

BLACK STREET CASE STUDY

Case Study Black Street Development



(412) 368-3412
modulehousing.com
info@modulehousing.com

BLACK STREET CASE STUDY

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Project Summary

Module's Black Street mixed-income development features an income-qualified 2 bedroom/1.5 bath unit, a market-rate 3 bedroom/2.5 bath unit, and a duplex with a 1 bedroom/1 bath unit on the bottom floor and a 2 bedroom/1.5 bath on the top floor. The duplex, Module's Duo model, was designed to serve as a show home and a rental unit for Module employees.

The key stakeholders in the project were Module (the design-build company), the Urban Redevelopment Authority of Pittsburgh (URA, current landowner and secondary lender) and Bloomfield-Garfield Corporation (BGC).

The site consisted of three vacant lots, where homes used to be. Two of the parcels were owned by Pittsburgh's Urban Redevelopment Authority (URA) & the other owned by Bloomfield-Garfield Corporation. The land was acquired by Module Development LLC in Spring of 2019.

Location: Pittsburgh, PA

Neighborhood: Garfield

Site Size: 8,900 Sq. Ft.

of Units: 4

Project Size: 4,300 Sq. Ft.

Project Type: Residential Infill

Construction Method: Off-Site; Modular

Developer

Module Development LLC

Architect & Off-Site Construction Manager

Module Design Inc.

General Contractor

Blockhouse Residential

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The Site & Neighborhood

The Black Street Site, located in Pittsburgh's Garfield neighborhood is a fairly typical infill site seen throughout the city. There was a >15% grade on the site and the rear of the lot is a steep hillside that was unbuildable; requiring a water drainage solution upon excavation. Additionally, the site had residual building foundations from previous homes which had to be removed.

Module Development LLC selected this site because of its proximity to the commercial district of East Liberty, its adjacency to an environmental charter school, and rapidly changing Garfield market

Unit Descriptions

5452 Black Street: Module Show Home

5452 Black Street is an up-down duplex totaling 1,728 Sq. Ft. A first floor one bedroom, one bathroom unit of 576 square feet, and a second and third floor unit with two bedrooms and one and a half bathrooms, totaling 1,152 square feet. The unit has one off-street parking space for the property. The first-floor unit of Black St. 1 is being rented to Module team members. The top unit is being used by the Module team as a show home and office + events space. Module Development LLC plans to hold the property until the market matures to support a sale when the show home is no longer needed.

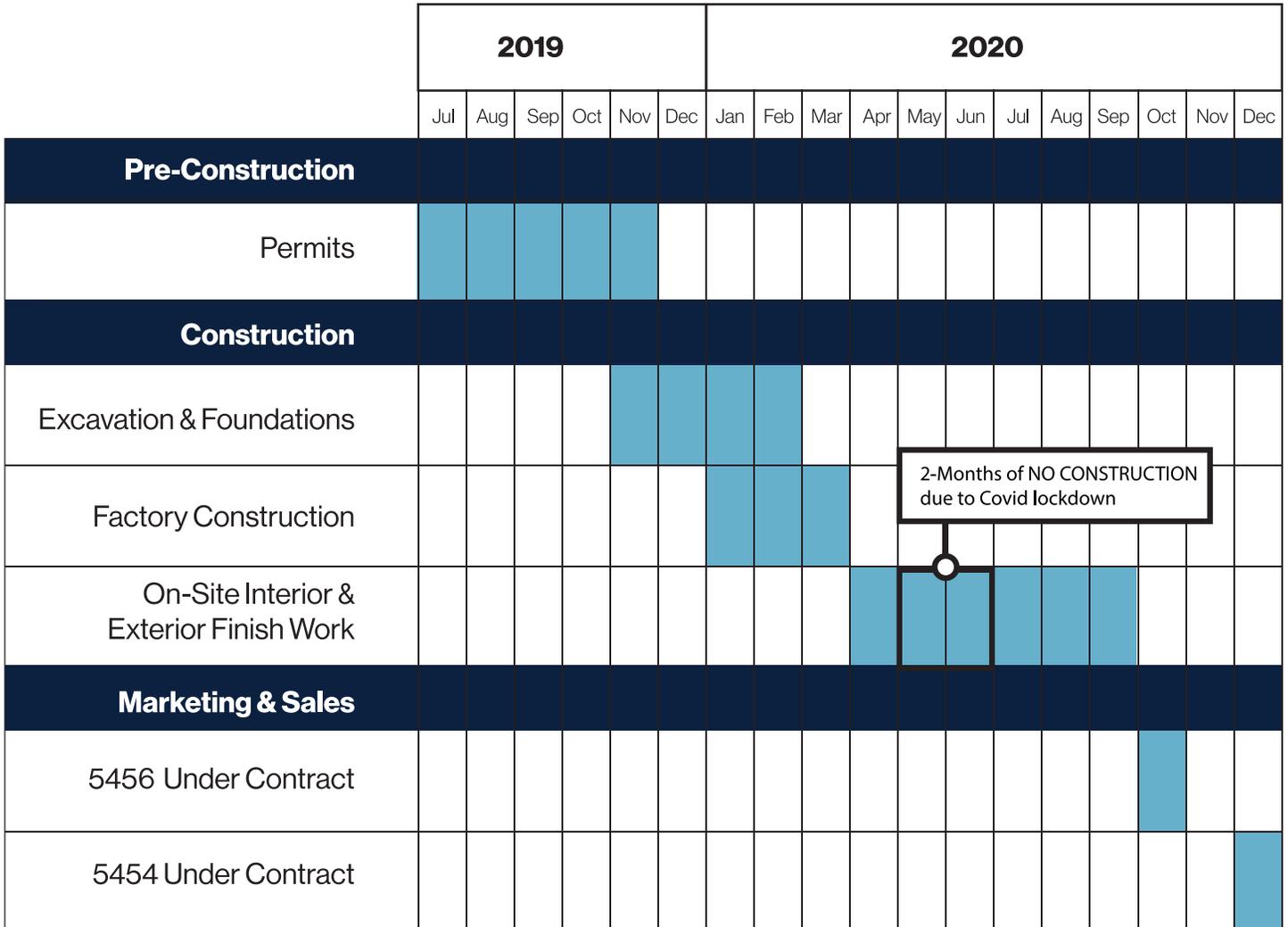
5454 Black Street: Market Rate Home

5454 Black St. is a market-rate single family home designed and built for immediate sale. The home consists of three bedrooms, two-and-a-half bathrooms, 1,280 square feet of space, and integral garage. Open living and kitchen with pocket doors that create a home office/flex space.

5456 Black Street: 80% AMI Single Family Home

Module is excited to support affordable housing in the City of Pittsburgh with the sale of Black St. 3, a two bedroom, one-and-a-half bath, 1,152 square foot home. The home was sold to an 80% Area Median Income buyer. The buyer was found through a local non-profit group called Open Hand Ministries. This unit is a partnership between Module and the Bloomfield-Garfield Corporation (BGC), a local community development corporation in the neighborhood and leader in Pittsburgh's efforts to develop inclusive urban communities.

Project Timeline



A Better Process

Pre-Construction & Construction

As a user-centered homebuilder, Module puts heavy emphasis on the development of a superior process. The completion of the Black Street Development highlighted many advantages that equate to time & cost savings and an improved project experience.

A Lean & Efficient Team

Successfully utilizing the off-site factory for drawing and engineering services eliminated the need for an external structural engineer and reduced the production hours needed by the architect of record.

Setting Expectations Early

Working with an off-site manufacturer requires the development of a clear and definitive scope and spec. Factory orders are signed off on and these costs are set during pre-construction.

Minimizing Coordination

Module is the “point person” for coordination with the on-site GC and the off-site factory. The factory serves as a supersub, so we can communicate with closer to 5 subcontractors, rather than the typical 25 subcontractors on a project this size.

Superior Marketing Support

Module provided the entire marketing package for selling the homes, including interior and exterior renderings, customer-facing floor plans, and finish selection packages. Module built a webpage for the project and created unique email and social campaigns targeting prospective home buyers.

Time Savings

Construction Phase: We saved 172 days.

Project Timeline Comparison

When comparing the construction phase of the Black Street Development to a typical 3-home (site-built) development in the same neighborhood at the same time:

Module Black Street Development: 272 Days

Comparable Site-Built Development: 444 Days

A 172 Day advantage equates to:

- Reduced fees (e.g. \$20K less paid to a Project Manager)
- Utility & equipment cost savings (e.g. fewer days of electrical service, dumpsters, portable toilets)
- Less disturbance for the neighborhood
- Faster to market and a quicker sale

We attribute this advantage to several factors, including:

Overlap of On-Site & Off-Site Work

At the same time foundations were being built, vertical construction was underway at the manufacturing facility. On the Black Street Development this was an 8-10 week time savings.

Zero Weather Delay Days

Above the basements, the Black Street homes were constructed in a protected and climate controlled factory. From initial framing all the way to building wrap and roof underlayment, weather was never a concern or a reason for delay.

Inspections in the Factory

Completing structural, plumbing rough and electrical rough inspections in the factory is a huge advantage. This eliminates the need to schedule those inspections through the local jurisdiction & wait for inspector availability (typically 2-4 weeks).

Off-Site Construction

Off-site construction can be utilized in many different ways. At its core, it means fabricated in a factory setting and delivered to the site. Building components like trusses and panels (wall, floor and roof) can be prefabricated, as can whole rooms or stories of a building. Everything from structure to finishes can be completed in a factory environment. Off-site construction provides a range of benefits including, less time spent on-site (as discussed), working in a climate controlled environment (eliminates delays due to weather), a dependable workforce, and less material waste. The Black Street Development employed off-site manufacturing for both the foundations (wall panels) and the vertical construction (modular boxes).



Prefab Panelized Foundation Walls

Module utilized precast foundations from Superior Walls due to the excavation requirements of the steep site. Additionally, foundation work was scheduled for late fall/early winter, so avoiding potential weather delays was critical. The foundations were poured in a factory in Carnegie, PA, then shipped to the Black Street site. All three foundations were set in one day.

Minimal disruption, no concrete mixers, no masonry crew. Just the team from Superior Walls (and they were in and out in six hours).

Off-Site Construction



Modular Boxes

The Black Street homes were manufactured in a modular factory about 75 miles from the site. In total, the seven boxes for the three homes were “on the line” being constructed for 2 weeks. The boxes were then delivered to the site and set by a crane and crew in just 2 days.

In two days the Black Street Development went from 10% complete to 75% complete.

5456 Black Street arrived on-site with about 85% of the home complete. Review the following pages for an understanding of exactly what can be completed in the modular factory.

BLACK STREET CASE STUDY

Off-Site Work vs. On-Site Work

5456 Black St.		Completed on Site	Completed in FACTORY
ENVELOPE			
Foundation	Superior Walls	X	
Exterior Wall Assembly	2x6, 1" of exterior XPS		X
Building Wrap	Tyvek		X
EXTERIOR DOORS & WINDOWS			
Door & Window Package	Klearwall, PassiV Futureproof, Gray Exterior / White Interior		X
EXTERIOR MATERIALS			
Roofing	Exposed Seam Metal Panel, Charcoal	X	
General Siding/Finish	HardiePlank Lap Siding, Smooth, Dream Collection, Montana Sky, 8" Exposure	X	
Lower Level Siding/Finish	None	X	
Entry Siding Material	1x4, T&G Natural Cedar, Horizontal, Clear, Sealed on 6 sides	X	
FLOORING			
General	Shaw Laminate, Boulevard, Crisp Linen		X
Bedroom	Shaw Carpet, Admire Me, Reflection		X
Full Bath Tile	Ceramic Tile, 2" Hex		X
Full Bath Grout	MaiPei, Flexcolor, Pearl Gray (19)	X	
Master Bath Tile	Ceramic Tile, 2" Hex		X
Master Bath Grout	MaiPei, Flexcolor, Pearl Gray (19)	X	
KITCHEN			
Kitchen Cabinets	Dartmouth, Shaker, White		X
Kitchen Countertops	Corian Solid Surface, Designer White	X	
Kitchen Backsplash Tile	4"-6" Corian Solid Surface, Designer White	X	
Cabinet Hardware	All Modern, Bar Knob	X	
Pendant Lights	IKEA, Nymane, White	X	
Sink	Kraus, Standart PRO 26", Stainless Steel	X	
Faucet	Kraus, Bolden, Stainless Steel	X	
Wall Finish	Paint, Grayish (SW - Super Paint), Satin	X	
Ceiling Finish	Paint, High Reflective White (SW - Promar 200), Flat	X	
Trim Finish	Paint, Spatial White (SW - ProClassic Interior Waterbased Acrylic-Alkyd), Semi Gloss	X	
HALF BATH			
Toilet	Kohler, Santa Rosa, White		X
Sink	Barclay, Hampshite, White		X
Faucet	Kohler, July, Polished Chrome		X
Mirror	IKEA, Rotsund, White	X	
Wall Finish	Paint, Software (SW - Super Paint), Satin	X	

BLACK STREET CASE STUDY

Off-Site Work vs. On-Site Work

5456 Black St.		Completed on Site	Completed in FACTORY
HALF BATH			
Ceiling Finish	Paint, High Reflective White (SW - Promar 200), Flat		X
Trim Finish	Paint, Spatial White (SW - ProClassic Interior Waterbased Acrylic-Alkyd), Semi Gloss		X
FULL/MASTER BATH			
Toilet	Kohler, Santa Rosa, White		X
Vanity Cabinet	Dartmouth, Shaker, Pewter		X
Vanity Top & Sink	North Coast Cultured Marble, Solid White, 3/4" Straight Edge, Medium Premier Bowl		X
Vanity Faucet	Miseno, Mia, Polished Chrome		X
Bath Tub	Oasis, Legacy, One-Piece Tub-Shower, White		X
Bath/Shower Faucet	Miseno, Mia, Polished Chrome		X
Shower Tile	Not Needed (One-Piece Tub-Shower)		
Wall Tile Grout	Not Needed (One-Piece Tub-Shower)		
Tile Edge Trim	Not Needed (One-Piece Tub-Shower)		
Vanity Light	All Modern, Kneeland 2-Light Bath Bar, Chrome	X	
Medicine Cabinet	Shaker Style Door, Paint to Match Vanity		X
Wall Finish	Paint, Spatial White (SW - Super Paint), Satin	X	
Ceiling Finish	Paint, High Reflective White (SW - Promar 200), Flat	X	
Trim Finish	Paint, Spatial White (SW - ProClassic Interior Waterbased Acrylic-Alkyd), Semi Gloss	X	
Flooring Threshold / Edge Trim	Schluter, Schiene, Polished Chrome		X
LAUNDRY (room)			
Floor	Ceramic Tile, 2" Hex		X
Wall Finish	Paint, Grayish (SW - Super Paint), Satin	X	
Ceiling Finish	Paint, High Reflective White (SW - Promar 200), Flat	X	
Trim Finish	3.25" Solid Natural Maple, Green Seal 11 Certified Finish, Clear	X	
Threshold	Schluter, Schiene, Polished Chrome		X
APPLIANCES			
Refrigerator	GE, 33", Counter Depth, Stainless, GWE19JSLSS	X	
Range	GE, 30" Electric, Stainless, JBS60RKSS	X	
Microwave	GE, 30" OTR, Stainless, JVM3160RFSS	X	
Dishwasher	Haier, 18", Stainless, QDT125SSLSS	X	
Clothes Washer	Haier, Front Load, Stackable, White, QFW150SSNWW	X	
Clothes Dryer	Haier, Ventless, Elec, White, QFT15ESSNWW	X	

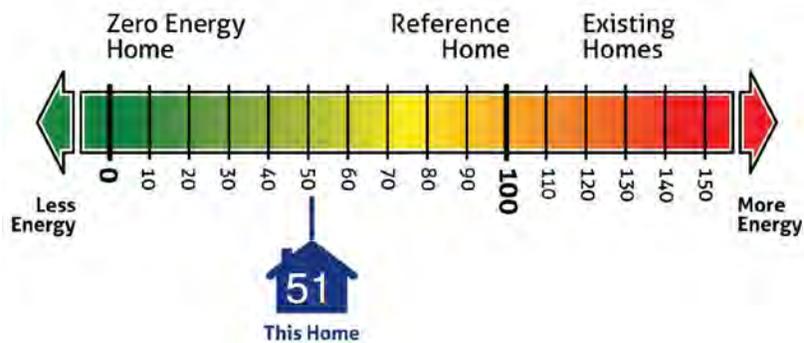
Off-Site Work vs. On-Site Work

5456 Black St.		Completed on Site	Completed in FACTORY
INTERIOR COMPONENTS			
Downlighting Lighting	Philips Lightolier, Slim Surface LED, 5" Round, 80 or 90 CRI, 2700K, 650 Lumens, White Trim		X
Switches & Outlets	"Lutron - Decora Style, White Rocker Switch w/ Slide Dimmer"		X
Stairs Treads	Poplar		X
Railing	Contemporary, Metal & Maple, Vertical Ballusters	X	
Trim	"1x3 (Nominal) Casing 1x6 (Dimensional) Base"		X
Closet Doors	Bifold, Solid Core, One Panel, Painted		X
Typ. Doors	Solid Core, One Panel, Painted		X
General Wall Finish	Paint, Grayish (SW - Super Paint), Satin	X	
General Ceiling Finish	Paint, High Reflective White (SW - Promar 200), Flat	X	
General Trim / Door Finish	Paint, Spatial White (SW - ProClassic Interior Waterbased Acrylic-Alkyd), Semi Gloss	X	
Basement Door	Solid Core, One Panel, Painted		X
Laundry Door	Solid Core, One Panel, Painted		X
SITE/EXTERIOR COMPONENTS			
Exterior Stairs	Concrete / Wood	X	
Railings	Metal, Black	X	
Entry Canopy	Metal, Black	X	
Deck	N/A	X	
Patio	Gravel	X	
Garage Door	N/A		
Driveway	Mech Concrete	X	

Energy Performance & Systems

The Home Energy Rating System (HERS) Index

The Home Energy Rating System (HERS) Index, a nationally recognized system, is the industry standard for measuring a home's energy efficiency. A HERS Index Score can provide indicators on how well a home is performing and can help anticipate energy usage and utility costs. The U.S. Department of Energy predicts that a typical, existing home scores about 130 on the HERS Index. A typical, new construction home scores a rating of 100. Lower HERS Index ratings equate to a home that uses less energy, 0 being the rating for a Zero Energy, or Net Zero, home.



The Module Show Home Scored a HERS Index Rating of 51

- 49% more efficient than a standard new home
- 79% more efficient than the average resale home
- Approximately \$1000/year savings on utility bills

Cost vs Value

- *A 2019 study by Freddie Mac found that better rated homes sold for 3-5% more than lesser rated homes
- Studies in North Carolina, California, Texas and DC found that certified and high performance homes sell for a premium of up to 10% more than average homes

Energy Performance & Systems

EnergyStar for Homes

5452 Black Street (Module's show home) is EnergyStar Certified, meaning that it meets rigorous requirements for energy efficiency. On average, EnergyStar homes use 20% less energy than homes built to 2009 IECC.

Thermal Enclosure System means comprehensive air sealing, quality-installed insulation and high performance doors & windows

- Air Infiltration Test: 442 CFM50
- Insulation: R-53 Ceiling, R-26 Walls
- Window Efficiency: .210 U-Value

Water Management System Protects roofs, walls and foundations. Flashing, drainage plane, and site grading. Water resistant materials below grade. Moisture management during construction.

High Efficiency HVAC System Designed and installed for optimal performance

- Total Duct Leakage: 92.00 CFM25
- Duct Leakage to Outdoors: 9.00 CFM25
- Heating & Cooling Efficiency: 7.2 HSPF, 14 SEER

Energy Efficient Lighting & Appliances Help reduce utility costs and provide high-quality performance

- Energy Efficient Lighting: 100%
- EnergyStar Appliances
- Water Heater: Electric Heat Pump 3.42 EF

Cost vs Value

- According to the EPA, EnergyStar Homes cost, on average, \$2,500 more to build, but sell faster & at a higher price
- A study in MD attributed a \$10,000-\$25,000 price premium to EnergyStar Certified new homes
- Research by the North Carolina Energy Efficiency Alliance shows that, on average, EnergyStar homes sell 89 days faster than traditional homes



Energy Performance & Systems

Zero Energy Ready Home (ZERH)

The Module Show Home at 5452 Black Street is Zero Energy Ready Home (ZERH) Certified. The standard, developed by the Department of Energy, builds upon the EnergyStar requirements to ensure an even higher level of performance and the opportunity to create a Zero Energy home (a home that produces as much energy as it uses). At a minimum, certified Zero Energy Ready Homes are 40-50% more energy efficient than a typical new home.

DOE Zero Energy Ready Home Requirements

1. Comply with EnergyStar
 - Thermal Enclosure
 - Quality HVAC Installation
 - Water Management
 - EnergyStar Appliances & Fixtures
 - High Performance Windows & Doors
2. Meet 2015 IECC levels for insulation
3. Install ducts in conditioned space / optimized location
4. Conserve water and energy through a high-efficiency water heater & fixtures
5. Provide comprehensive indoor air quality through EPA's Indoor AirPlus program
6. Follow the PV-Ready Checklist to enable a future system installation

Cost vs Value

- A Certified ZERH projects an average energy savings of 6,800kWh per year. That's almost \$28,000 over a 30 year period.
- A WaterSense certified home saves 24,000 gallons of water a year (for a family of four) amounting to \$180/year in savings. WaterSense upgrades pay for themselves in 3 years.



A Higher Quality

Additional Upgrades for Comfort, Performance & Durability

The Module homeowner was top of mind in the design and development of the Black Street homes. We made the following additional upgrades for market appeal and, of course, to make our homeowners happier and healthier.

Continuous Exterior Insulation

A building envelope that includes a layer of continuous exterior insulation is more tightly sealed against air leakage, has reduced heat loss through thermal bridging and reduced condensation within the wall assembly. Better efficiency and better air quality, happier homeowner.

High Performance Doors & Windows

The Black Street home feature Klearwall PassiV Future Proof windows and doors. The units perform above and beyond certification requirements. These doors & windows are better insulated, tighter sealed and mitigate sound better.

Energy Recovery Ventilator (ERV)

Module homes rely on ERVs to provide a constant cycling of fresh, filtered air into the home while also balancing humidity levels. Controlling ventilation with this type of mechanical equipment ensures that energy is not lost and that indoor air quality is superb.

All-Electric

Module homes are all-electric (no natural gas utility). This is a big step toward future proofing Module homes, improving indoor air quality (by eliminating combustion), and making it even easier to achieve net zero status.

Hybrid Electric Hot Water Heater

The most advanced hot water heaters available - 4x more efficient than a standard electric tank. They utilize a heat pump to preheat water with ambient conditioned air.

Hardie Fiber Cement Lap Siding

Made from recyclable materials. Durable and very low maintenance. Warranties are a standard 30 years, but longer lifespans are common.

Metal Roofing

Replacing a roof is one of the most expensive home improvement projects. For this reason, we know that homeowners value long lasting roofing materials. Metal panel roofing is very low maintenance and extremely durable. Most metal roofs come with a 50 year warranty, but can last up to 75 years.

Module Innovation Partners

Module launched its Innovation Partners program to facilitate collaboration with industry-leading building products and home goods companies. Below is a list of the 2020 Module Innovation Partners and some of their contributions to the Black Street Development.



Dupont assisted with the high performance building envelope. Their team provided technical support and in-kind materials to create a factory installed high-performance building envelope.



Cobalt Creed delivered a small-duct high velocity HVAC system for the homes. The system was rated at 14 SEER and the sizing was tailored for our right-sized homes. Cobalt Creed installed a portion of their system in-factory, which reduces on the onsite installation requirements by the local HVAC subcontractor.



Mitsubishi delivered our low energy heating & cooling system for 5456 Black Street. Their hyper efficient mini split system is significantly reducing the homeowner's utility bills.



IKEA provided in-kind product for the live/work space, including the kitchens and furnishings in the Module Show home. IKEA's efficient, modern kitchens complement Module's aesthetic and their commitment to sustainability aligns with the Module homeowner.



James Hardie provided a durable, high quality siding solution that uses recycled content. Their discounted material contribution enabled us to have a consistent exterior facade system not only on the market rate homes, but on the affordable home as well.



Lowe's provided in-kind construction and finish materials for a portion of the homes. Working with the local Lowe's team enabled us to deliver the project on-time even during covid-season.

Module Innovation Partners



J Frank Studios provided in-kind landscape architecture services to minimize soil erosion on the project site and add appropriate vegetation to the exterior space between the homes.



Lutron provided smart switches at a discounted price. Their technical support was very helpful in setting up the right selection of switches and lighting solutions for our homes.



Klearwall provided high-performance windows at a discounted price. In addition to the windows being well sealed and having a high level of insulation, their windows also provide superb sound mitigation, which is valuable on a busy street such as Black Street.

BLACK STREET CASE STUDY

Selling the Homes

The Black Street Development was completed in August of 2020.

5456 Black Street 80% AMI Home

Went under contract on August 20, 2020 and sold on October 16, 2020 for \$183,794.

5454 Black Street Market Rate Home

Went under contract on December 1, 2020 and sold on February 19, 2021 for \$396,155.



Learnings

Experience is the best teacher.

Black Street was Module's first multi-unit, mixed-income development. We did many things very well and, of course, made a few mistakes along the way. Ultimately, we consider the project to be a huge success and a springboard for bigger and more successful projects. Here are a few of our takeaways:

Modular construction is faster, not cheaper.

The speed at which a project that utilizes modular construction can be completed (when compared to a typical build) is undeniable. The idea that off-site construction is less expensive than typical construction is a misnomer.

Complete as much as possible in the factory.

We ran a few experiments on the Black Street Development to test on-site vs. off-site finishing. 5456 was the most complete from the factory (about 85%). 5454 and 5452 were lesser degrees of finished. We tested flooring, kitchen cabinets, countertops, tile, trim, fixtures and equipment. We found that the hand off between off-site finish work to on-site finish work isn't always smooth. Additionally, on-site work seems to always take more time. On future projects we look forward to testing even higher degrees of completion - pushing 95%. We'll look to have the factory install both siding and roofing on an upcoming project.

Standard models will save time.

The design and manufacturing phase with the factory is a collaborative process that takes time. The final "shop drawings" balance the design intent with code compliance, structural feasibility and manufacturing capabilities. We estimate that standard plans (already been vetted by the factory) will save 4-6 weeks.

Challenging sites can be unpredictable and really expensive to develop.

The Black Street project looks simple and straightforward, right? Three structures, three lots, no problem. Definitely an incorrect assumption. Buried basements from pre-existing homes, natural freshwater springs, a very steep slope and aging city infrastructure. In total, site challenges accounted for about a \$30,000 per house increase in construction costs. Our site analysis and project contingencies will be adjusted accordingly in the future!

Homeowner Feedback

5456 Black Street Buyer

“The house is spacious, beautiful, open and airy. I love how they designed it, how the open space flows. It’s perfect for me. [The home] is super worry-free. I stand near my door—just to see if I can feel a draft: Not a thing. I watch the curtains to see if they’re moving. Never. I’m so thankful for that.”

“The fresh air that comes in from the outside and brings it in, it’s always fresh air in the house...you don’t even have to open the windows and doors [to get fresh air]”

5454 Black Street Buyer

On the design.

“It’s modern but it throws back to the row house vibe of Pittsburgh.”

“The light, the design, those are the two things I like the most [about the house].”

“It’s just right for me. It’s kind of like Goldilocks size.”

On energy efficiency and solar install on a solar-ready house.

“What’s right for me is something that’s energy efficient.”

“The [solar] install was fast. By mid-day the second day they fired up the system and the meter started rolling backwards.”

GC Partner Feedback

Blockhouse Residential

On offsite construction

“Modular makes things a whole lot easier for us because we are able to work onsite while the structure is being completed in the factory. We are able to condense the time to about half the time of traditional construction. Ultimately, I get to do the project in half the time, which means I can do twice the number of projects.”

On working with Module

“Module has a vested interest in making sure the project goes well. They’re bringing intelligence and expertise to the project that allow me to fill some of my responsibilities. They’re looking out for my back as much as anything else. Helping me get the project done, maintaining schedule, working with the factory, acquiring materials, ensuring quality. it’s like having an entire extra group in your company that are ready and willing to work with you to make sure you succeed. That’s why I like working with them.”