

SolaBlock Solar Masonry Units (SMUs) combine solar technology with standard concrete masonry--part of a vertical solar wall solution, providing renewable energy generation and solutions for net-zero buildings. This paper is a summary of performance capabilities, technical specifications, and a summary of essential certification test passage of our go to market design, which we term our Gen v1.0 product. **We are happy to provide all supporting documentation as needed.**

Physical Description

SolaBlock SMUs are currently being manufactured to standard concrete block sizes of 8" x 16" X 4", in a form factor that directly replaces conventional brick walls. Each SMU provides about .89 square feet of building façade. The current SMU is only a façade block, not load-bearing. However we plan on a structural block soon after initial product launch as a Gen v1.1 product.

Electrical Description

SMUs are offered in three power output ratings: 7.50 Watts; 7.25 Watts; and 7.00 Watts.¹ Each is fitted with high-performance back-contact crystalline silicon cells, including a bypass diode to address shadowing and a pass-through circuit for greater design flexibility. Blocks are wired in series horizontally and from course to course, using UL-rated direct-bury PV-wire. We will also work for block-to-block wiring to address stronger resiliency, particularly in FEMA designated higher disaster return areas.

Electrical Performance

SolaBlock 7.50 Watt SMUs provide 8.4 Watts of electrical power per square foot of wall space, and about 8.4 kilowatt-hours of electrical energy per square foot per year, depending on location². A typical office building in the U.S. uses @ 3.5 Watts per square foot of floor space.

A typical 12-foot by 50-foot commercial SolaBlock installation in Boston is expected to produce about 4,800 kilowatt-hours yearly, depending on location. *Note: SMU wall systems produce between two-thirds to three-quarters of the output of rooftop systems but perform better when there is snow on the ground.*

Longevity Estimations

SMUs rely on the concrete substrate to transfer heat away from the cells, enabling higher efficiency and longer operating life. Based on initial product thermal analyses of hardware tested by the University of

Photovoltaic System	
Cell Type ₁	21.5% efficiency back-contact monocrystalline
Cell Size ₁	125 x 125 mm (5 x 5 inches)
Cell Number	2
Bypass Diode	15A-45V Schottky
Leads ₄	#16 AWG stranded copper, direct-bury PV wire
Pass-Through Wire	Internal solid copper
Maximum System Voltage ₂	600 V by UL 61730 rating
Maximum Series Fuse Rating	20 A per string
Nominal Operating Cell Temperature (NOCT)	38.6 °C estimated
Nominal Operating Module Temperature (NOMT)	32.1 °C estimated

Massachusetts College of Engineering³, we've estimated Average Normal Operating Cell Temperatures of 38.6 degrees C for typical operation. While not conclusive, these results strongly indicated achieving 40 years of operating life⁴, with cells performing 80% of original at year 40.⁵ Note given this test is quite dated we plan to refresh this testing in Q1'24.

Product Certification and Validation

ASTM: Testing by the National Concrete Masonry Association has established that SMUs meet ASTM C90-16a standards for Concrete Masonry Units to about 3,500 psi of compressive strength.⁶

UL: SMUs are being safety tested by Intertek Testing Laboratories under the requirements of Underwriters Laboratories (UL) 61730 "Standards for PV Module Safety", completing and passing all post-stress testing elements for the SMUs, including the last set of tests (UL 61730 Sequence C) in June 2023:⁷

- ✓ UV (15 kWh/m2)
- ✓ Thermal Cycling 50
- ✓ Humidity Freeze 10
- ✓ Insulation Test
- ✓ Visual Inspection
- ✓ Wet Leakage Current Test
- ✓ Robustness of Terminations

Intertek is still scheduled to approve markings, labels, the instruction manual (thus "Pending"), and a last set of product measurements including:

- Final Visual Inspection
- Final Insulation Test
- Final Accessibility Test
- Maximum Power Determination
- Durability of Markings
- Sharp Edge Test
- Bypass Diode Functionality

Note: The final requirement for Intertek's UL 61730 certification will be a factory audit, which is planned for SolaBlock's pending establishment of a manufacturing site in Pittsfield, Massachusetts. A detailed summary of the UL testing to date is provided in the Appendix, next page.

Warranty & Certifications	
Warranty	
Performance (Period, Rate)	Linear to 80 percent after 40 years
Materials and Workmanship	25 years
Operating Temperature Range	-40.0 °C to 80.0 °C
Net Compressive Strength	2000 psi
Fire Safety Rating	Fire Resistant Concrete, V1-rated PV
Certification	
Solar Performance (pending)	UL 61730, California CEC
Masonry Performance	ASTM-C90-16a
Listing Organizations (pending)	National Concrete Masonry Association, Intertek
<i>Note: Our Warranty policy will be finally determined after longevity testing is refreshed and results confirmed.</i>	

¹ "SolaBlock SMU 8x16x4 Technology Data Sheet", SolaBlock, Inc., revised December 11, 2023.

² "PV-Watts Solar Calculator", National Renewable Energy Laboratory, (Boston, MA; south-facing; premium cells; 10% losses) <https://pvwatts.nrel.gov>.

³ Algeri, J., et al., "Senior Capstone Design Project: SolaBlock Build Report and Poster", University of Massachusetts College of Engineering, May 8, 2012.

⁴ "SolaBlock Technical Report: SolaBlock Longevity" SolaBlock, Inc, April 5, 2021.

⁵ "SolaBlock Technical Report: SolaBlock Thermal Mass Benefits", SolaBlock, Inc., Dec. 2017.

⁶ "ASTM C140/C140M Test Report" National Concrete Masonry Association R&D Lab. January 9, 2020.