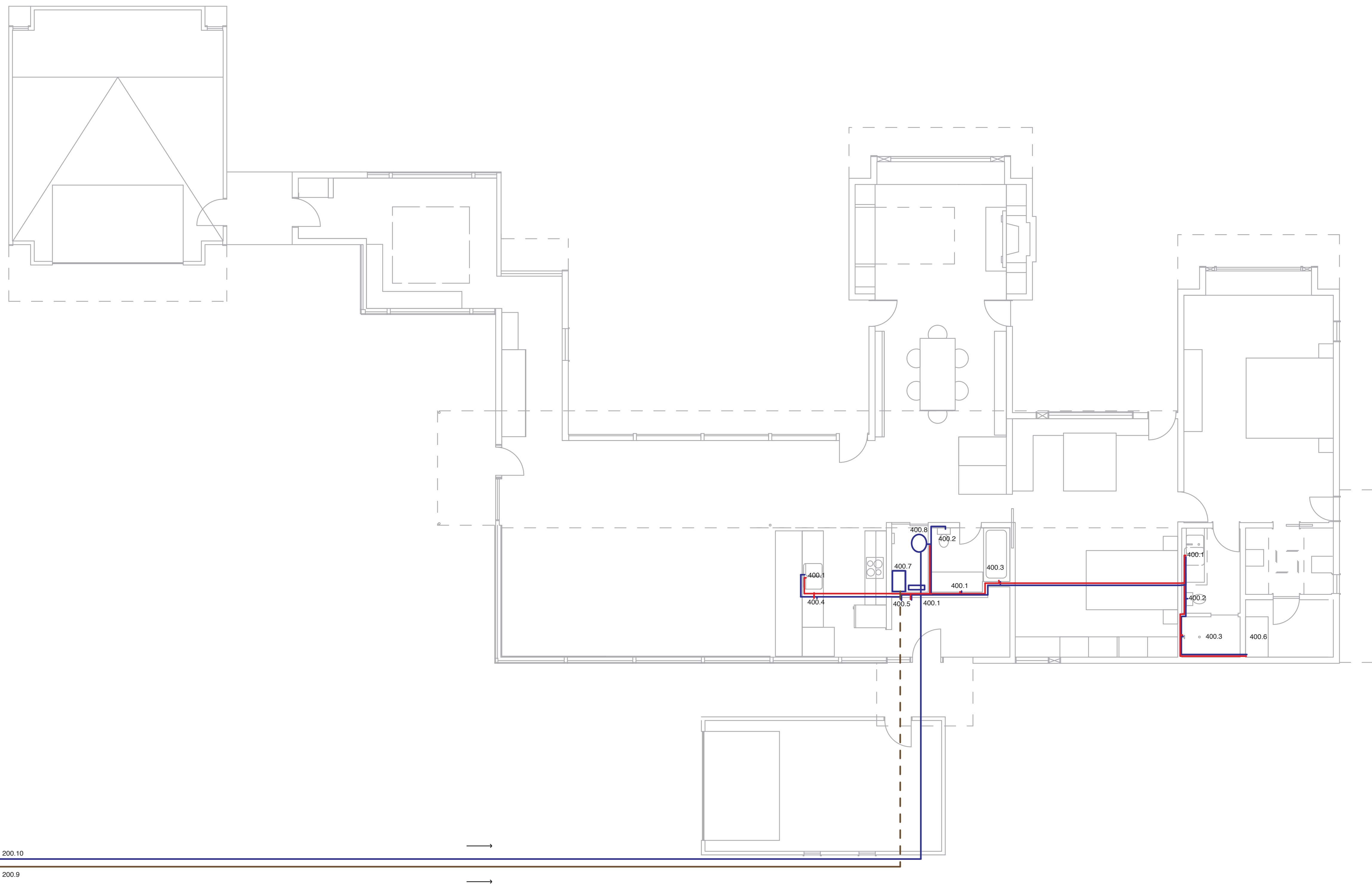
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Legend

- 400.1 Sink
- 400.2 Toilet
- 400.3 Shower/Bathtub
- 400.4 Dishwasher
- 400.5 Washing Machine
- 400.6 Furnace
- 400.7 Boiler
- 400.8 Water Heater 50 gal
- 400.9 Gas Main
- 400.10 Water Main



Water & Gas Plan

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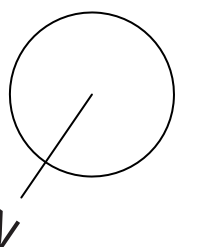
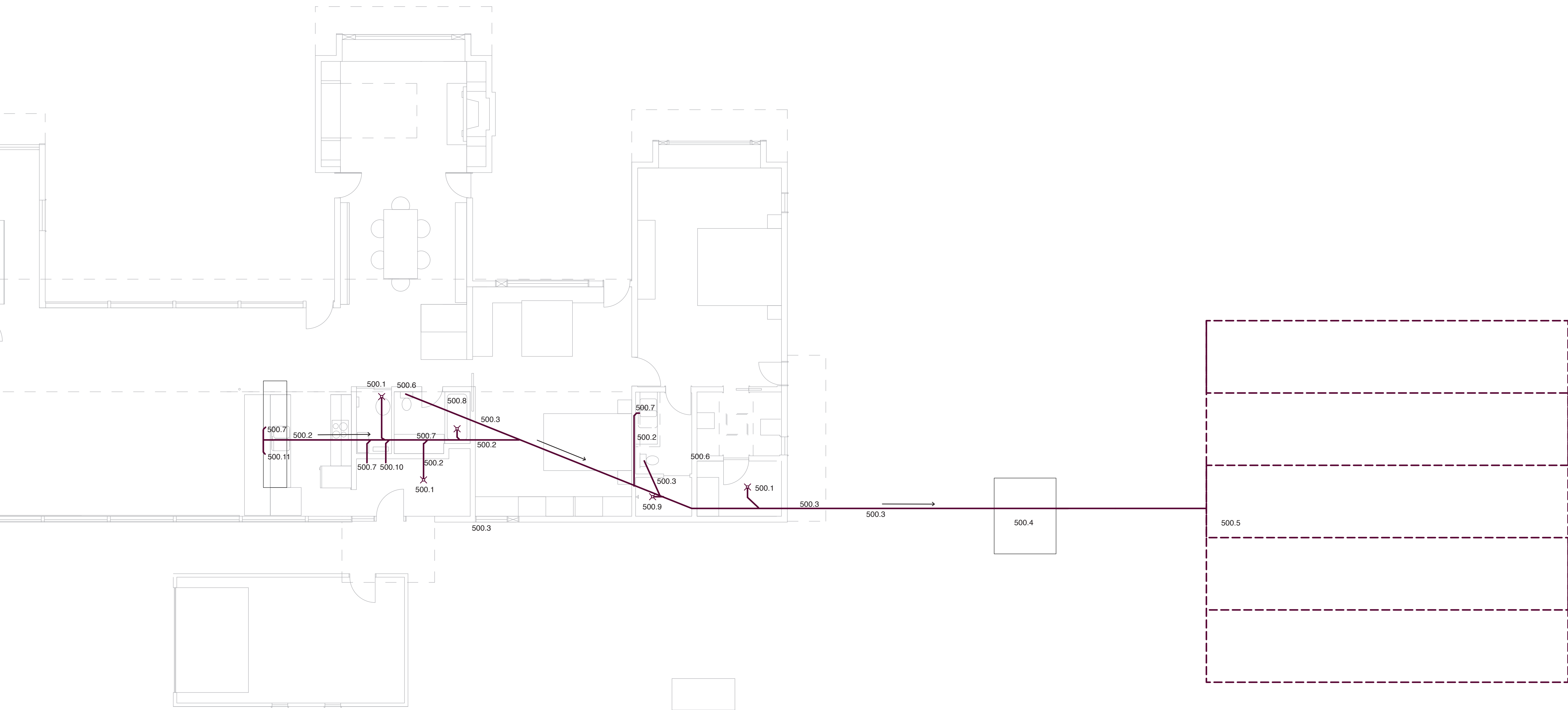
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M.400

- Legend**
- 500.1 Floor Drain
 - 500.2 2 inch Pipe, 2% grade
 - 500.3 6 inch pipe, 2% grade
 - 500.4 Septic Tank
 - 500.5 Drainage Field
 - 500.6 Toilet
 - 500.7 Sink
 - 500.8 Shower/Bathtub
 - 500.9 Shower
 - 500.10 Washing Machine
 - 500.11 Dishwasher
- Sewage**

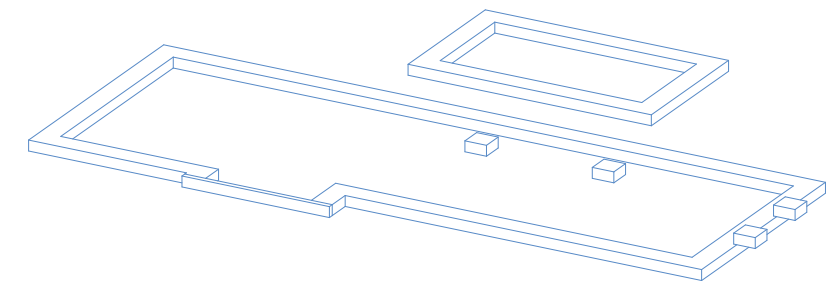


Refuse Plan
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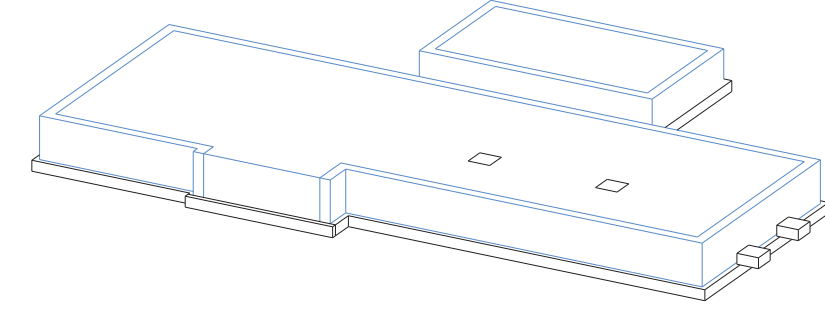
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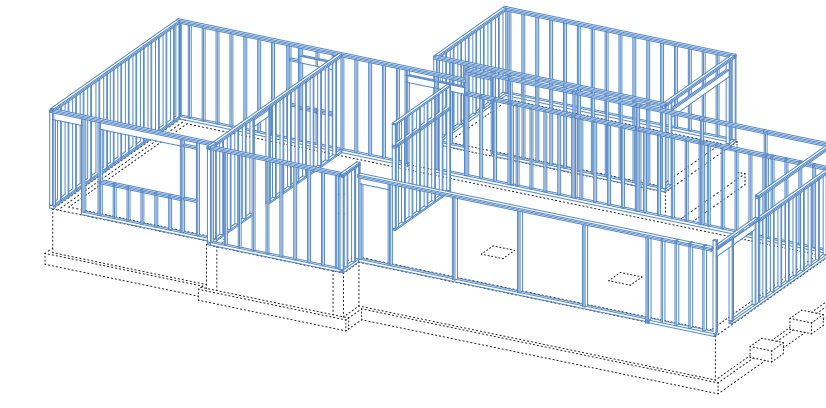
Excavation / Spread Footing

- Site is surveyed and marked for excavation
- Formwork is set for footing w/ holes for pipes etc
- Footing is poured in concrete
- Concrete pad poured for steel columns



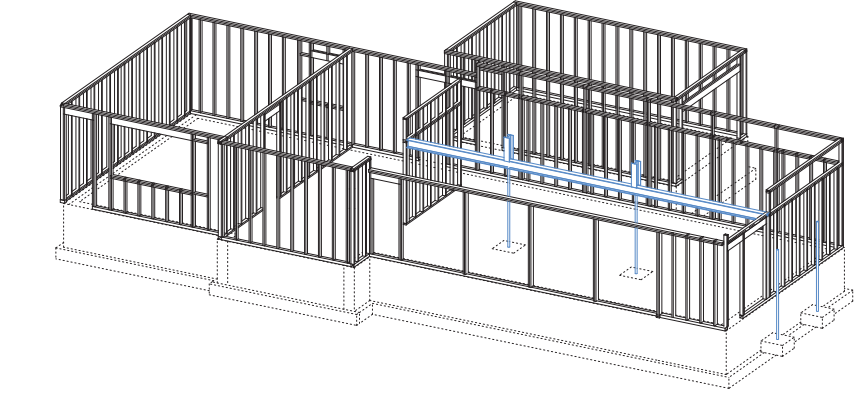
Foundation Wall

- Formwork Set to pour wall
- Foundation wall is poured in concrete
- Backfill placed around perimeter, sloped away from house
- 3 1/2" Floor slab poured on top of 6" gravel setting bed



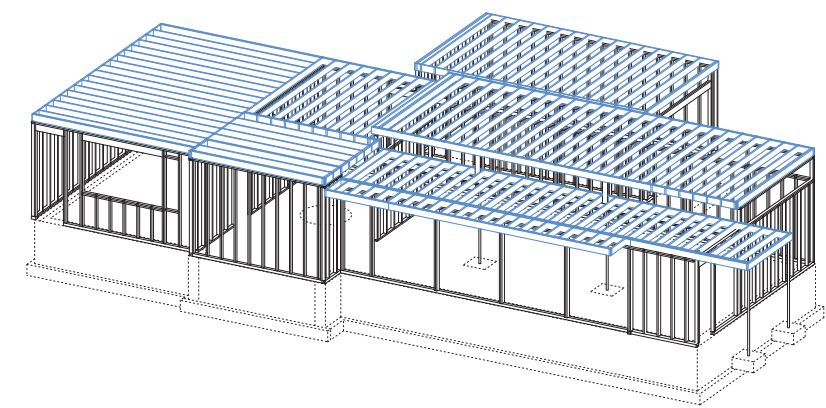
Wood Framing System

- Double sill plate anchored into concrete
- 2" x 4" Wood stud walls framed.



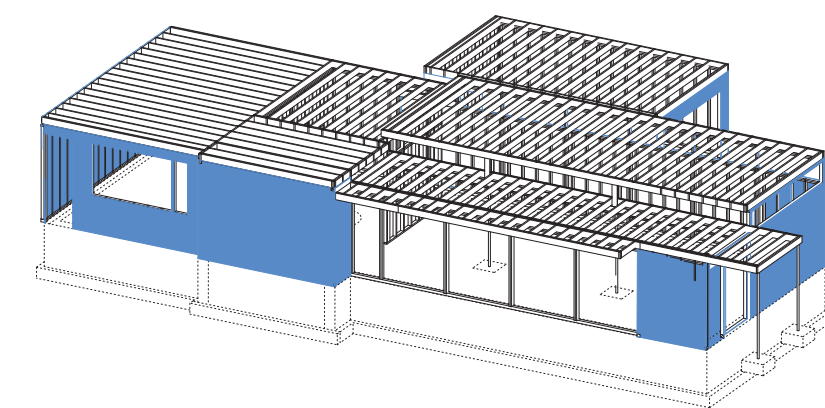
Steel Columns / Beam

- Steel I-beam placed on stud walls & steel columns to support roof detail



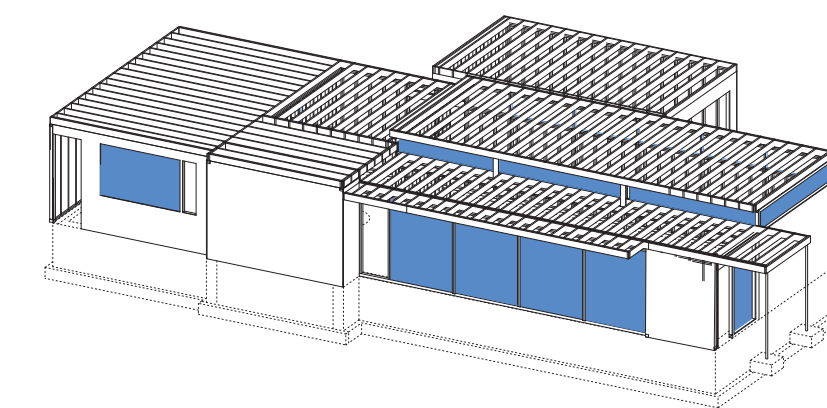
Wooden Roof Joists

- 2" x 8" Wooden roof joist system is assembled



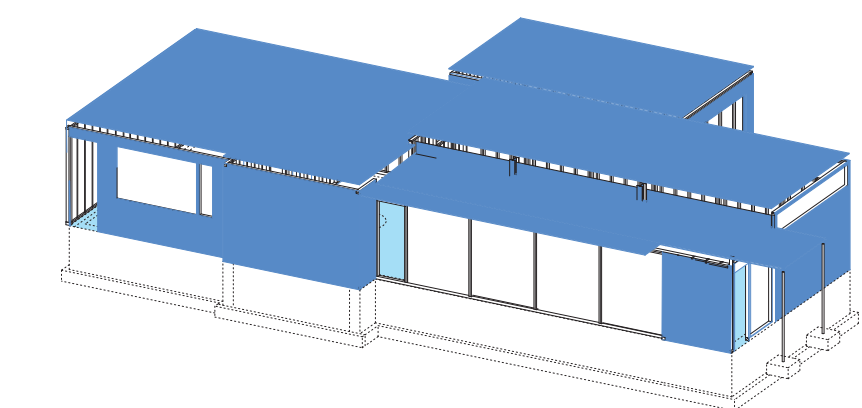
Plywood Sheathing

- 3/4" Plywood sheathing onto walls & roof system
- Brick laid on 1" setting bed



Windows

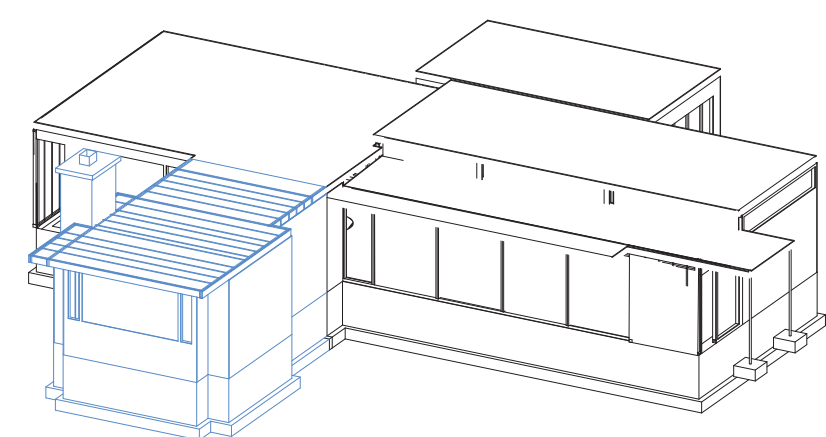
- Glass double pane windows installed



Finish materials

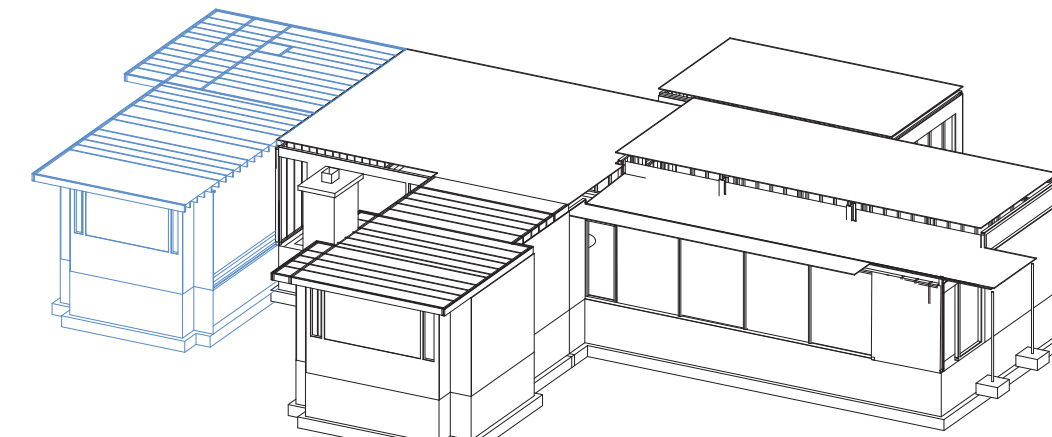
- 3" Wide cedar panels added to exterior and interior.
- Gypsum board added to interior ceiling
- Aluminum insulation added
- Roofing membrane tacked to roof and parapet detail

Construction Phasing



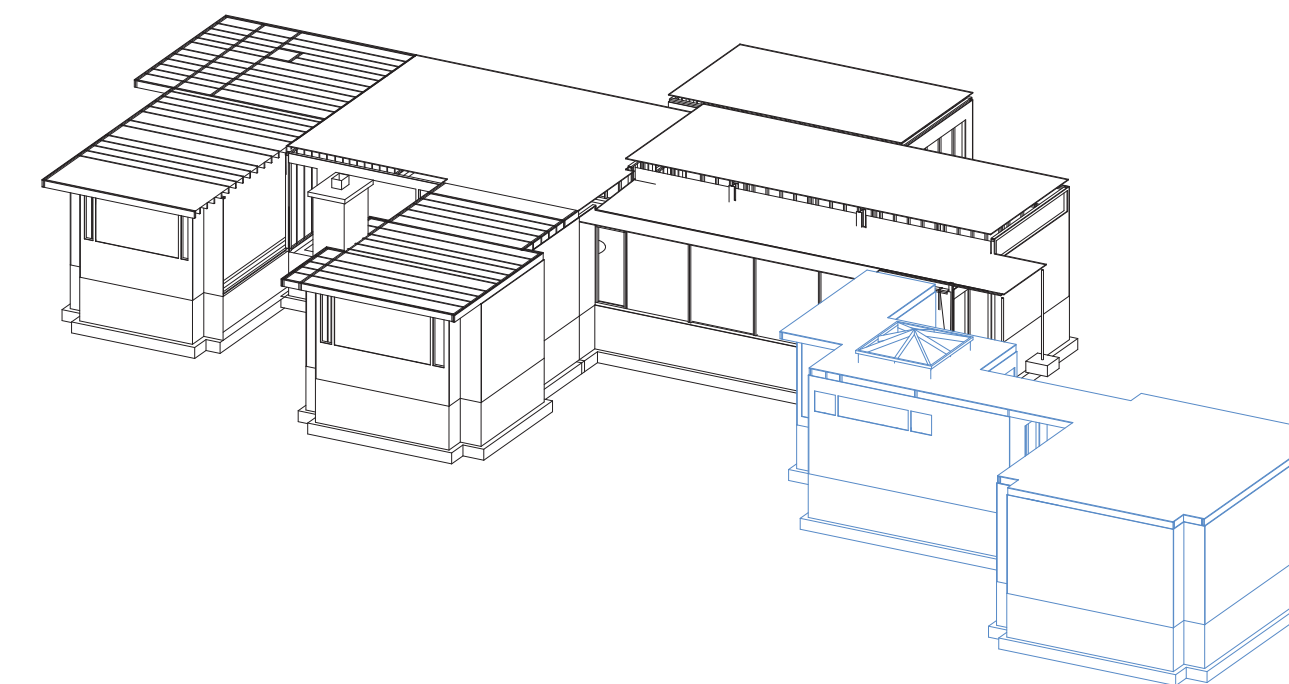
Addition #1

- Hearth room and reading room
- Room includes murphy bed



Addition #2

- New master bedroom, bathroom, and closet added



Addition #3

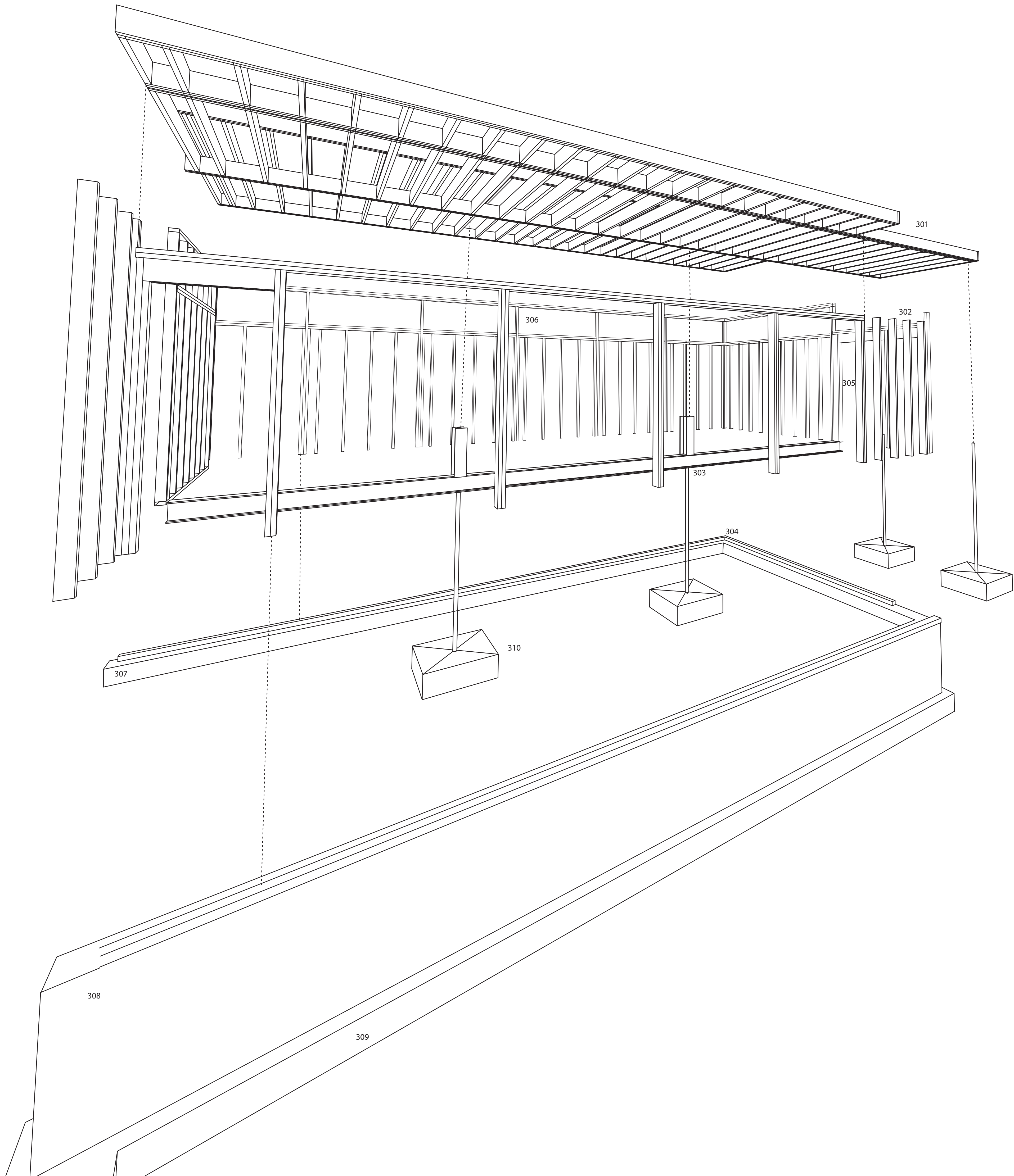
- Second Garage
- Office and solarium

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Legend

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Structural Diagram Living Room & Kitchen

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Cost Estimate Metcalf House (From RSMMeans Assemblies Cost Data 2009)

RAW MATERIALS	RS MEANS #	Name	Description	Units	Unit Cost	Total Cost
Substructure						
Poured Concrete (linear ft)	A1010 110 6300	Strip Footing	The Strip Footing System includes: excavation; hand trim; all forms needed for footing placement;forms for 2"x6" keyway (four uses); dowel	553	\$157.50	\$87,097.50
Foundation Underdrain (linear ft)	A1010 310 1400	Porous Concrete 6" Diameter	Costs include labor and materials for the pipe and 6" only of gravel or crushed stone around pipe. Excavation & Backfill not included.	553	\$14.15	\$7,824.95
Slab on Grade (sq ft)	A1030 120 2240	Slab on Grade 4" reinforced	A Slab on Grade System include 3 passes with a grader; 6"of compacted gravel fill; polyethelene vapor barrier; 3,500 p.s.i. concrete placed b	4930	\$4.74	\$23,368.20
Shell						
Roof System	B1020 102 3350	2"x8" 16" spacing, Flat	Sheathing is 5/16" CDX for 16" spacing.	4700	\$2.65	\$12,455.00
Structual I Beam w/columns	B1020 112 1200		I beam for support of the great room roof.	35	\$9.44	\$330.40
Exterior Brick (sq ft)	B2010 125 3110	Common Norwegian Solid Brick	Brick exterior for the chimney. Flashing, Shelf angles, control joints are included in cost.	200	\$17.20	\$3,440.00
15in Windows	B2020 102 4200	Wood, Casement, insul. Glass 2 lite	Prices include Frame, hardware, and casing.	4	\$779	\$3,116
Small Plate Glass	B2020 102 4500	Wood, picture, insulated glass, 4'6"x4'6"	Prices include Frame, hardware, and casing.	1	\$844	\$844
Large Plate Glass	B2020 102 4550	Wood, Picture, Insulated Glass, ~6'x4.5'	Prices include Frame, hardware, and casing.	7	\$945	\$6,615
Clerestory Windows (large)	B2020 106 8350	Aluminum, Picture, Insulated, 2'x3'	Prices include Frame, hardware, and casing.	20	\$266	\$5,320
Exterior Doors Without Glass	B2030 210 2400	Birch Solid Core Door	Price es are per opening for a complete door system including frame.	7	\$1,446	\$10,122
Front Door	B2030 210 2650	Front Door Wide	Price es are per opening for a complete door system including frame.	1	\$2,645	\$2,645
Roof Covering (sq ft)	B3010 105 1500	Asphalt Base Sheet, 3 piles, # 15 asphalt felt, mopped on nailable deck.	Cost per square foot.	4700	\$2.65	\$12,455.00
Roof Covering (sq ft)	B3010 430 4100	1/16" Rubber butyl	Include the cost per L.F. for a 2" by 8" treated wood nailer fastened at 4'-0" O.C. and a diagonally cut 4" by 6" treated wood cant.	4700	\$3.19	\$14,993.00
Gravel Stop (linear ft)	B3010 630 5100	Milled Aluminum 4"		500	\$10.56	\$5,280.00
Skylight (Small) (sq ft)	B3020 110 5200	Plastic Dome, Double glazed		8	\$43.95	\$351.60
Skylight (Large) (sq ft)	B3020 110 5800	30 to 65 sq ft Single Glaze		52	\$21.35	\$1,110.20
Interiors						
Countertop	C1030 830 0160	Custom Square Edge	Laminated plastic countertops per linear foot. 7/8" thick	30	\$50.80	\$1,524.00
Interior Wall System (sq ft)	C1010 128 0560	Drywall Components	Wood Studs including blocking, shoe and double top plate. 2"x4, 16" O.C.	1100	\$1.33	\$1,463.00
Exterior Wall System (sq ft)	C1010 128 0620	2"x6" Wood Framing Wall Construction	Wood Studs including blocking, shoe and double top plate. 2"x6, 16" O.C.	5000	\$1.70	\$8,500.00
Accordion Doors (sq ft)	C1010 205 0500	Folding Accordion, Wood, non acoustic, Pella		252	\$31.80	\$8,013.60
Interior Doors	C1020 120 1800	Wood, birch, hollow core	Included in the components for each system is the painting and the door frame. 2'8"x6'8", pine frame.	6	\$472	\$2,832
Pocket Doors	C1020 120 3200	Particle Core, sliding	Included in the components for each system is the painting and the door frame. 2'8"x6'8", pine frame	2	\$493	\$986
Hinges	C1020 310 0200	Average Frequency 6" Steel	Sets of 3 per system	14	\$48	\$672
Door Handles	C1020 310 0340	Exterior Doors	Lockset, heavy duty cylindrical, passage door.	8	\$95	\$760
Privacy Lock	C1020 310 0380	Bathroom Door	Lockset, Privacy	2	\$108.50	\$217.00
Grab Bar	C1030 710 0140	12" Long	1' 1/4" diameter. For the Bathroom.	2	\$53	\$106
Bathroom Mirrors	C1030 710 0170	72"x24" Mirror	Fittings, Bathroom and Toilet Accessories.	1	\$497.50	\$497.50
Tissue dispenser	C1030 710 0180		For toilet, surface mounted, single roll.	2	\$38	\$76
Towel Bar	C1030 710 0210	Towel bar 30"		3	\$134.50	\$403.50
Medicine Cabinets	C1030 710 0310	Lighted 19" Medicine Cabinet		6	\$274	\$1,644
Lower (linear ft)	C1030 830 0110	12" Cabinets	Household, base, hardwood, one top drawer and one below.	30	\$290	\$8,700
Upper (linear ft)	C1030 830 0130	30"x12"	Wall, hardwood, 30" high with one door 12"wide.	10	\$256	\$2,560
Paint (sq ft)	C3010 230 0080	Painting on Drywall Primer & 2 Coats		3000	\$1.03	\$3,090.00
Berber Carpet (sq ft)	C3020 410 0180	Woven, Wool, 36oz		507	\$14.01	\$7,103.07
Tile (sq ft)	C3020 410 1800	Quarry Tile	For main floor in the house throught living room, kitchen, and guest bedroom.	3800	\$13.45	\$51,110.00
Tile (sq ft)	C3020 410 1740	Porcelain Type	For Bathrooms, Office/Solarium.	200	\$9.56	\$1,912.00
Cedar Paneling	C3020 410 2120	Minimum	Stripped, sanded and finished.	750	\$8.76	\$6,570.00
Gypsum Ceiling	C3030 140 0200	3/8" Thick	Lath	3550	\$1.44	\$5,112.00
Pock-Board Ceiling (sq ft)	C3030 210 6800	5/8" Accoustical Mounted on Wood	Mineral fiber, 12"x12" 1"x3" Wood, 12"O.C.	150	\$5.51	\$826.50
Services						
Double Bowl Kitchen Sink	D2010 410 1840	42"x21" double bowl	Systems are complete with trim and rough-in (supply,waste and vent) to connect to supply branches and waste mains.	1	\$1,636.00	\$1,636.00
Laundry Room Sink	D2010 420 2040	Plastic, on wall or legs, 18"x23" single compartment	Systems are complete with trim and rough-in (supply,waste and vent) to connect to supply branches and waste mains.	1	\$1,060.00	\$1,060.00
Bathroom #2	D2010 924 1170	Three Fixture Bathroom, one wall plumbing. Stand alone.	Three Fixture Bathroom systems consisting of a lavatory, water closet, bathtub or shower and rough in-service piping.	1	\$4,425	\$4,425
Bathroom #1	D2010 926 2160	Three Fixture Bathroom, two wall plumbing. Stand alone.	Three Fixture Bathroom systems consisting of a lavatory, water closet, bathtub or shower and rough in-service piping.	1	\$4,450	\$4,450
Hot Water Heater	D2020 240 1820	Electric 50 gal	System includes piping and fittings within 10' of heater. Electric water heaters do not require venting.	1	\$6,000	\$6,000
2in Iron piping (linear ft)	D 2090 810 0840	Cast iron, 2" diameter	For Floor heating Estimate.	400	\$24	\$9,480
4 in Piping (linear ft)	D2090 810 2850	PVC, plastic, DWV, schedule 40, piping installed.		300	\$39	\$11,583
Pipe Fittings	D2090 820 5170	PVC 4" diameter		20	\$81	\$1,610
2in Piping (ft)	D2090 810 2830	PVC, plastic, DWV, schedule 40, piping installed.		100	\$20.27	\$2,027.00
Boiler	D3020 102 1360	For floor heating system.	Includes Boiler, electric stem, copper tubing type L, radiation tubes, pipe coverings, low water cutoff.	860	\$14	\$11,885
Furnace (sq ft)	D3030 214 1300	Heating/cooling system, gas fired. SEER 14.	Thermostat, Furnace, Cooling tube 25 ft, Ductwork and connections supply grill and ductwork, duct insulation, and return register. Installed	1	\$10,400	\$10,400
Electrical System	D5010 120 0280	200A Service installation, breakers, metering 20' conduit & wire	3 phase, 4 wire 120/208 volts	1	\$3,475	\$3,475
Wiring (linear ft)	D5010 230 0280	200A Feeder Installation 600V including RGS conduit and XHHW wire	Rigid galvanized steel conduit, 3/4" including fittings, copper #6 wire.	200	\$49.50	\$9,900
Outlets	D5020 125 0520	Receptacle Duplex 120V grounded, 15A.	Electric metal tubing conduit, Wire 600V copper solid #12, steel outlet box, receptacle, wall plate. Installed	35	\$228	\$7,980
Light Swiches	D5020 125 0680	Toggle Switch single, 15A.	Electric metal tubing conduit, Wire 600V copper solid #12, steel outlet box, receptacle, wall plate. Installed	25	\$232.50	\$5,812.50
Equipment						
Dryer	E1010 610 0100	Laundry Equipment, dryers, residential, 16lb. Capacity. Installed.		1	\$885	\$885
Washing Machine	E1010 610 0160	Residential, 4 cycle.		1	\$1,075	\$1,075
Handmade Bookcases	E1020 210 0120	Hardwood Bookcases, deluxe.		7	\$989	\$6,923
Double Oven	E1090 410 0140	30" wide, deluxe. Installed		1	\$1,878.50	\$1,879
Dishwasher	E1090 410 0170	Built in, Econemy, 2 cycles		1	\$513	\$513
Refrigerator	E1090 410 0220	Refrigerator, no frost, 21 to 29 C.F.		1	\$3,511	\$3,511
Building Sitework						
Driveway (per car)	G2020 210 1500	3" Paving 6" Gravel Base		7	\$1,190	\$8,330
Pedestrian Paving (sq ft)	G2030 150 3550	Concrete Brick Pavers 4"x8"	2 1/2" thick, Gravel Bedding, sand base. Edging and precast grating costs included.	2000	\$13.10	\$26,200.00
Gas Line (linear ft)	G3060 110 2130	4" Diameter		80	\$24.85	\$1,988.00
Sculptural Downspout	None	Decorative Sculptures which assist movement of water from roof to ground		3	\$1,400	\$4,200

TOTAL \$459,273

Cost Breakdown by Section		Robert Metcalf House	
Description	Division	Subtotal Cost	Cost Per Sq. ft
Substructure	A	\$118,290.65	\$23.99
Shell	B	\$79,077.20	\$16.04
Interiors	C	\$114,678.17	\$23.26
Services	D	\$91,723.70	\$18.61
Equipment	E	\$14,786	\$3.00
Building Sitework	G	\$40,718	\$8.26
		\$459,273.22	\$93.16
General Conditions			
		Contractor Fee: 10%	\$45,927.32
		Subtotal "A"	\$505,200.54
		Overhead: 5%	\$25,260.03
		Subtotal "B"	\$530,460.57
		Profit: 10%	\$53,046.06
		Subtotal "C"	\$583,506.63
Location Factor		Ann Arbor, MI	98.2
Architects Fee			N/A
Project Total Cost		\$573,003.51	\$116.23
Adjusted Cost for 1953	From Bureau of Labor Statistics	\$67,843.24	

Cost Analysis Report

Metcalf House
1052 Arlington Road
Ann Arbor, MI 48104

The Graebner Group

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Anthony Chan
Nikki Elman
Ross Kuchin
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Yojairo Lomeli
Katie Morris
Paul Provenza
Kelsey Reynolds
Victoria Rice
Kyle Schram
Andrea Yoas

2009 International Building Code
2006 International Residential Code

PROJECT SUMMARY		
1 Building Height	1 story above grade	
	10' 11" maximum	
2 Area/ Use Group	R-3	
3 Construction Type	V-B	

SUMMARY OF ANALYSIS		
1	The Building is a one story residence in Ann Arbor. It has a light-wood frame construction and cedar wood siding. The construction type is V-B. The building consists of R-3 residential use.	
2	The overall building construction type is V-B, which allows for an unlimited square footage and up to 3 stories, as per table 503.	
3	Per table 601, the building elements are unrated in a Type V-B construction, except for the requirement of exterior-wall protection, per table 602.	

CH3 USE AND OCCUPANCY CLASSIFICATIONS (IBC)		
Group R-3 occupants are permanent, and the group is defined as being those not meeting the criteria for R-1, R-2 or Group I occupancy groups. These are primarily single-family residences and duplexes. Day-care facilities for five or fewer people using the facility for less than 24 hours also fall into this occupancy group. In many jurisdictions these occupancies are regulated under the International Residential Code when it is adopted by the local jurisdiction.		

CH6 TYPES OF CONSTRUCTION (IBC)		
601		
Table 601 Required Fire-Resistance Ratings in Hours		
	Type V-B	
structural frame	0 hours	
bearing walls		
exterior	0 hours	
interior	0 hours	
nonbearing walls		
floor construction	0 hours	
roof construction	0 hours	
603 Type V Construction		
Type V Construction is the least restrictive construction type. It allows the use of any materials permitted by the code. A typical example of Type V construction is the conventional light-wood-framed single-family residence.		
Type V-B construction is unprotected and requires no fire-resistance ratings, except Table 602 requires exterior wall protection.		

CH7 FIRE-RESISTIVE CONSTRUCTION (IBC)		
702 Definition		
Fire Resistance Rating: "the period of time a building element, component, or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both."		All members are allowed to have 0 hours, as per table 601.
704 Fire Resistance of Structural Members		
Section 704 requires that the fire-resistance ratings of structural members and assemblies comply with the requirements for type of construction as set forth in Ch6 and Table 601.		All members are allowed to have 0 hours, as per table 601.
705 Exterior Walls		
705.5 Section 705.5 requires that the fire resistance ratings for exterior walls be as prescribed by Tables 601 and 602.		All members are allowed to have 0 hours, as per Tables 601 and 602

CH8 INTERIOR FINISHES (IBC)		
803 Wall and Ceiling Finishes		
Application: Section 803.11 governs the application of materials over walls or ceilings required to be fire-resistance rated or of noncombustible construction.		
803.1	Section 803.10 requires finish materials be securely attached so that they will remain in place for at least 30 minutes at 200 degrees F.	

CH9 FIRE PROTECTION SYSTEMS (IBC)		
907 Fire-Alarm and Detection Systems		
907.2.11.2		
Occupant Load or condition: R-3	1. Near each separate sleeping area 2. In each sleeping room 3. In each story of dwelling units	
Device Type	Smoke alarms	no smoke detection system.
Notes	not required at I-1 with smoke detectors in sleeping rooms as part of an automatic smoke detection system	

907.4.2	Manual Alarm Boxes	Section 907.4.2 requires manual alarm boxes be located no more than 5' from the entrance to each exit. Travel distance to the nearest box is not to exceed 200'.	no manual alarm boxes.
907.5.2.1	Audible Alarms	Section 907.5.2.1 requires audible alarms to have a distinctive sound not used for any other purpose. They are to be loud enough to provide a sound-pressure level at least 15 dBA above the ambient sound or 5 dBA above the maximum sound level.	

CH9 ROOF ASSEMBLIES (IRC)		
903		
R903.1	Roof decks shall be covered with approved roof coverings secured to the building or structure	
R903.2	Flashings shall be installed in a manner that prevents moisture from entering the wall and roof through joints in copings, through moisture permeable materials and at intersections with parapet walls and other penetrations through the roof plane.	See diagram 1.
R903.2.1	Flashings shall be installed at wall and roof intersections, wherever there is a change in roof slope or direction and around roof openings.	See diagram 1.
R903.3	Parapet walls shall be properly coped with noncombustible, weatherproof materials of a width no less than the thickness of the parapet wall.	
R903.4	Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof. Where required for roof drainage, scuppers shall be placed level with the roof surface in a wall or a parapet. The scupper shall be located as determined by the roof slope and contributing roof area.	See diagram 1.
905		
R905.3.3.1	For roof slopes from two and one-half units vertical in 12 units horizontal, up to four units vertical in 12 units horizontal, underlayment shall be a minimum of two layers. 1. Starting at the eave, a 19-inch strip of underlayment shall be applied parallel with the eave and fastened sufficiently in place. 2. Starting at the eave, 36-inch-wide strips of underlayment felt shall be applied, overlapping successive sheets 19 inches, and fastened sufficiently in place.	

CH14 EXTERIOR WALLS (IBC)		
1402 Exterior-Wall Envelope		
Section 1402 requires an "exterior wall, envelope" to protect the structural members of a building, including framing and sheathing materials, as well as conditioned interior spaces from detrimental effects of the exterior environment.		See diagram 2.

Diagram 1: Parapet Detail

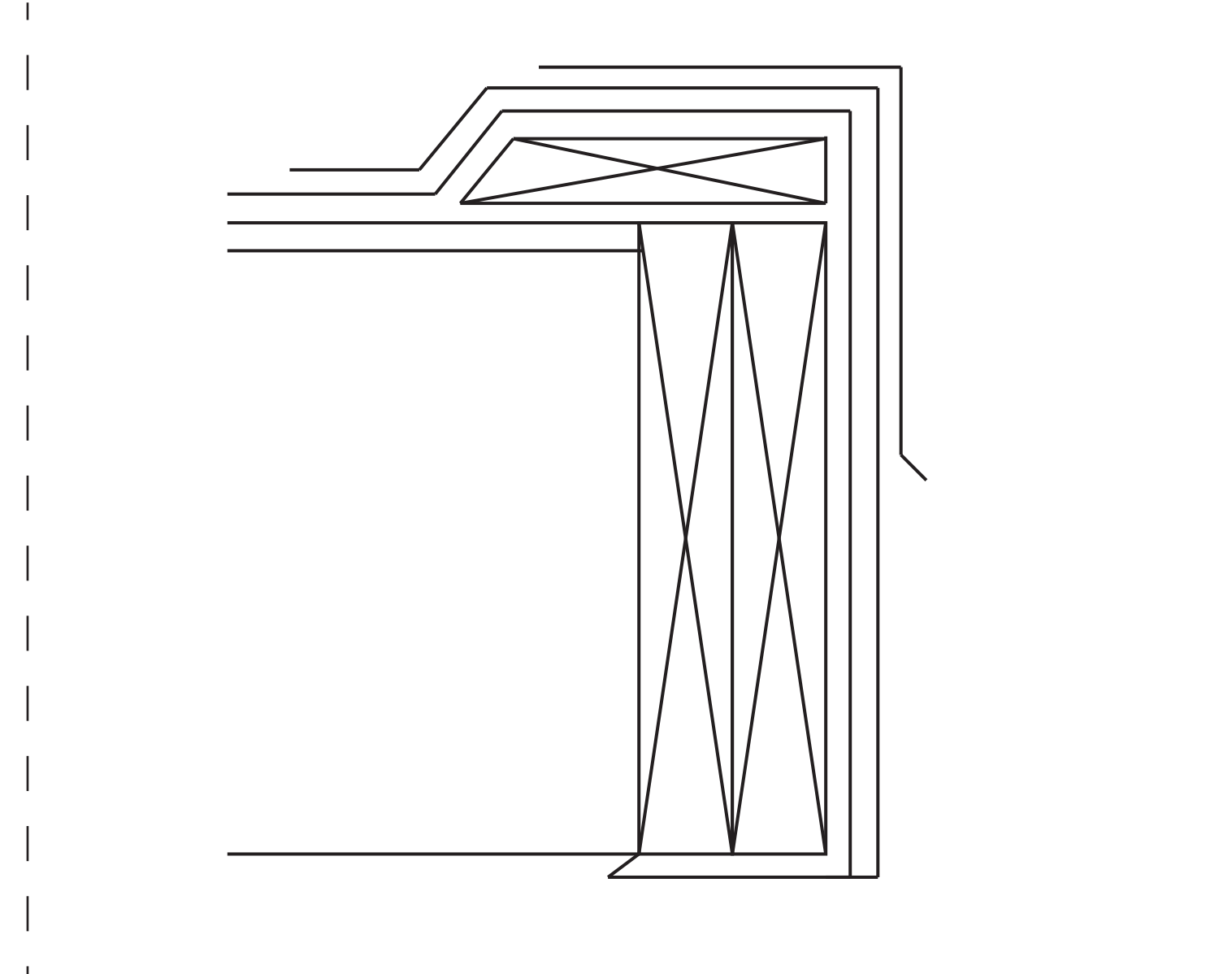


Diagram 2: Exterior Wall Construction

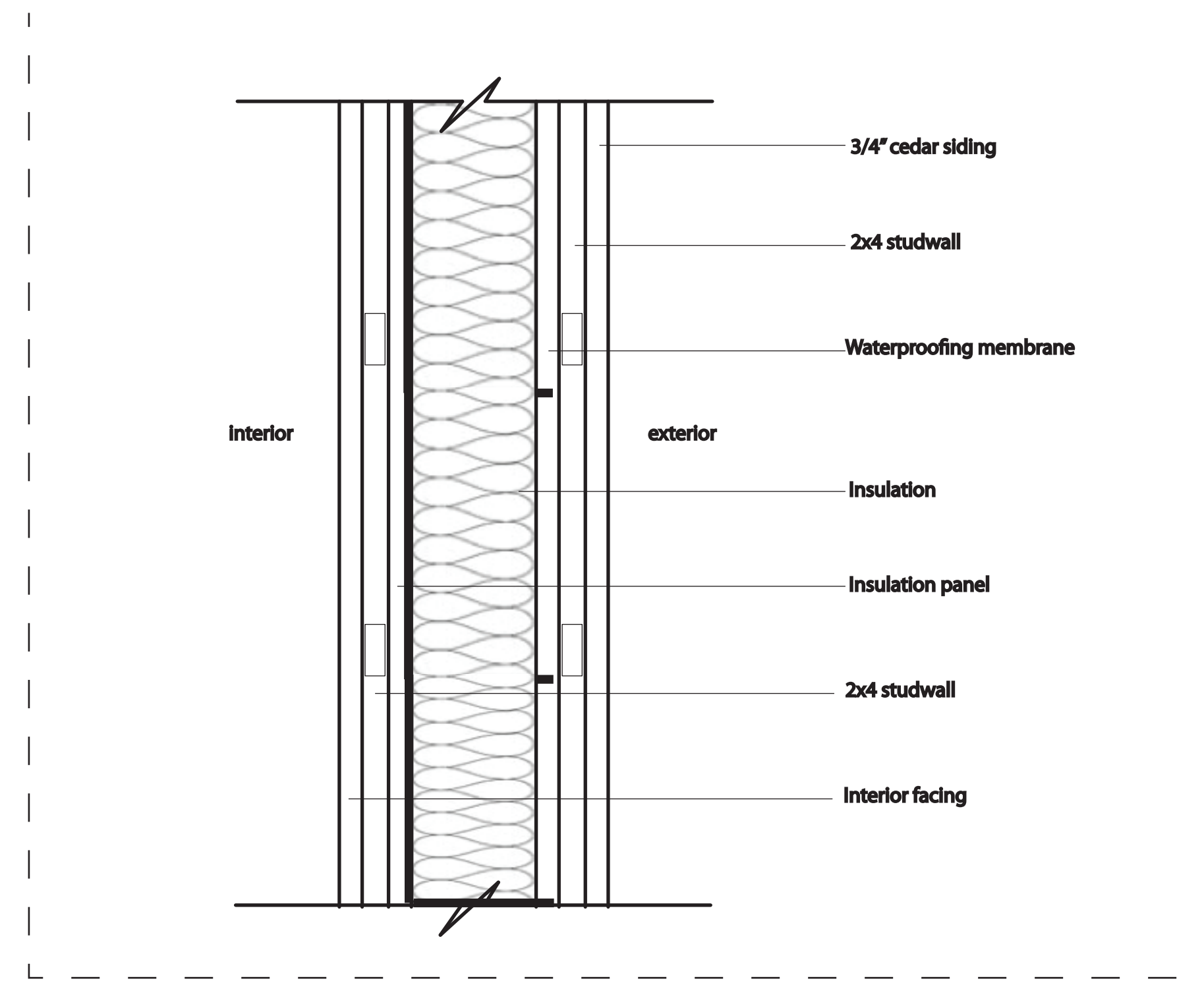
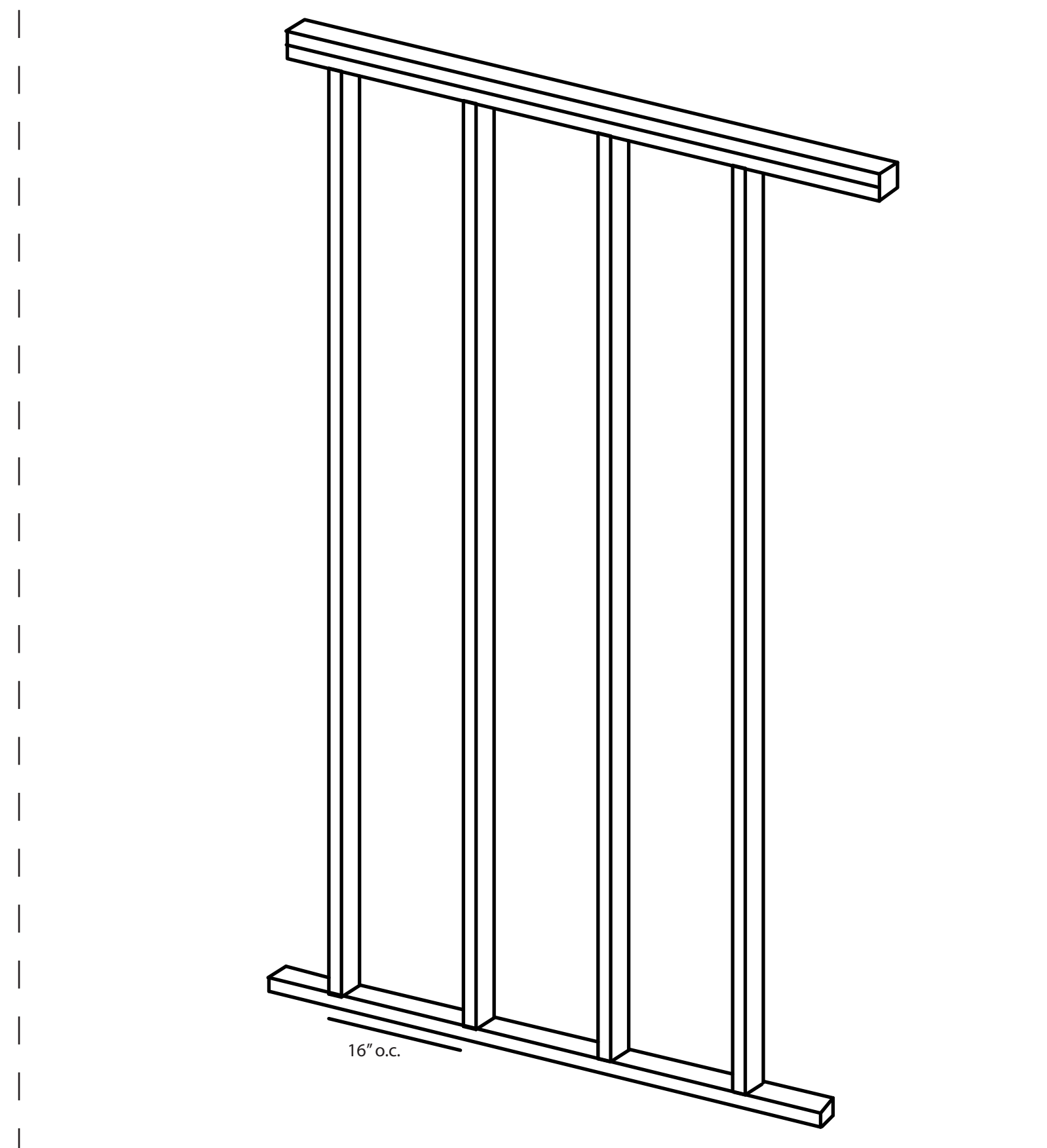


Diagram 3: Wood Stud Walls



Building Code Analysis

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