

SCALABLE SOLUTIONS FOR MODULAR HOUSING

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BACKGROUND

Virginia Tech's FutureHAUS project is a research initiative tasked with developing innovative, sustainable housing solutions that combat the unique challenges facing the U.S. housing market below through factory-built, prefabricated construction.

Housing Market Challenges



OPPORTUNITY STATEMENT

FutureHAUS is developing a new exhibition home to showcase at the 2026 Solar Decathlon and seeks business partners for future mass production of the concept home. FutureHAUS requires the documentation of a proposed facility layout and the estimated costs of the concept home for its business endeavors.



IMPACT

The figures below, over time, will lead to broader indirect impacts for the client across multiple areas





Housing **Units**

Priced Out Demand of Market

Increased	Improved	Standardized
Brand	Environmental	Process
Awareness	Sustainability	Framework

SOLUTION

1.

A standardized framework for modular housing production alongside two proposed assembly facility layouts <25,000 sq ft 2

A complete itemized bill of materials estimating 95.5% of total material costs at <\$200,000 and associated costs for each individual cartridge

Bill of Materials



ITEM	DESCRIPTION	PART NUMBER	UNIT PRICE	QUANTITY	TOTAL
1.4	Subflooring (4' x 8')	637367	\$ 22.40	42	\$ 940.80
1.5	9-Step Stair Stringer	N/A	\$ 175.00	2	\$ 350.00
1.6	6-Step Stair Stringer	N/A	\$ 235.00	2	\$ 470.00
1.7	Stair Header	N/A	\$ 77.00	2	\$ 154.00
1.8	Stair Treads (48" x 11.5" x 1.125")	470807048	\$ 18.45	30	\$ 553.50
1.9	Stair Risers (48" x 7.5" x 0.75)	489807548	\$ 9.74	30	\$ 292.20
2.0					
2.1	Exterior Entry Door (36" x 80")	10125279	\$ 164.00	1	\$ 164.00

Framework and Facility Layout





OBJECTIVES

Reduce the required square footage of proposed assembly facility layout < 50,000 sq ft Source construction materials for the concept home such that the total cost does not exceed \$220,000 Estimate a minimum of 90% of the total material costs of the concept home



Additional Requirements

Facility layout design must integrate all necessary trade tasks and work in the assembly process

The Bill of Materials should additionally outline the material costs associated with each individual cartridge

PROJECT APPROACH



Problem Definition

- Tour FutureHAUS facility
- Determine scope and additional requirements

Architectural Design

- Understanding the cartridge components of the concept home
 - Documenting required materials for each cartridge of the concept home

Learning Modular Construction Fundamentals

- Interview industry specialists
- Conduct literature reviews

Data Collection and Prototyping

- Creating an itemized a bill of materials
- Propose prototype of assembly layout and bill of materials