

# The Altoona Block House

Block House is a modular system to create custom accessory dwelling units (ADUs) that can fit on virtually any site. It would offer Altoona residents unlimited options on the size, arrangement, and style of their ADUs - all using the same four modules.

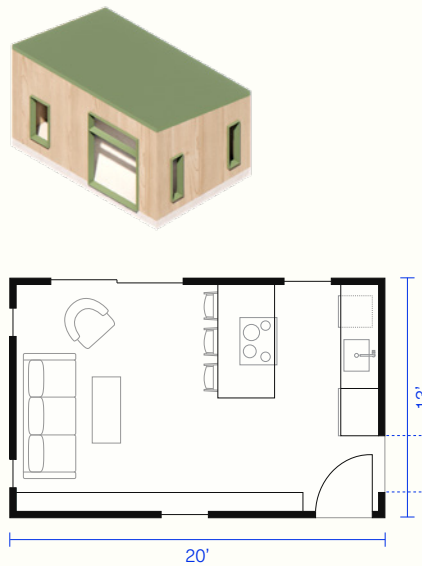
Block House modules are based on the forms of traditional American Homes found throughout Altoona like gabled roofs and chimneys, but with a clean, contemporary aesthetic and using modern and sustainable materials and systems. Every aspect of the Block House system has been meticulously considered, from the materials it's made with to the sustainable systems it uses. It maximizes space with wall-to-wall built-in storage and furniture, high ceilings, and bright and airy interiors so that it lives big despite its small footprint.

The Block House's signature element is a tall central core that serves as a solar chimney and light well, creating a dynamic and unique form that brings light and passive ventilation into the home's interior spaces. It also contains a rainwater harvesting system that collects water runoff from the roof for reuse. The unique stack form signals that these ADUs are unlike any other, and that Altoona is not just an innovator in affordable housing policy but also in the design and construction of affordable and sustainable housing.

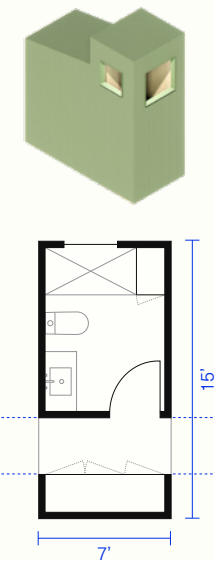


## Four modules, limitless possibilities.

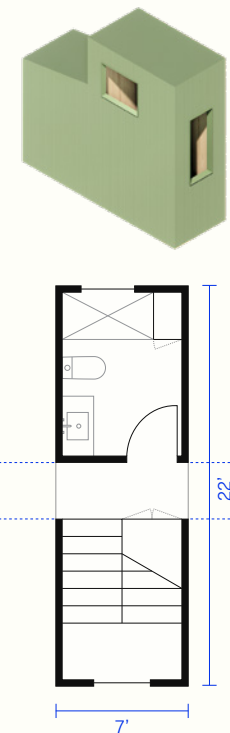
Living, Dining & Kitchen



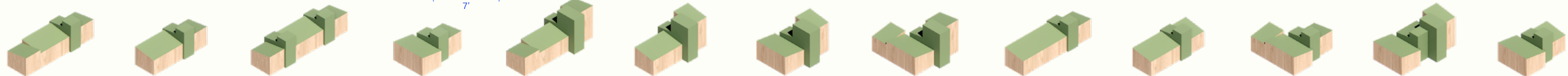
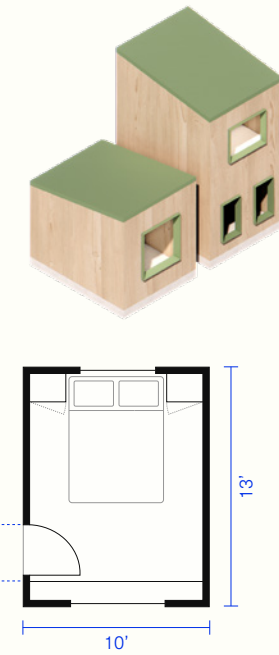
Bathroom + Solar Stack



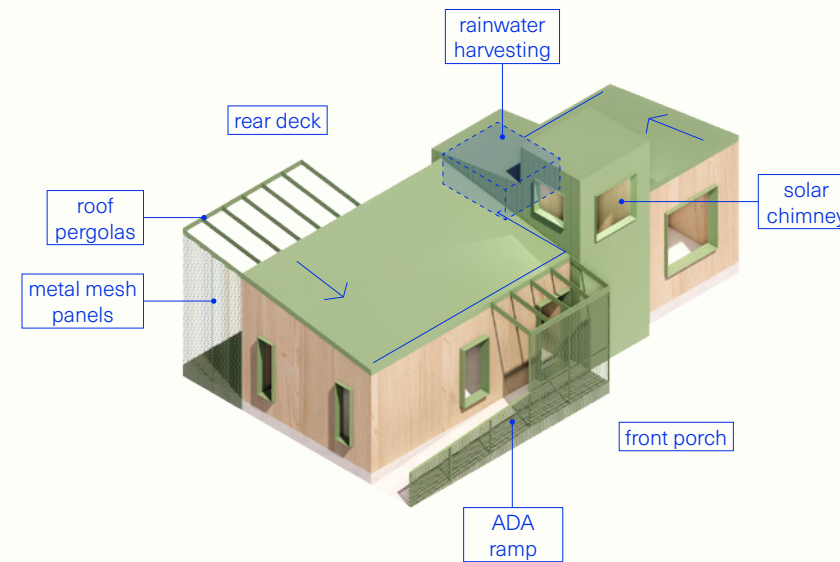
Bathroom + Solar Stack + Stairs



Bedrooms



## Bold and unique design features.



### All Block House configurations feature:

#### Interior

- High cathedral ceilings
- Engineered hardwood floors
- Walls with painted drywall finish
- Exposed timber upper wall and ceiling
- Spacious bathroom with walk-in shower
- Bathroom floor to ceiling tile
- Dimmable LED lighting fixtures throughout
- Solid core interior doors
- Custom kitchen cabinetry and millwork
- Extensive built-in storage and shelving
- Premium all electric appliances

#### Mechanical

- High efficiency heat-pump heating and cooling
- Instant water heater
- Rainwater harvesting, storage, and reuse
- Solar panels

#### Exterior

- Concrete slab foundation
- Cross-laminated timber wall cores
- Wood siding and corrugated metal siding around core
- Standing seam metal roof with concealed gutters
- Roof pergola extensions with metal mesh for privacy
- Wood casement windows
- Front porch with options for ADA-compliant ramp
- Rear deck

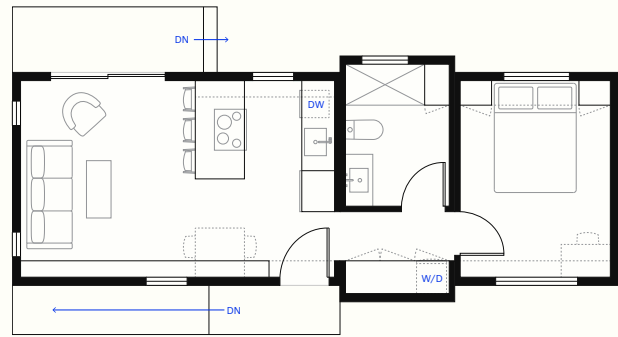
Configurable to fit any site and style.



1 Bed / 1 Bath

500 s.f.

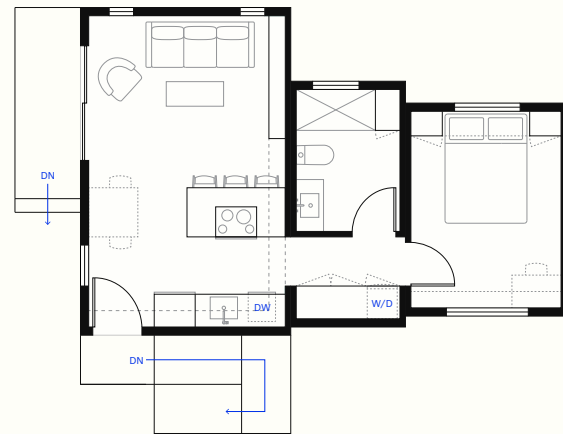
- wood siding
- corrugated metal solar stack
- ADA entry ramp
- solar panels



1 Bed / 1 Bath

500 s.f.

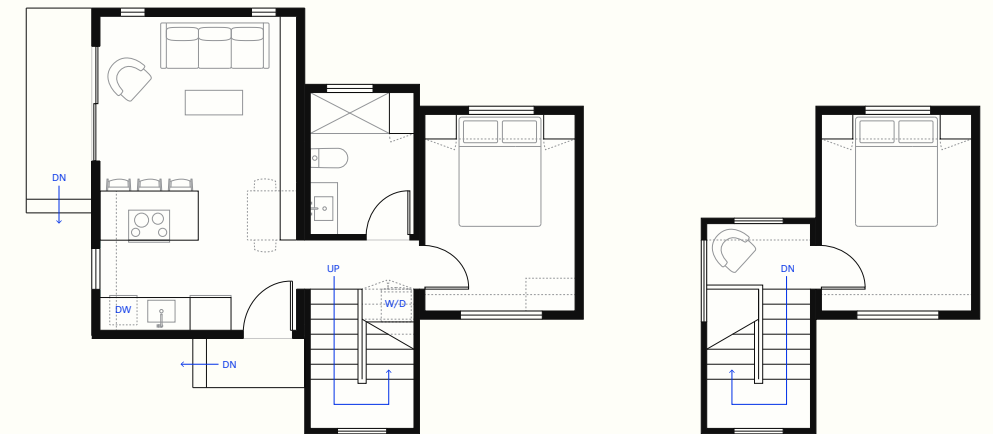
- wood slat siding
- metal panel solar stack
- ADA entry ramp
- no solar panels



2 Bed / 1 Bath

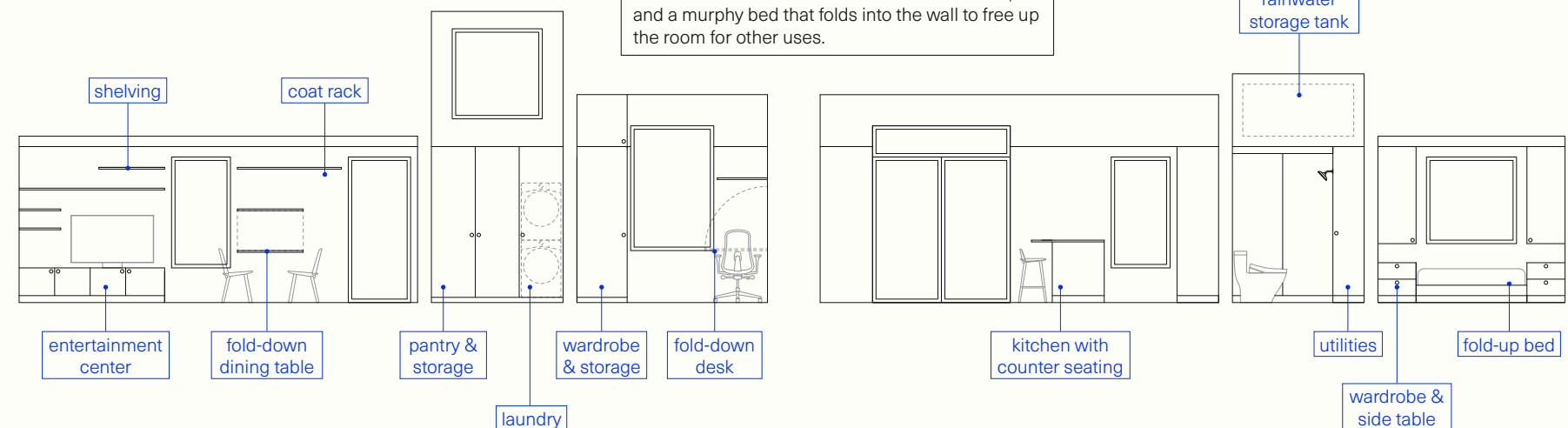
680 s.f.

- corrugated metal siding
- wood siding solar / stair stack
- front porch with steps
- no solar panels



Live large in a small footprint.

Built-in millwork throughout the Block House provides ample storage, even in a small footprint. A small dining table and desk fold up against the wall to make room when you need it. The bedroom features two built-in side tables and wardrobes, and a murphy bed that folds into the wall to free up the room for other uses.

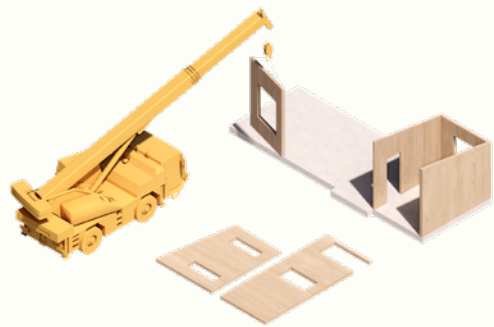


## Budget and environmentally friendly.

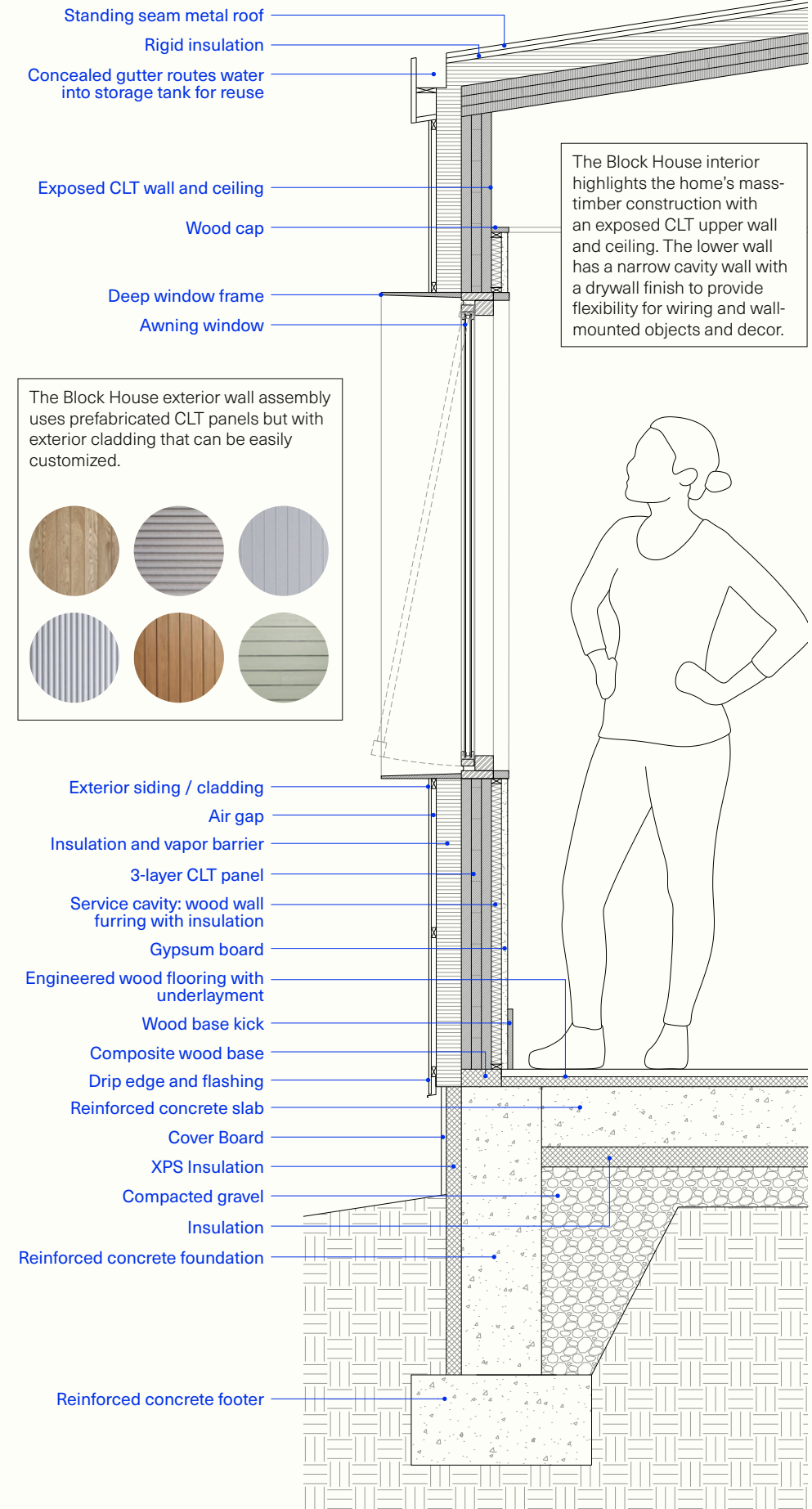
Every single material that goes into building a Block House ADU has been carefully considered to ensure it is healthy and natural, has lower embodied carbon than traditional materials, and either contains recycled content or can be reused. These material characteristics are not only better for us and our environment, but reduce costs — particularly in the long-term.

Each material, assembly, and fixture used has also been selected based on its performance — low-flow fixtures, passive ventilation, and ample daylighting all contribute to reduced power and water consumption and costs.

Cross-Laminated Timber (CLT) panels have low embodied carbon, are pre-fabricated in factories to precise dimensions and structural requirements, and can be assembled on site much faster and more easily than traditional construction methods. It's a natural, healthy material that is extremely durable, strong, and naturally insect and fire-resistant.



## High performance materials, inside and out.



Block House modules are designed for passive ventilation via operable windows, a tall light well that serves as a solar chimney for the ventilation of hot air, and an open plan to allow for cross-breezes. The result is a light and airy interior with fresh air and a lower reliance on HVAC - even as our summers continue to get hotter.



# Sample Configuration

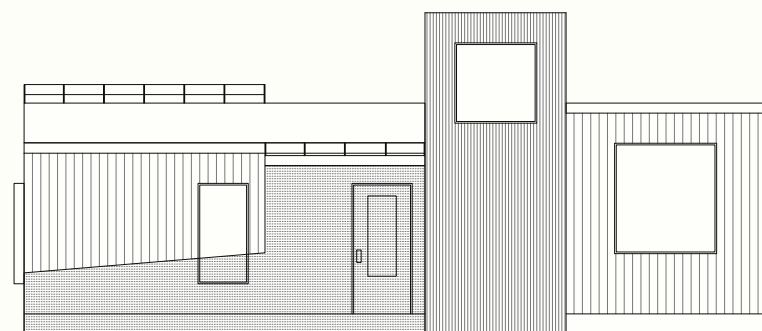
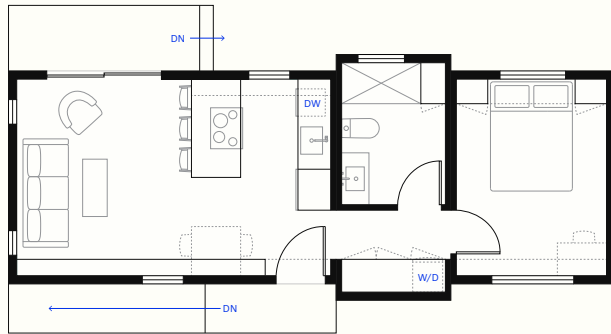


1 Bed / 1 Bath

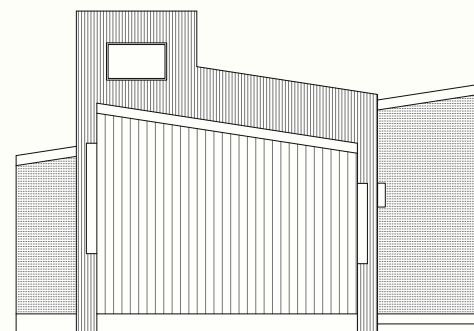
500 s.f.

[wood siding](#) [corrugated metal solar stack](#) [ADA entry ramp](#) [solar panels](#)

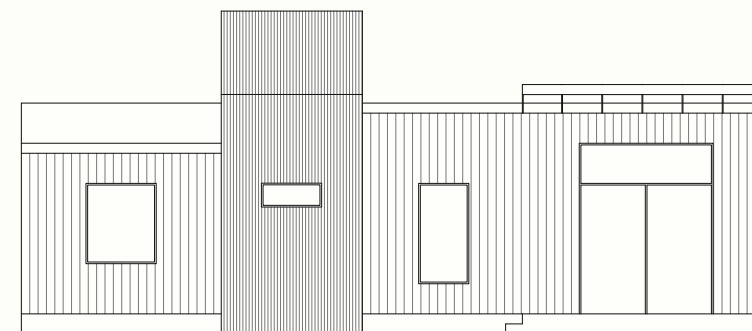
This sample configuration shows a 1 bedroom, 1 bathroom Block House in a linear configuration with natural wood siding, a pale green corrugated metal core and matching roof, pergola, and mesh panels. It features an ADA-accessible front porch and a rear deck with a pergola. This sample configuration also shows the addition of solar panels on the roof for supplemental power generation.



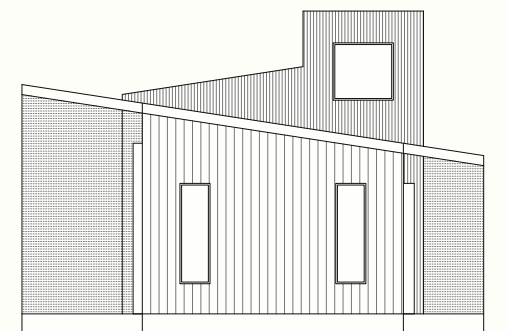
Front Elevation



Right Elevation



Back Elevation



Left Elevation

# Sample Configuration

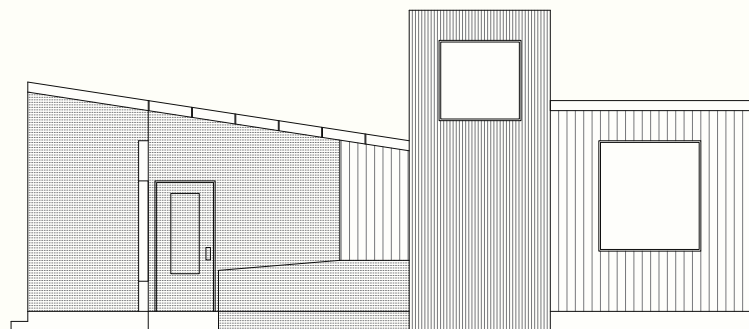
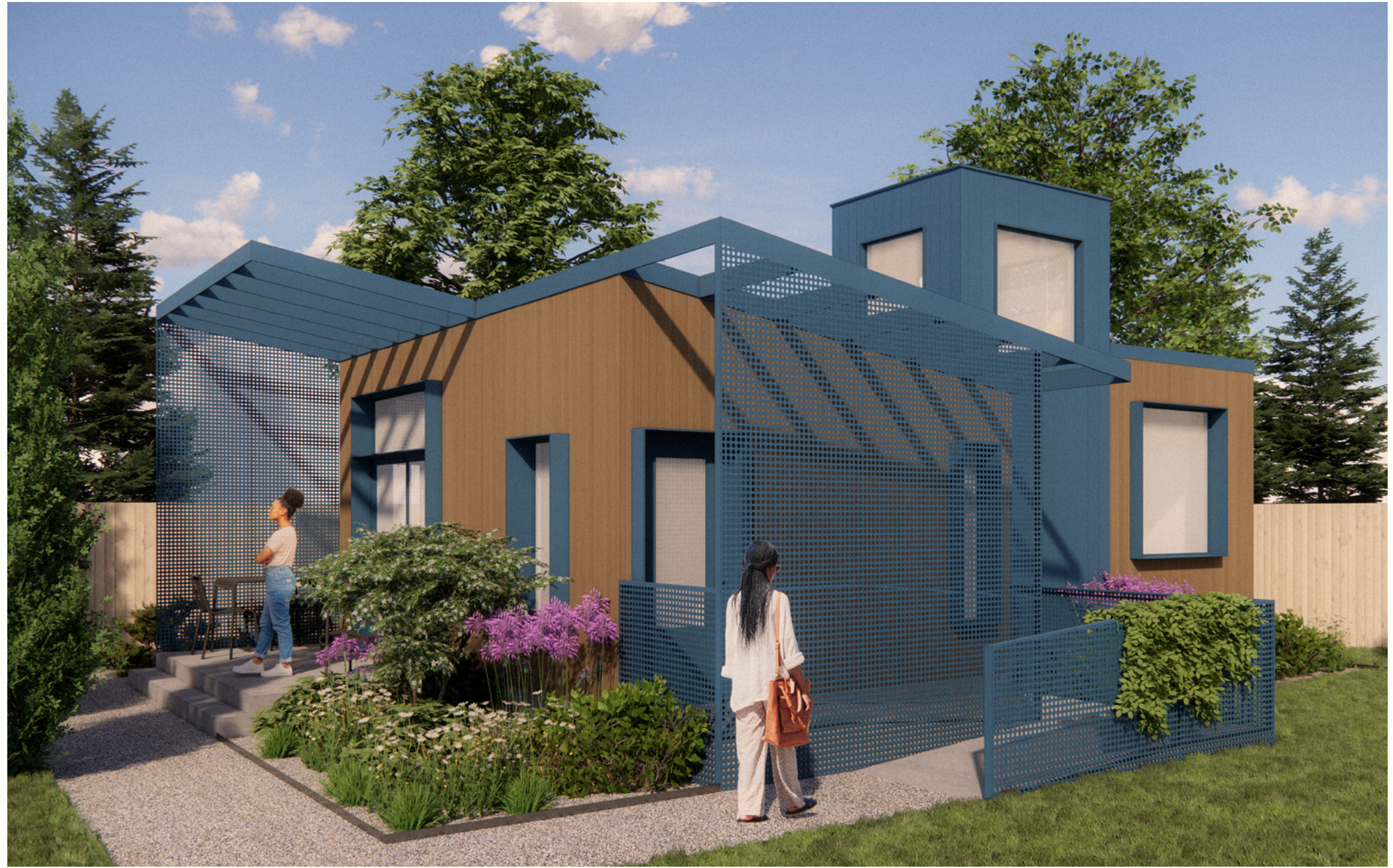
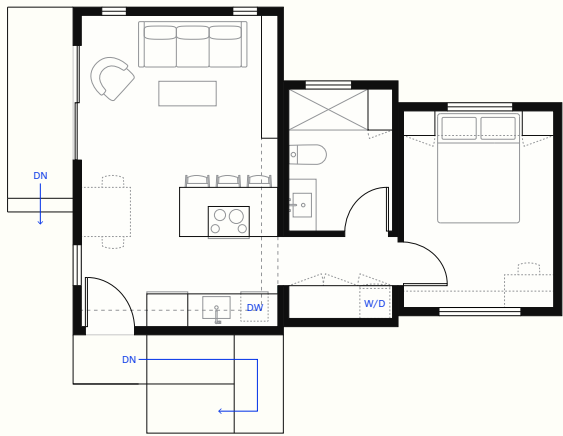


1 Bed / 1 Bath

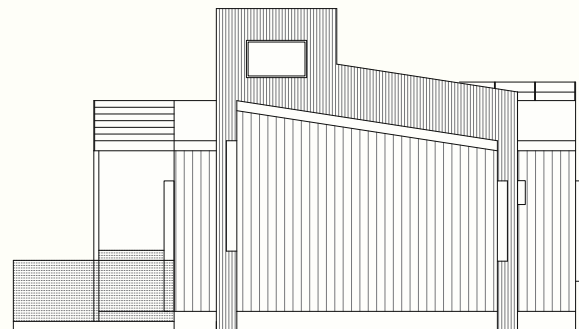
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[wood slat siding](#) [metal panel solar stack](#) [ADA entry ramp](#) [no solar panels](#)

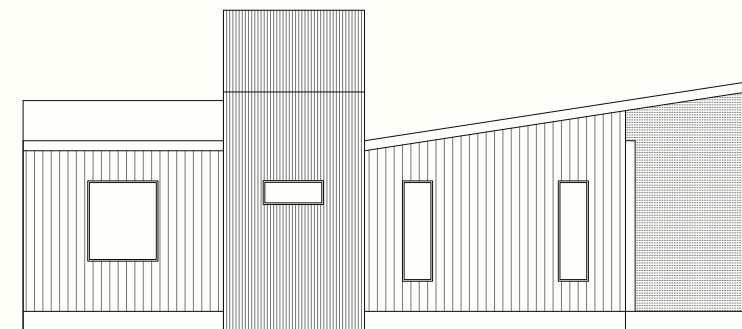
This sample configuration shows a 1 bedroom, 1 bathroom Block House in a compact configuration with natural wood slat siding, a deep blue board and batten core and matching roof, pergola, and mesh panels. It features an ADA-accessible front porch and a rear deck with a pergola.



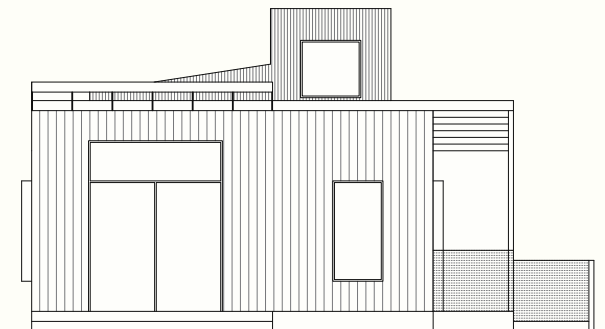
Front Elevation



Right Elevation



Back Elevation



Left Elevation

# Sample Configuration

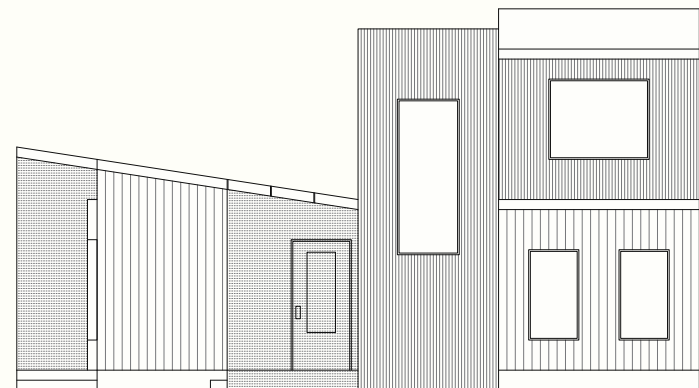
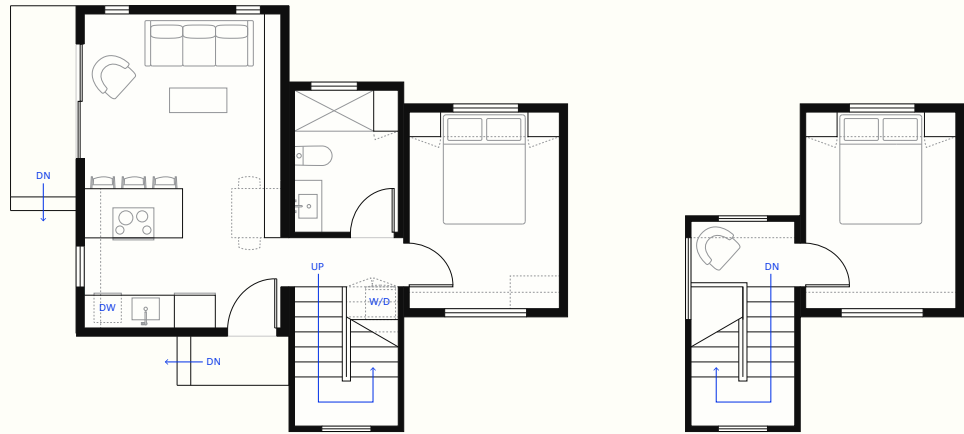


2 Bed / 1 Bath

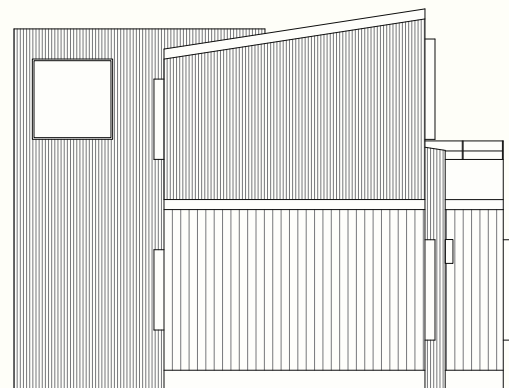
680 s.f.

[corrugated metal siding](#) [wood siding solar / stair stack](#) [front porch with steps](#) [no solar panels](#)

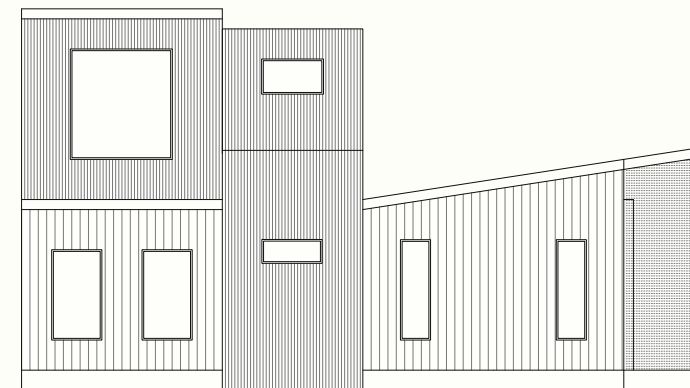
This sample configuration shows a 2 bedroom, 1 bathroom Block House in a two-story, compact configuration with corrugated metal and natural wood siding and a deep charcoal roof, pergola, and mesh panels. It features a front porch and a rear deck with a pergola.



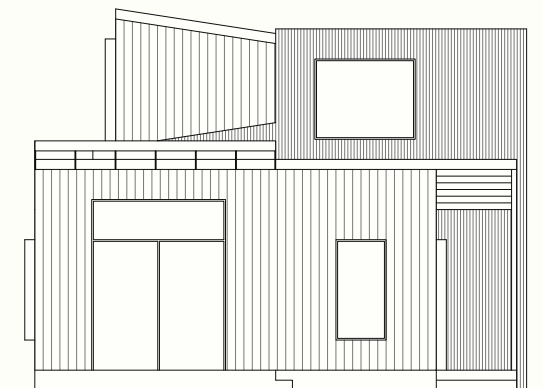
Front Elevation



Right Elevation



Back Elevation



Left Elevation

# Project Overview

## Project Narrative

Block House is a modular system to create custom accessory dwelling units (ADUs) that can fit on virtually any site. It would offer Altoona residents unlimited options on the size, arrangement, and style of their ADUs - all using the same four modules that could even be pre-approved by the city, similar to the ADU programs in other cities across the US.

The Block House's signature element is a tall central core that serves as a solar chimney and light well, creating a dynamic and unique form that brings light and passive ventilation into the home's interior spaces. It also contains a rainwater harvesting system that collects water runoff from the roof for reuse. The unique stack form signals that these ADUs are unlike any other, and that Altoona is not just an innovator in affordable housing policy but also in the design and construction of affordable and sustainable housing.

The Block House framework was designed with the following principles:

### Flexibility

Block House's modularity offers unlimited flexibility in ADU size, shape, and style so that it can fit on any site and meet the individual needs of Altoona residents, as well as allowing for future expansion as families grow and needs change.

### Sustainability

*Materials*  
All materials have been carefully considered to ensure they are healthy and natural, have low embodied carbon, and contain recycled content or can be recycled. The Block House drawing set could include an extensive library of pre-approved materials and fixtures to give residents and contractors options while ensuring the project remains true to its core mission of sustainability and simplicity.

### Form

The angled roofs and the tall solar stack are designed to provide passive ventilation throughout the home, and operable windows at different levels allow for the natural flow of air to keep the space cool during the summer, reducing the need for HVAC. Modules can be rotated in any direction so that their sloped roof and solar panels always face south for maximum sun exposure.

### Systems

Each sloped roof features a concealed gutter that captures rainwater and diverts it into a large storage tank inside the central stack for reuse. Solar panels on the roof offset power consumption, and a heat pump system heats and cools the space efficiently, using up to 50% less energy than traditional heating systems. The Block House's CLT panel wall assembly has multiple layers of insulation and the precise fabrication of mass-timber allows for an air-tight facade.

### Affordability

Block Houses were designed to be affordable through their simple but elegant design. Cross-laminated timber has a much higher material cost than conventional timber framing, but is delivered as prefabricated panels on site that are constructed quickly and easily — significantly reducing labor costs. Low-flow fixtures, passive ventilation, and ample daylighting all contribute to reduced power and water consumption and costs.

### Contextuality

Block House ADUs are a modern interpretation of the traditional forms found in American homes in Altoona. Forms like gable roofs and the chimney are rethought to be built using modern, high-performance materials and support passive ventilation. It's exterior wall assembly can accept many different types of siding and cladding, allowing residents to reference or even match the aesthetic of their Block House with their primary structure.

### Accessibility

Block House modules are designed according to Universal Design principles, providing ample maneuvering space throughout all spaces. The bathroom features large clearances and a walk-in shower. The front porch and rear deck have options to add an ADA-compliant ramp, which is integrated into the roof pergola and metal mesh structures.

### Proposed Materials

Block Houses are constructed using prefabricated Cross-Laminated Timber (CLT) panels which are fabricated precisely and in a controlled environment and delivered on site to reduce construction time, complexity, and cost. It is naturally fire, insect, and mold resistant and permitted in Wisconsin's Building Code. Mass timber can be sustainably harvested and sequesters carbon rather than emitting it. A 1-Bedroom Block House will have sequestered approximately 12 metric tonnes of carbon just by being constructed. Its structural properties allow for simple and elegant details and construction, and it can be left as a beautiful, natural interior finish. Mass timber can also be easily repurposed and reused at the end of its life.

Block Houses make use of natural and non-toxic materials with as much recycled content as possible and the ability to be reused. This includes:

- Low VOC interior finishes, paints, and exposed laminated timber panels
- Engineered wood floors harvested sustainably and installed with non-toxic adhesives
- Tile made from recycled materials
- Natural hemp insulation
- Engineered stone countertops made from recycled materials
- Metal roof and corrugated metal siding made from recycled metals
- Concrete manufactured using waste materials

# Estimated Construction Costs

2023 construction costs for a new home in Wisconsin are estimated to be between \$160-\$300/SF. This equates to a 1-Bedroom Block House costing between \$90,000 and \$150,000.

A more detailed cost estimate puts a 1-Bedroom Block House just under \$90,000 for base finishes, millwork, fixtures, and appliances, which includes an average estimate on labor and a 10% design contingency. Its modular design and pre-fabricated mass timber construction allows owners to easily expand their home in the future, to break costs into phases. The estimated cost includes the features listed below, which match the features offered in premium ADU packages by companies like Abodu and Samara, for a fraction of the cost.

The cost estimate is based on the following features:

### Interior

- 1 Bedroom, 1 Bathroom; 500 SF
- High cathedral ceilings
- Engineered hardwood floors
- Walls with wood baseboard, painted drywall finish, and exposed timber upper wall and ceiling
- Floor to ceiling tile in bathroom
- Dimmable LED lighting fixtures throughout
- Solid core interior doors
- Custom kitchen cabinetry and millwork
- Extensive built-in storage, folding table and desk, shelving, and built-in murphy bed
- Premium all electric appliances, including washer and dryer

### Mechanical

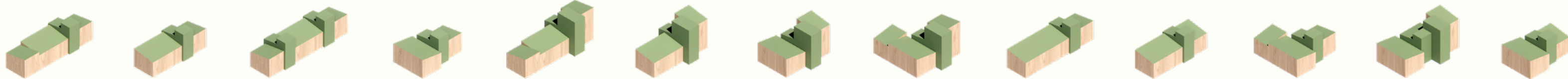
- High efficiency heat-pump heating and cooling
- Instant water heater
- Rainwater harvesting, storage, and reuse
- Solar panels

### Exterior

- Concrete slab foundation
- Cross-laminated timber wall cores - prefabricated and delivered on site
- Wood siding and corrugated metal siding around core
- Standing seam metal roof with concealed gutters for rainwater harvesting
- Roof pergola extensions with metal mesh for privacy
- Wood casement windows
- Front porch with options for ADA-compliant ramp
- Rear deck

### Prefabricated ADUs with equivalent size and features

Samara Backyard - \$339,000; DEN Outdoors - \$200,000; Abodu - \$310,200



# Detailed Cost Estimate

Altoona Block House - Preliminary Cost Estimate		NOTE: table shows material costs only - labor calculated below as part of total						
Item	Description / Notes	Size	Estimated Unit Price - Base	Estimated Unit Price - High	QTY	Units	Total Estimated Cost - Low	Total Estimated Cost - High
<b>Envelope</b>								
CLT with Insulation & furred out service cavity with drywall finish	CLT wall construction with added insulation and membranes; interior drywall finish with utility cavity for electrical runs		\$30	\$45	500 SF		\$15,000	\$22,500
Siding - Living and Bedroom Blocks			\$4	\$8	860 SF		\$3,440	\$6,880
Corrugated Metal - Stack			\$2	\$5	400 SF		\$800	\$2,000
Perforated Metal Mesh			\$6	\$8	176 SF		\$1,056	\$1,408
Metal Roof	Standing seam metal roof with recycled materials		\$6	\$10	500 SF		\$3,000	\$5,000
Slab Foundation	Concrete with recycled content		\$5	\$8	500 SF		\$2,500	\$4,000
Porch	Poured concrete porch		\$4	\$8	80 SF		\$320	\$640
Deck	Poured concrete rear deck		\$4	\$8	70 SF		\$280	\$560
<b>Windows and Doors</b>								
Entry Door	Solid core insulated exterior door and hardware	36 x 80	\$500	\$1,200	1		\$500	\$1,200
Interior Doors	Solid core wood door and hardware	30 x 80	\$100	\$200	2		\$200	\$400
Sliding Door	Low - Pella sliding door; High - NanaWall folding glass wall	96 x 80	\$1,400	\$8,000	1		\$1,400	\$8,000
Awning Window - Small		36 x 48	\$840	\$1,200	3		\$2,520	\$3,600
Awning Window - Medium		18 x 60	\$790	\$1,000	3		\$2,370	\$3,000
Awning Window - Large		62 x 48	\$1,400	\$2,000	3		\$4,200	\$6,000
<b>Millwork</b>								
Kitchen	Cabinets, drawers, pull hardware, soft close sliders, countertops with recycled content		\$60	\$100	74 SF		\$4,440	\$7,400
Shelving and Closets	Custom millwork shelving, cabinets, and closets throughout		\$60	\$100	38 LF		\$2,280	\$3,800
<b>Plumbing</b>								
Kitchen sink and faucet	Low-flow fixture		\$100	\$250	1		\$100	\$250
Bathroom vanity	Low-flow fixture		\$300	\$800	1		\$300	\$800
Toilet	Low-flow fixture		\$100	\$200	1		\$100	\$200
Shower and Showerhead	Low-flow fixture		\$50	\$100	1		\$50	\$100
Water heater	Instant water heater		\$400	\$600	1		\$400	\$600
<b>Lighting and Electrical</b>								
Outlets and wiring	Shallow junction boxes compatible with service cavity		\$2	\$5	500 SF		\$1,000	\$2,500
Hanging Pendants	Low - Leo Hanging Globe Pendant; High - Muuto Rime		\$130	\$600	4		\$520	\$2,400
Bedroom Reading Light	Low - IKEA NYMÅNE; High - Muuto Tip Lamp		\$38	\$315	2		\$76	\$630
Cabinet LED	LED Tape for integrated lighting into millwork		\$8	\$16	38 LF		\$304	\$608
Outdoor Fixtures			\$50	\$80	4		\$200	\$320
General Lighting			\$10	\$20	10		\$100	\$200

Altoona Block House - Preliminary Cost Estimate		NOTE: table shows material costs only - labor calculated below as part of total						
Item	Description / Notes	Size	Estimated Unit Price - Base	Estimated Unit Price - High	QTY	Units	Total Estimated Cost - Low	Total Estimated Cost - High
<b>Appliances / Fixtures</b>								
Kitchen Appliances	All-electric appliance package with oven, cooktop, microwave, refrigerator, and dishwasher. Low - GE; High - LG Premium						\$2,000	\$5,000
Washer Dryer	All-electric stacked washer and dryer. Low - GE; High - LG						\$1,200	\$1,800
HVAC	Ductless mini-split heat pump system with three air handlers. Low - standard system; High - standard system with upgraded air filtration		\$6	\$10	500 SF		\$3,000	\$5,000
<b>Finishes</b>								
Flooring	Engineered wood flooring		\$4	\$8	500 SF		\$2,000	\$4,000
Floor Tile	Tile with recycled content		\$2	\$6	56 SF		\$112	\$336
Bathroom Wall Tile	Tile with recycled content		\$2	\$6	240 SF		\$480	\$1,440
Baseboards	Solid wood baseboards		\$2	\$4	120 LF		\$240	\$480
<b>Sustainable Features</b>								
Rainwater Harvesting	Tank and associated piping		\$1,000	\$2,000	1		\$1,000	\$2,000
Solar	Solar panels		\$4	\$10	500 SF		\$2,000	\$5,000
<b>TOTAL MATERIAL COSTS</b>							<b>\$59,488</b>	<b>\$110,052</b>
		Low	High	Average				
<b>Calculated Cost Estimate</b>								
Material Cost		\$59,488	\$110,052	\$84,770				
Labor Cost - 40% of Material Cost		\$23,795	\$44,021	\$33,908				
Contingency - 10% of Material Cost		\$5,949	\$11,005	\$8,477				
<b>Total Estimated Cost</b>		<b>\$89,232</b>	<b>\$165,078</b>	<b>\$127,155</b>				
		Low	High	Average				
<b>For Comparison</b>								
Typical cost per square foot in Wisconsin, including labor		\$180	\$300	\$240				
<b>Total Estimated Cost</b>		<b>\$90,000</b>	<b>\$150,000</b>	<b>\$120,000</b>				

