



zeroHouse
by Specht Harpman

zeroHouse is:



completely self-sufficient and incredibly comfortable

zeroHouse generates its own electrical power.

High-efficiency solar panels produce power and store it in an onboard bank of batteries. Fully charged, zeroHouse can operate continuously for up to one week with no sunlight at all.

zeroHouse collects its own water.

A rainwater collection plane gathers and diverts water into an elevated 2200 gallon cistern. Low-pressure plumbing fixtures are gravity-fed, reducing the need for power-consuming pumps.

zeroHouse processes its own waste products.

All organic waste is processed in a digester unit located beneath the house. It converts the waste into clean, dry compost that needs to be removed only twice a year.

zeroHouse is completely automatic.

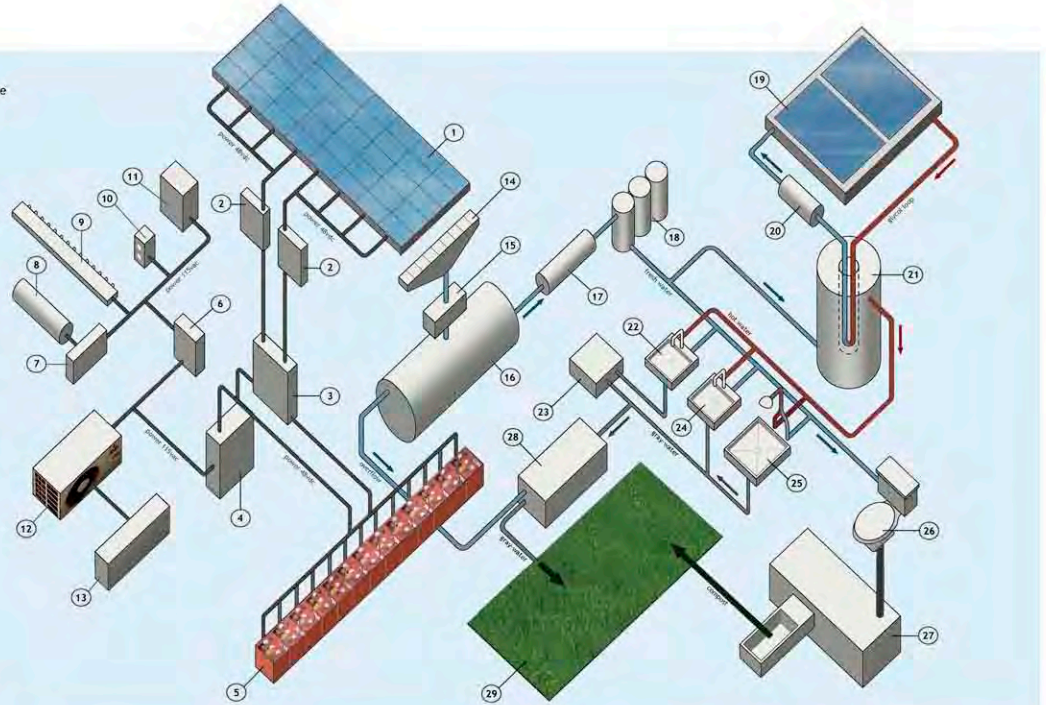
All functions of the house are monitored by an array of sensors, and can be controlled through any laptop computer. zeroHouse is fully customizable for personal usage patterns, from weekend getaway to extended-stay living.



functional



- 1 PV array / rainwater collection plane
- 2 PV load centers
- 3 power control center
- 4 inverter
- 5 battery array
- 6 distribution panel
- 7 automated device controller
- 8 transfer pumps
- 9 LED lighting devices
- 10 convenience outlets
- 11 appliances
- 12 heat pump outdoor unit
- 13 heat pump indoor unit
- 14 rainwater collector
- 15 prefiltration box
- 16 fresh water storage tank
- 17 UV microbial treatment unit
- 18 reverse-osmosis filter panel
- 19 solar hot water collector
- 20 glycol recirculation pump
- 21 heat exchanger and tank
- 22 kitchen sink
- 23 grease trap
- 24 bathroom lavatory
- 25 shower
- 26 low-flush toilet
- 27 composting unit
- 28 gray-water filter box
- 29 garden / biodegradables recycling



The zeroHouse is a small, prefabricated house that can be easily shipped and quickly erected. It features a full kitchen, bath, and all elements necessary to comfortably support four adults. What sets the zeroHouse apart from other prefabricated structures on the market, however, is its ability to operate independently, without the need for any external utility or waste disposal connections.

The zeroHouse can be used in many applications, including residential uses in remote or ecologically sensitive locations, as ecotourism resort units, or as living or office modules for remote employment such as mining, construction, or relief agency uses.

Technical requirements were a major determinant in the initial design and final appearance of the zeroHouse. Unlike many off-the-grid houses, the zeroHouse integrates all systems to work in concert to improve efficiency, thus the size, arrangement, elevation and orientation of many of the components was critical to the proper function of the house. Additional constraints were introduced by transportation and erection limits.

The final configuration of the zeroHouse achieves full operational independence of all major systems: power supply, water collection, and waste recycling.

comfortable



The zeroHouse is designed for comfort as well as efficiency. Each house features a fully-appointed living room with modular wraparound couch, 42" LCD TV, and ample built-in storage. The kitchen has a full array of high-efficiency appliances, including an induction cooktop, microwave oven, and full-size refrigerator. The dining area includes a restaurant-style booth, and comfortably seats four adults.

Upstairs, a covered deck provides the perfect rooftop perch for outdoor living. Two bedrooms come furnished with king-size beds, window seats, and large closets. The bathroom, which features a large shower, full vanity, and a porcelain low-flush toilet, opens onto its own private sun-deck with outdoor shower and lounge chairs.

The zeroHouse is fully climate-controlled, with a high-efficiency air-conditioning / heating system and separately zoned sleeping and living areas. The walls, roof, and floor are all insulated with closed-cell structural foam, and achieve a thermal resistance rating of R-58. The full-wall windows in each room are triple-insulated and fabricated from low-e heat-mirror glass. Exterior doors feature vacuum-sealed aerogel panels to maintain maximum thermal performance.

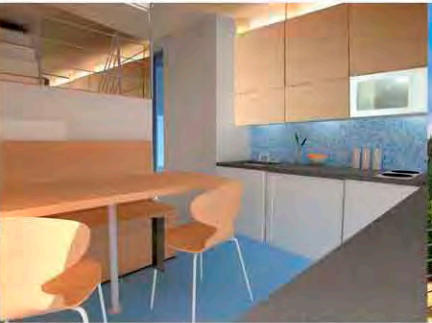
Finishes within the house are selected for beauty and durability. Countertops, sinks, and bath surfaces are seamlessly fabricated from solid-surfacing material. Natural-fiber fabrics and carpet are used throughout the house, and bio-based wood composite wall and ceiling panels can hold up to heavy use and retain their appearance. Fully-dimmable LED lighting built into the wall and ceiling panels will last for up to 100,000 hours of continuous use. The interior of each zeroHouse can be customized with many material and color combinations.



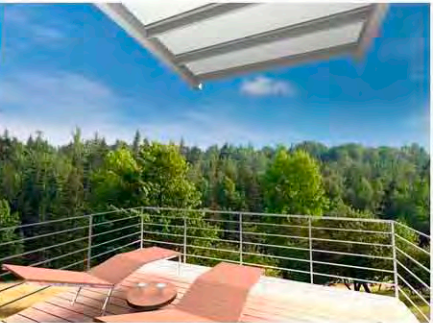
entry porch



kitchen / dining



kitchen / dining



upper deck

versatile



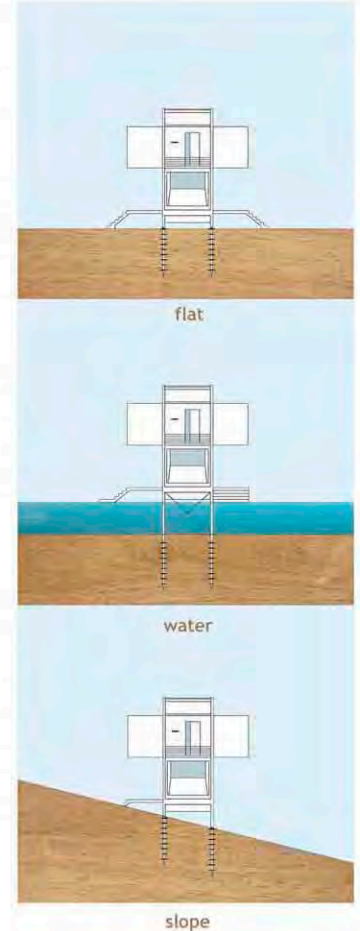
The zeroHouse can be located almost anywhere. Two flatbed trucks carry all the zeroHouse components to the site, and it can be erected rapidly. It can be installed in places that would be unsuitable for standard construction, including shallow water, or on slopes of up to thirty-five degrees.

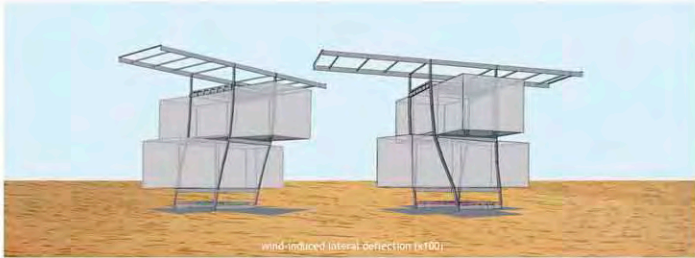
The zeroHouse uses a helical-anchor foundation system that touches the ground at only four points, requires no excavation, and only disturbs the ground to a minimal degree. It is especially suitable for use on environmentally-sensitive sites, or locations where no permanent structural elements are desired.

The zeroHouse is nearly maintenance-free. The exterior is clad with integrally-colored body panels that are impervious to scratching, denting, mildew and fading. Steel frame components are bonded for corrosion resistance. The photovoltaic panels, solar hotwater panels, and other devices are highly durable and rated for continuous exposure.

The zeroHouse is also extremely secure. All windows feature laminated "Sentry-Glass" for impact and penetration resistance, and fully-mortised locking systems are used throughout. A continuous web-based house monitoring system is also available.

In many locations, the zeroHouse will produce electrical power in excess of what is required to operate the house. With a grid-intertie option, this excess energy can be sold back to the utility. Excess power can also be used to operate remote devices, including the charging of electric or plug-in hybrid vehicles. With the zeroHouse, completely fossil-free living is a possibility.





The tubular steel frame of zeroHouse can withstand winds of up to 140 mph. The living modules feature flexible attachment points to the frame and allow the entire structure to twist and deflect without damage. Additionally, the solar panels are independently anchored and can detach in extreme wind conditions to prevent damage to the rest of the structure.

Exterior cladding panels are installed in a pressure-equalized rainscreen configuration that allows for an "air-gap" between the cladding panels and the waterproofing membrane behind. This feature minimizes the possibility of water penetration from driving rain, and allows heat to convect behind the panels, increasing the energy efficiency of the house.

project facts page

Location

The zeroHouse is being marketed worldwide. It has been designed to work within an operational range of 36°N to 36°S latitude for year-round occupancy, and 47°N to 47°S for partial-year occupancy.



Site Characteristics

The zeroHouse has been designed for use in a wide variety of site conditions. Due to its unique foundation system, it can be installed on land with a slope of up to 35 degrees, and in water to a depth of five feet. It touches the ground at only four points with minimal disturbance, making it appropriate for environmentally-sensitive areas. The flat-mounted solar array allows the house to be oriented in any direction to take advantage of localized views and access paths. A flexible structural exoskeleton provides resistance to wind loads of up to 140 mph.

The house was designed to meet most aspects of the major international residential codes. Stair widths, railing heights, and other items have been developed for maximum applicability. Local restrictions, however, vary widely, and modifications may be necessary in particular locations.

Markets

The zeroHouse has wide applicability in a variety of markets. First-adopters will welcome this unique, comfortable, and environmentally-positive vacation home. High-visibility owners will provide recognition and promotional opportunities for the house. Large sector markets include military housing, governmental and relief agencies, ecotourism, and housing for remote industries such as mining. A modified, lower-cost configuration is currently in development for multi-unit affordable housing, relief agency, and emergency housing use.

Schedule

Architectural and engineering documents are complete, and a preliminary cost analysis has been prepared. The zeroHouse is "shovel-ready."

Funding

Capital is currently being raised to produce a full-scale working prototype. The business plan supports site-built as well as factory-built start up.

Construction Systems

Foundation: The house is supported on four stainless-steel helical micropiles fitted with field-adjustable leveling jacks. Alternate foundation systems are available for extreme locations where the micropiles are not suitable.

Exoskeleton: A multi-part tubular-steel structural system supports the living and service modules, as well as the large photovoltaic / rainwater collection panel. All elements of the house are independently anchored to this frame, allowing flexibility in high wind conditions.

Module Envelope System: The envelope is composed of steel-reinforced closed-cell-foam SIPs panels that achieve an R-value of 58. A continuous-membrane waterproofing barrier is applied on exposed surfaces of the panels in order to achieve complete weather-resistance. Exterior cladding is a custom-colored resin-composite sandwich panel installed over aluminum battens in order to create a pressure-equalized rainscreen envelope.

Windows and Doors: Triple-glazed windows with foam-filled fiberglass frames are used throughout the house. Exterior-face glazing incorporates DuPont SentryGlass for impact protection. Door panels are insulated, and are fitted with full-perimeter compression seals for minimum air leakage.

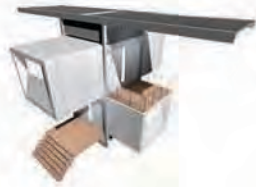
Roofing: Single-sheet TPO membranes are used at all roof locations. Roofing materials are surfaced to provide maximum reflectivity.

Interior Finishes: Interior wall and ceiling panels, and all cabinetry is fabricated from composite board material with a variety of maintenance-free surface finishes, including natural wood veneers with catalyzed lacquer coatings. Solid-surfacing composites are used in the bath and kitchen. Furniture is largely built-in in order to maximize use of space.

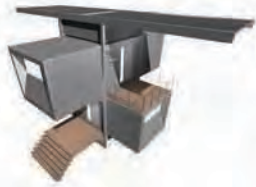
Electrical System: Forty high-efficiency solar panels are interconnected for a peak power generation capacity of 7000 watts. Power is stored in a bank of 36 deep-cycle lead-acid batteries. All electrical devices are selected for maximum energy efficiency, including full-LED lighting, a closed-cycle refrigerator, and inverter-controlled microwave oven and heat pump. Grid-intertie inverters are available for integration with local utilities.

Water Supply System: Rainwater is collected and stored in four 550-gallon polyurethane tanks mounted above the living spaces. Water is filtered and sterilized with UV light prior to use. Solar hot water is provided via two large collector panels linked to a heat-exchanger system with a closed-loop glycol system. Solar-electric well pumps are available for areas with low rainfall rates.

Septic / Graywater System: Solid organic waste is processed in a Centrex 3000 composter unit installed in the lower service module of the house. Graywater is collected from all plumbing fixtures, filtered, and discharged via a perforated flexible distribution manifold. In areas with pre-existing septic systems, the waste processor may be supplemented or eliminated.



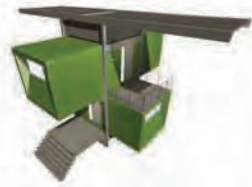
bright white



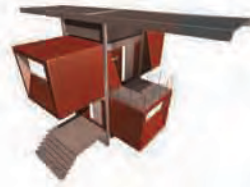
silver metallic



deep marine



forest green



desert red



custom graphics

specifications

Photovoltaic Array:	40 high-efficiency solar panels capable of generating 7000 peak watts.
Power Storage:	36 interlinked Concorde Sun-Xtender sealed lead-acid batteries.
Operational Voltage:	48v battery bank and standard 115v operational voltage. Utilizes Outback Systems FX 2524T sealed inverters.
Lighting:	Fully-concealed, dimmable LED light strips. Average lifespan 100,000 hours of continuous use.
Climate Control:	9000 BTU Daikin Micro-Split heat-pump system with two independently controlled zones. SEER: 18
Water Supply:	Four 550-gallon primary storage tanks elevated for passive pressurization. UV and reverse-osmosis processing.
Waste Processor:	Centrex 3000 auto-composter with negatively-pressurized vent system. Odor-free high-grade compost needs to be removed every 6 months.

Foundation Anchors:	Four Chance Pulldown helical micropile anchors, stainless steel with levelling plates.
Structural System:	Tubular cold-rolled steel frame sections with bonded powder-coat finish.
Body Shell:	Structural insulated panel system (SIPS), with integrally-colored Alucobond exterior cladding.
Insulation:	Closed-cell polyethylene foam panel cores. Metallized Tyvek panel wrap. Assembly rated at R-58.
Window Assembly:	Triple-pane insulating units with SentryGlas laminated exposure film, low-e coating, and argon-filled cavities.
Exterior Doors:	Kevlar reinforced door shell with vacuum-sealed aerogel insulating core.
Total Floor Area:	650 sq.ft. net usable interior area. 250 sq.ft. covered exterior decks.



zeroHouse is a product of Specht Harpman LLC
for more information, please feel free to contact us:

www.zeroHouse.net
zeroHouse@gmail.com

1314 Rosewood Avenue, Suite 103
Austin, TX 78702

512.382.7938

Copyright 2005 Scott Specht, Architect LLC. "zeroHouse", and the zeroHouse logo are registered trademarks of Scott Specht, Architect LLC. This brochure and any files attached contain information that is legally privileged and may not be disclosed to third parties without the consent of Scott Specht, Architect LLC. If you are not the intended recipient, you are hereby notified that disclosure, copying, distribution or use of any of the information contained in or attached to this brochure is strictly prohibited. If you have received this material in error, please notify the sender and destroy the original without reading or saving in any manner. The materials and specifications noted herein are preliminary and subject to change without notice.