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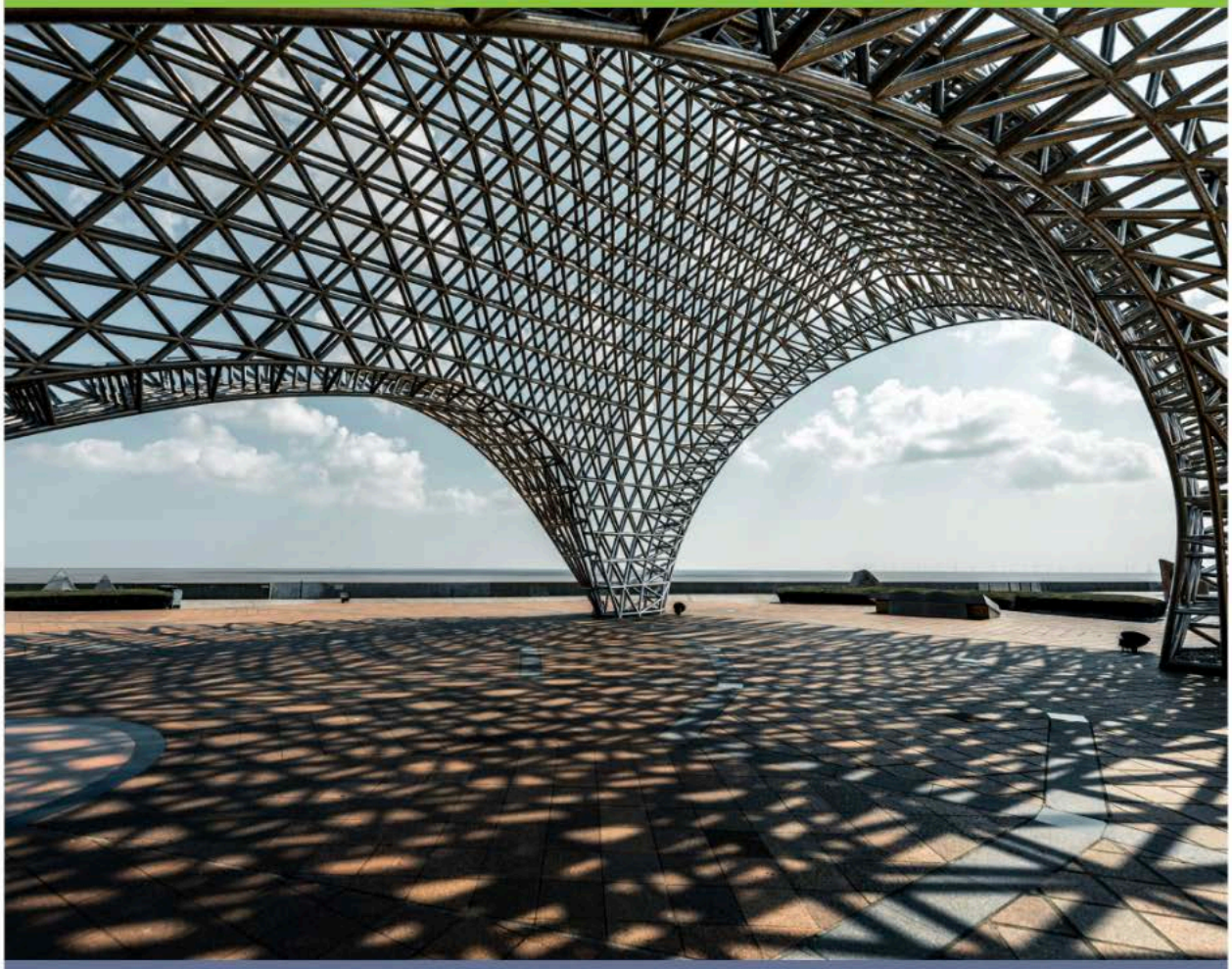
FURTHER FUTURES: Shaping a Better Tomorrow Through Architecture and Design



AIA New York State

Modular House Coastal Prototypes

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Designing with Sustainability and Resilience in Mind

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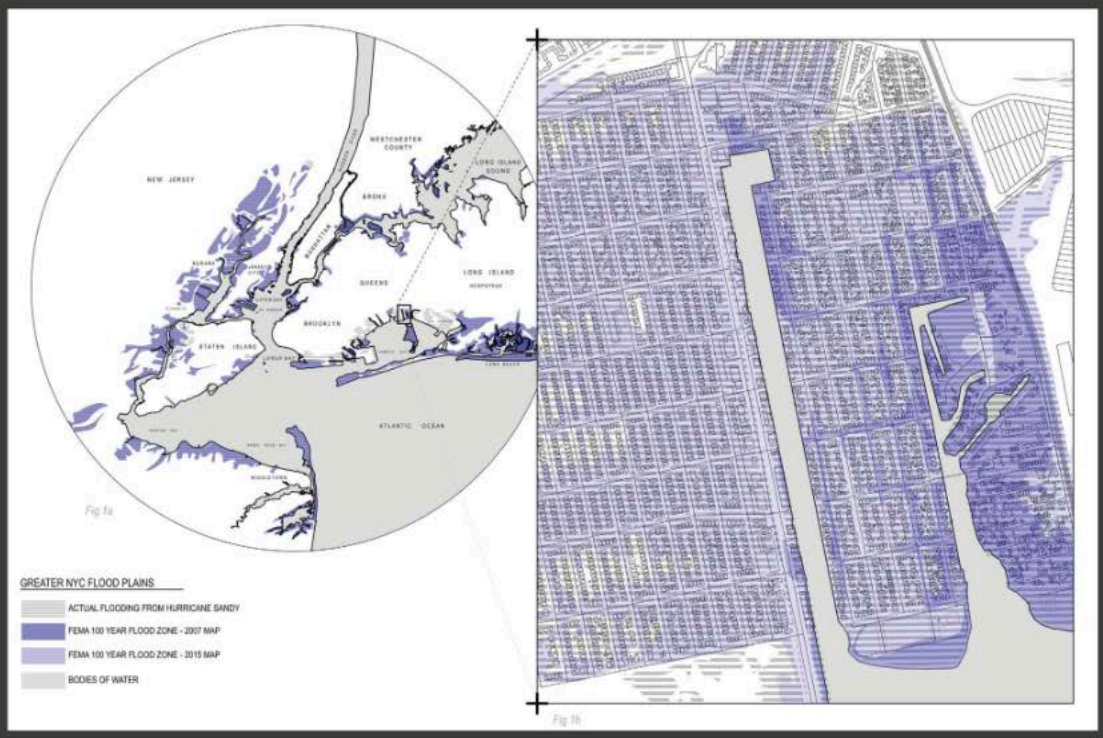
Climate change requires new approaches to coastal settlements of all scales. Architects must respond with solutions at both the urban and single-family home scale. The single-family typology has been critical to the exploration of architectural ideas and basic societal needs. The transformation of this building type must be broadly available to communities with a wide range of economic resources. SPG seeks to meet this need using modular design that addresses resiliency, sustainability, and affordability.

The designs seen here seek to address issues such as adaptability, social relevance, and environmental consciousness. With the imminent threats of climate change, we apply sustainable strategies to all our projects. In the projects included here-in, we explore the environmental and economic effects of climate change on the single-family home.

THE REALITY OF AN INCREASINGLY TUMULTUOUS CLIMATE

The clock is ticking on global warming and new construction must confront climate change. It must reduce environmentally

Greater NYC and Queens Flood Map



dangerous emissions during construction and through the life of the building. It must also be resilient enough to survive new and more destructive climate patterns. Additionally, housing affordability has become a rightly potent issue.

Sea rise and more extreme weather patterns are causing an unprecedented battering of coastal shores. The wealthy enclaves typically associated with US waterfront living and many homes in middle- and lower- income communities could be rendered uninhabitable.

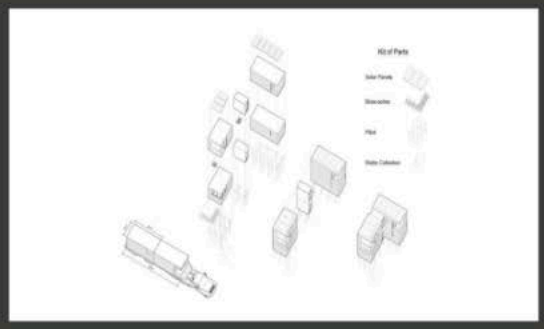
160 million Americans live near the coast and over 1.6 million people live within FEMA's 100-year coastal flood zones in the Northeast. New York has 269,165 occupied units in these areas. The 2012 Hurricane Sandy exposed the vulnerability of New York City's 520 miles of waterfront communities. This storm and others like it raise larger concerns about how and where we build in coastal locales.

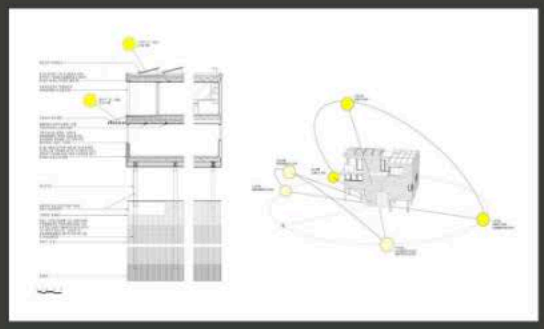
FINANCIALLY UNSTABLE WITH UNSUITABLE HOMES

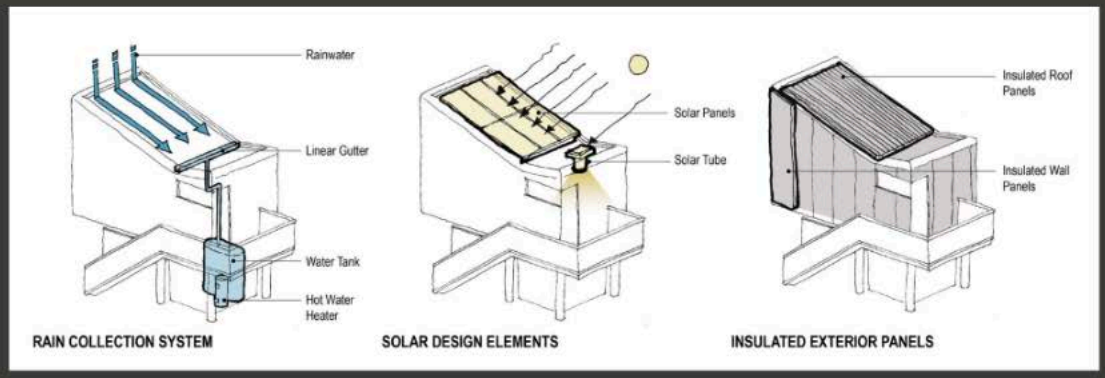
Architect-designed houses are financially unattainable for most, and many populations have been living in ill-conceived or under-designed buildings that are especially unsuitable for the changing climate: 32,137 single-family homes in NY were damaged by Sandy, most of these in marginalized communities. Large storms will continue to hit especially hard on the most vulnerable in our population.

Architects must become more invested in creating affordable and resilient architecture. There is a clear need for a new kind of single-family typology that is financially accessible, has a small carbon footprint, and can adapt to changing coastal weather patterns.

Top Left: Modular Diagram. Top Right: Solar Diagrams.
Bottom: Microhome Building Systems Diagram







OVERCOMING THE STIGMA OF MODULAR CONSTRUCTION

To many, "prefabricated home" recalls the lowest common denominator of housing—identical, dilapidated trailers and mobile homes—but modular design brings numerous assets to the construction process, providing significant economic and sustainability advantages over conventional construction methods. Modular designs can disprove the negative associations of factory-fabricated buildings and can instead contribute to a reduction in the environmental impact of construction, while providing thoughtful and affordable housing solutions.

Since prefabricated modular homes are built in factories, unlike traditional building methods, the cost saving strategies typically associated with factories can be brought to the housing industry.

THE RESILIENCE OF MODULAR CONSTRUCTION

Modular construction has the potential to reduce the energy consumption associated with the fabrication and use of residential typologies.

More efficient use of materials—thanks to optimized factory construction—reduces waste, increases recycling, and saves on the transportation of waste. These efficiencies contribute to a much lower carbon footprint than a stick-built residence constructed on-site.

Modular construction also presents several resilient advantages in the face of climate change. The benefits of factory-built construction extend to the strength of the building including better welds, stronger assemblies, and tighter joints. Consider that a building module is constructed to withstand the vibrations and

Top: Elevations. Bottom: Modular Plan Compilation.

vicissitudes of on-road transport. The Insurance Institute for Business & Home Safety found that prefabricated homes fared better then site-built homes under strong winds up to 145 mph due to the structural integrity of building modules.

Given the statistics of its affordability and inherent sustainability, modular construction provides the base upon which architects can resolve to hone design towards meeting the 2030 goals established by the AIA. The major centerpiece of the 2030 challenge is for all new construction to be carbon neutral. In articulating these designs, we saw two clear points on which to push the resilience of modular construction to meet this benchmark: changing its relationship to the site and adding passive design strategies.

POSITIONING THE MODULAR HOUSE

Linking a home's interior to its site through horizontal sight lines expands the perceived size of the Modular House living areas. These houses disengage the house from the landscape by raising them. To re-link the house with its environs, the vertical planes of the enclosure are made transparent with large expanses of high UV rated and hurricane resistant glass fenestration. Outdoor terraces are also added to achieve a distinct and profound relationship between the houses and the land on which they sit.

These prototypical designs replace the traditional horizontal transition from exterior to interior employing piloti structure, providing an opportunity to re-build on land that might not be otherwise considered. The raised house solution will allow neighborhoods to be re-built with their social fabric intact while avoiding the harmful impact of new development in fragile, flood-prone, or previously undeveloped environments.

FACTORY CONSTRUCTION

The deployment of energy-saving and resilient strategies begins with factory assembly with its enhanced structural stability but has other advantages including the capacity to employ robust sprayed insulation. The fenestration is triple-glazed, and Energy Star approved.

Caulking at fenestrations and intersections of horizontal and vertical planes greatly tightens the house's envelope and decreases energy consumption. Additionally, all appliances and equipment specified for this house are Energy Star approved.

Once the house arrives on site, it is further outfitted with energy-saving technology. After installation, the roof is equipped with a white roof membrane, providing a high Solar Reflectance Index - a measure of the material's ability to reject solar heat. Additionally, a rainwater collection system is put in place. The house will collect nearly 100% of rainwater through a series of roof drains and leaders that lead to water storage tanks.

MODULAR COMMUNITY AND ADAPTABILITY

The breakaway structure contains utilities, storage and/or circulation below the house but otherwise allows light and air to filter through the space without impeding storm or flood surges. Limiting the building's overall use of artificial cooling devices is intrinsically enhanced by the one-room width of the

Top: Coastal Modular Rendering. Middle: Flooded Rendering.
Bottom: Microhome Community Rendering.

modules themselves. The constrained width and height of each module ensures no space will be too difficult or too costly to heat and cool, and with multiple exposures and in each room, natural ventilation reduces the need for air-conditioning.

Modular construction inherently lends itself to a wide range of solutions accommodating both traditional and non-traditional families. Studio living and up to four-bedroom solutions are easily achieved using pre-designed components so that bathroom and kitchen designs are easily incorporated into the varied modules, without undue design effort, providing a range of semicustom design solutions.

CONCLUSION

These designs enhance a fluid relationship between the built and natural environments, wherein the building does not impose itself on the landscape, but instead works harmoniously in concert with the environment. Rather than stand steadfast against the changing climate, these prototypes accept and absorb the flows of nature. Numerous components of these design do their part to slow the tide of climate change, but not at the expense of aesthetic quality. All of this is delivered at a cost much below typical costs for on-site construction, allowing for viable solutions in a changing world.

SPG Architects is a full-service award-winning architecture firm currently led by Eric Gartner. SPG provides a comprehensive range of design services and has worked with clients on a broad array of architecture and design projects. Our work includes projects of varying scales and character, with a range of regional, national, and international projects that include single- and multi-family residences, retail environments, corporate interiors, and institutional and hospitality buildings and spaces.

Eric A. Gartner, AIA, LEED AP

As SPG's principal partner, Eric has been practicing architecture since obtaining his Master of Architecture degree from the University of Virginia where he also received his undergraduate degree. He maintains an active relationship with UVA, having long served on the School of Architecture's Foundation Board and he regularly serves as a visiting design critic for student reviews at numerous schools of architecture. At SPG, Eric has broadened the firm's range of project types and helped it to expand its national and international presence. SPG Architects' built work is now located not only across the US, but also in Latin America and Africa, and it has been published worldwide. Eric's ongoing commitment to both environmental and social responsibility has instigated and informed a series of projects that explore the benefits of sustainable design. Eric is a member of the American Institute of Architects, is registered with the National Council of Architectural Registration Boards through which he is licensed in numerous states, and is a LEED Accredited Professional.