The Material

Vinyl products can be rigid or flexible based on how they’re made. Rigid products such as pipes, siding, windows, fences, and rail are strong, durable, and stand up to the test of time. Flexible PVC flooring, wallcovering, and reflective roofing is lightweight, easy to maintain and often comes in a multitude of styles and colors.

The Story

The Vinyl Institute is committed to smart material selection, and to ensuring future decision makers have the material education they need to make informed choices. That’s why the Vinyl Institute has poured more than $1.6M over the last four years in programs to encourage material exploration and innovation like the Sure House.

PVC building products have numerous energy and environmental benefits. Since the late 1980s, more than 20 life-cycle evaluations have been completed on PVC building products, many of them comparing those products to similar products made of other materials. PVC products were found to perform favorably in terms of energy efficiency, thermal-insulating value, low contribution to greenhouse gases and product durability, which means using fewer resources.

Sustainable + Resilient

The Vinyl Institute is committed to smart material selection, and to ensuring future decision makers have the material education they need to make informed choices. That’s why the Vinyl Institute has poured more than $1.6M over the last four years in programs to encourage material exploration and innovation like the Sure House.

VinylinDesign

AIA Student Design Competitions

For nearly five years, the Vinyl Institute sponsored an annual design competition with the American Institute of Architects. Students were invited to design a new building or renovation project that would optimize the use of vinyl materials. The competition has been a successful way to encourage young architects to consider vinyl materials in their practice.

ACSA/NEA Habitat Design Competition

In 2012, matching funds from the Vinyl Institute allowed the Association of Collegiate Schools of Architecture and the National Environmental Design organization to provide student architects a chance to design affordable homes that respond to local demands of Habitat for Humanity. These design challenges challenged the notion that affordable housing can’t be beautiful, accessible and resilient.

The Vinyl Institute has invested more than $1.6M over the last four years in programs to encourage material exploration and innovation like the Sure House.

Columbia University GSAPP

Permanent Change Plastics Conference

Permanent Change: Plastics in Architecture and Engineering was one in a series of conferences convened by Graduate School of Architecture, Planning and Preservation at Columbia. The conference explored the contributions of plastics in the built environment. Designers of all disciplines joined researchers, academics and vinyl industry representatives for a multi-day symposium to look at the use of plastic products and systems. Historically, in the present day, and the future. A book published in 2014 is a resource to those exploring various building material categories.

The Solar Decathlon Competition

In the U.S. Department of Energy Solar Decathlon, collegiate teams design and build energy-efficient houses powered by the sun. These teams spend almost two years creating houses to compete in the 10 contests of the Solar Decathlon.

The SURE HOUSE

The SURE HOUSE, Stevens Institute of Technology’s 2015 entry in the U.S. Department of Energy Solar Decathlon, represents the team’s vision of a sustainable and resilient home for coastal neighborhoods at greatest risk from rising sea levels and increasingly severe storms.

VinylinDesign

In 2012, matching funds from the Vinyl Institute allowed the Association of Collegiate Schools of Architecture and the National Environmental Design organization to provide student architects a chance to design affordable homes that respond to local demands of Habitat for Humanity. These design challenges challenged the notion that affordable housing can’t be beautiful, accessible and resilient.

The Vinyl Institute has invested more than $1.6M over the last four years in programs to encourage material exploration and innovation like the Sure House.

Columbia University GSAPP

Permanent Change Plastics Conference

Permanent Change: Plastics in Architecture and Engineering was one in a series of conferences convened by Graduate School of Architecture, Planning and Preservation at Columbia. The conference explored the contributions of plastics in the built environment. Designers of all disciplines joined researchers, academics and vinyl industry representatives for a multi-day symposium to look at the use of plastic products and systems. Historically, in the present day, and the future. A book published in 2014 is a resource to those exploring various building material categories.

The Solar Decathlon Competition

In the U.S. Department of Energy Solar Decathlon, collegiate teams design and build energy-efficient houses powered by the sun. These teams spend almost two years creating houses to compete in the 10 contests of the Solar Decathlon.

The SURE HOUSE, Stevens Institute of Technology’s 2015 entry in the U.S. Department of Energy Solar Decathlon, represents the team’s vision of a sustainable and resilient home for coastal neighborhoods at greatest risk from rising sea levels and increasingly severe storms.

VinylinDesign

AIA Student Design Competitions

For nearly five years, the Vinyl Institute sponsored an annual design competition with the American Institute of Architects. Students were invited to design a new building or renovation project that would optimize the use of vinyl materials. The competition has been a successful way to encourage young architects to consider vinyl materials in their practice.

ACSA/NEA Habitat Design Competition

In 2012, matching funds from the Vinyl Institute allowed the Association of Collegiate Schools of Architecture and the National Environmental Design organization to provide student architects a chance to design affordable homes that respond to local demands of Habitat for Humanity. These design challenges challenged the notion that affordable housing can’t be beautiful, accessible and resilient.

The Vinyl Institute has invested more than $1.6M over the last four years in programs to encourage material exploration and innovation like the Sure House.

Columbia University GSAPP

Permanent Change Plastics Conference

Permanent Change: Plastics in Architecture and Engineering was one in a series of conferences convened by Graduate School of Architecture, Planning and Preservation at Columbia. The conference explored the contributions of plastics in the built environment. Designers of all disciplines joined researchers, academics and vinyl industry representatives for a multi-day symposium to look at the use of plastic products and systems. Historically, in the present day, and the future. A book published in 2014 is a resource to those exploring various building material categories.

The Solar Decathlon Competition

In the U.S. Department of Energy Solar Decathlon, collegiate teams design and build energy-efficient houses powered by the sun. These teams spend almost two years creating houses to compete in the 10 contests of the Solar Decathlon.

The SURE HOUSE, Stevens Institute of Technology’s 2015 entry in the U.S. Department of Energy Solar Decathlon, represents the team’s vision of a sustainable and resilient home for coastal neighborhoods at greatest risk from rising sea levels and increasingly severe storms.
### The House
The SURE HOUSE was designed with a simple question: how can we design a home that reduces its energy use and adapts to the realization of a changed climate? Our answer emerged as a new direction in storm-resilient coastal housing. We merged the inherently efficient indoor/outdoor rooms and open floor plan of the traditional gabled Dutch homes with innovative structural and building science, the latest renewable energy technologies, and fibrous-composite materials repurposed from the boat-building industry.

### The Innovation
The engineering innovations of the SURE HOUSE share a common thread by responding to the need for sustainable, resilient homes along the New Jersey and New York coastlines. Our team broke up various key features of the house in order to gain a better understanding of the individual attributes that make-up the SURE HOUSE. We aim to optimize each of these engineering innovations to work together in order to create a sustainable and resilient home that will withstand most emergencies.

### The Resilience
SURE HOUSE responds to the need for sustainable homes along the NJ and NY shores. The house’s “solarizing” solar PV array is capable of producing energy for the house to be net-zero and still producing energy when the grid is damaged or disconnected. The use of smart construction techniques, exceeds the strict Passive House standard for energy use over the course of a year. The SURE HOUSE team devised an innovative water-tight construction details, and an innovative storm-resistant shutter which allows the house to stay safe during coastal storm events.

#### The Resilience

**Storm Resistant Construction Methods**

By looking at these prior construction methods we have been able to identify what storm resistant techniques have been successful and which are prone to damage. By coming up with innovative storm resistant solutions to the construction methods of a contemporary coastal home, we hope SURE HOUSE can be used as a learning tool for future designers and builders in flood prone areas.

### THE REASONS

1. **90% Less Energy Use**
   - By focusing on holistic, efficient solutions such as increasing our building envelope’s overall energy efficiency, we can reduce our energy needs. The SURE HOUSE will reduce energy consumption by 90% more than a typical home.

2. **Fully Solar Powered**
   - For the first time ever, a home will produce enough power to supply all of the home’s energy needs and store the remainder for use by the homeowner. The SURE HOUSE will feature custom Building Integrated Solar Panels (BIPS), the first of its kind, which were capable of producing up to 10% of the home’s total energy needs. This reduces our reliance on the grid and provides a source of energy during power outages.

3. **Resilient Energy Hub**
   - Our innovative design ensures that the house stays safe during storms and hurricanes. Our storage/treatment energy center serves as the heart of the house. It supplies the power grid with excess energy during times of peak demand. This reduces our reliance on the grid and provides a source of energy during power outages.

### Building Integrated Solar Panels
- SURE HOUSE features a resilient energy hub that supplies power to the grid when needed. The system is designed to be self-sufficient during power outages and can provide power to the grid when excess energy is available. The energy hub is equipped with solar panels that are integrated into the house’s structure, ensuring that power can be produced even during storm events.

### Resilient Hot Water System
- Even when equipped with a roof full of solar panels to provide all of the house’s energy needs, a severe weather event can still disrupt the power grid infrastructure. The SURE HOUSE is designed with a resilient hot water system that is unaffected by power outages, ensuring that hot water is always available.

### Durable Fiber-Composite Siding
- Glass fiber composite structures have been developed in conjunction with storm resistant features in the SURE HOUSE to provide a durable and weather-resistant exterior that can withstand the forces of storms and hurricanes.

---

**The House**

**Sustainable + Resilient**

**Open**

**Closed**

**SURE HOUSE**

**Typical NJ Construction**

**SURE HOUSE**

**Typical NJ Construction**

---

**Building Integrated Solar Panels**

**Resilient Hot Water System**

**Durable Fiber-Composite Siding**

---

**Mechanical Equipment Heights to Flood Levels**

SURE HOUSE Construction

Typical New Jersey Construction

---

**The Resilience**

---

**THE REASONS**

1. Mitigating climate change while bracing for its effects.
2. Educating the next generation of problem solvers.

---

**1: Partnering with Seaside Park and the Jersey Shore.**

**2: Mitigating climate change while bracing for its effects.**

**3: Educating the next generation of problem solvers.**