



D U R  
A





# URBAN

DURA home is in the heart of the URBAN environment. Heightened living densities and consumption rates in excess are normal factors against sustainable practices. DURA challenges conventional methods of a post industrial society to meet the evolving path of urban living sustainable into the future.



## DIVERSE

Our home is DIVERSE. It combines the NYC social micro climate and the techniques of ancient civilizations [chinese interlocking joinery + afrakan use of earth wall as thermal massings] identifiable through the inhabitants of the city.



## RESILIENT

Our home's proximity to the flood plain, rising sea levels and Atlantic ocean increases the need for RESILIENT design proactive in response to the threat of flood water, gail force winds and seismic activity.



## ADAPTABLE

A DURA dwelling is ADAPTABLE in construction, deconstruction and relocation through framing techniques practiced throughout millennia. Adaptable is also our home's ability to converse with the natural environment. A biophilic philosophy to our design development means that there is one ecosystem all living species must adhere to including the built environment of humans and the DURA home for the future.

W

WATER



GREY WATER  
SOLAR WATER  
COLLECTORS

H

HEATING



COPPER HEAT  
EXCHANGER

GSHP  
GROUND  
SOURCE  
HEAT PUMP

V

VENTILATION



PASSIVE  
ORIENTATION

CLERESTORY  
CROSS  
VENTILATION

A

AIR



FANS  
CLERESTORY

C

CONDITIONING



RADIANT  
COOLING

E

ELECTRICITY



SOLAR  
PV CELLS

WIND TURBINE  
HYDROELECTRIC

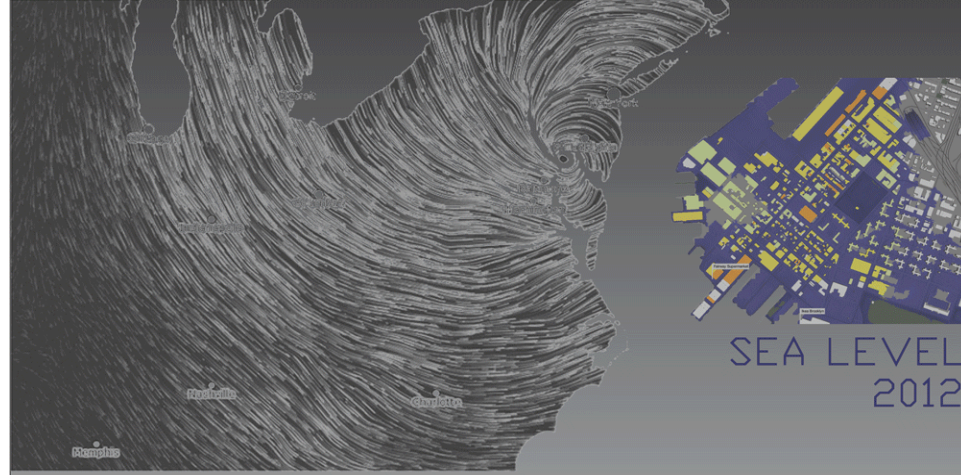
VIBRATIONAL  
CHIP

# RED HOOK, BROOKLYN, NY



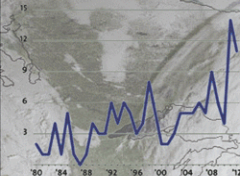
50 VERONA STREET

# SUPERSTORM SANDY 2012



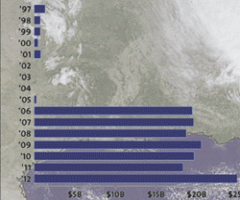
## PERFECT STORMS

For three decades, the number of billion dollar disasters per year has trended up.



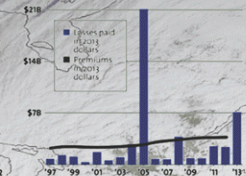
## PERFECT STORMS

Katrina sent the NFIP's skyrocketing and it hasn't come down since.



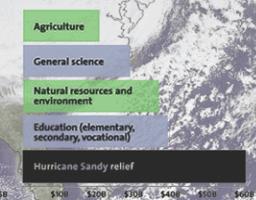
## STORM SURGE

After Katrina and Sandy, National Flood Insurance Program payouts far exceeded the money earned through premiums.



## 48 HOURS, \$60 BILLION

Sandy relief spending dwarfs 2012 budgets of many federal programs



# SOLAR DECATHLON 2013 GREAT IRVINE PARK, CA

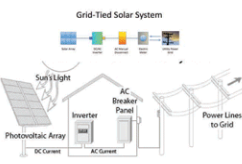




## Photovoltaic System

Fahana Rahman  
Prof. Aptekar  
Architectural Technology

Photovoltaic system is a new system to convert sun rays or light into energy. The sun is the only resource needed to power a solar photovoltaic system. It collects the sun's energy and turns it into electricity so we can use it to power home appliances when needed. As our team participates in the Solar Decathlon competition, we are motivated to find a way to use photovoltaic systems in our design. The PV system is economical efficient and sustainable. It reduces CO2 and is good for the environment. Photovoltaic systems are less expensive now than when first created. As time passes, the demand of the PV systems increase and the costs decline, they have a direct relationship. In my research, I found that there are 3 basic types of photovoltaic systems: Stand Alone Systems, Grid Tied Systems and Hybrid Systems. The Grid Tied System is considered the best. This system is mostly used in homes because it is the least expensive and the most efficient of all the systems.



### Grid Tied System

- Connected to the electrical grid
- Uses the grid as a battery
- Can be any size
- Can sell or excessive energy

- Advantage**
- Simple
  - Expandable
  - Can start with small size then change the size later

- Disadvantage**
- Need a generator
  - Not a back-up power source
  - If the grid is down, then the PV system is down too

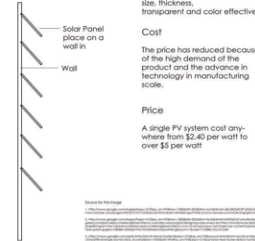
Calculation to figure out how many solar panel we need and the size.

- How much electricity do you use each month?
  - The electricity it need to generate a house is about 4,732 KW
- What percentage of your house power do you want to generate with solar power?
  - The percentage of a house power, it need to generate with solar power is about 100 %
- How many Peak Sun Hours do you get per day?
  - 13.773

**Calculation**  
30 Kwpcwa - 1 panel generate about 140-watts  
4,732 divided by 140(watts per panel) = 33.8 = 34

We need about 30 solar panel to generate 4,732 KW -and the size of the panel need to be 1'x2' or 2'x4'.

### Section of a wall with solar



**Shape and Size**  
It is available in standard size and also can choose shape, size, thickness, transparent and color effective

**Cost**  
The price has reduced because of the high demand of the product and the advance in technology in manufacturing scale.

**Price**  
A single PV system cost anywhere from \$2.40 per watt to over \$5 per watt



System	Capacity	Cost	Efficiency
Stand Alone	1000W	\$1000	15%
Grid Tied	5000W	\$5000	20%
Hybrid	3000W	\$3000	18%

There are 3 basic types of photovoltaic system

### A) Stand Alone System

- stand alone system without batteries or stand alone system with batteries

### B) Grid Tied System (using Inverter)

- off-grid without battery (array-direct)
- off-grid with battery storage for DC-only appliances
- off-grid with battery storage for AC and DC appliances

### C) Hybrid System

- grid-tie without battery
- grid-tie with battery storage

**Stand Alone System**  
- Stand alone system without batteries or stand alone system with batteries  
- Stand alone system without batteries or stand alone system with batteries  
- Stand alone system without batteries or stand alone system with batteries

**Grid Tied System**  
- Off-grid without battery (array-direct)  
- Off-grid with battery storage for DC-only appliances  
- Off-grid with battery storage for AC and DC appliances

## NEW YORK CITY COLLEGE OF TECHNOLOGY

### MICRO ELECTRICAL GENERATION - VIBRATIONAL KINETIC ENERGY

CHANTAL MANNING, PROF. APTEKAR, ARCHITECTURAL TECHNOLOGY

FALL 2013

MICROGENERATION IS THE SMALL-SCALE GENERATION OF HEAT OR ELECTRIC POWER THROUGH THE HARVESTING OF WASTE ENERGY ERITTED BY CONVENTIONAL METHODS. TO FURTHER PUSH IN THE REALM OF MICRO GEN ENERGY HARVESTING APPLICATIONS, THERE ARE TWO MAIN AVENUES OF INTEREST!

**MICRO POWERED GENERATORS THAT SCAVENGE ENERGY FROM AMBIENT VIBRATIONS**

**PIEZOELECTRICITY, WHICH IS THE PROPERTY OF A MATERIAL'S ABILITY TO PRODUCE AN ELECTRIC CHARGE WHEN BENT, SQUEEZED, TWISTED OR PRESSURIZED**

AS THE SUSTAINABLE TECHNOLOGY ASSOCIATION PREPARES FOR THE 2015 SOLAR DECATHLON COMPETITION WE ARE INSTRUCTED TO DESIGN A NEW CONSTRUCTION OF UNPRECEDENTED INNOVATIVE ECOLOGICAL AND ECONOMIC EFFICIENCY, THE USE OF MICROGENERATION WITHIN THE RESIDENCE CAN SCAVENGE VIBRATIONAL ENERGY FROM RUNNING WATER PIPES, HEATING/ COOLING APPARATUS AND HIGH VOLTAGE ELECTRICAL DEVICES, SENSORY SYSTEMS AND UTILITY METERING. PIEZOELECTRIC MICRO CHIPS WILL BE USED UNDER THE GROUND OF FREQUENTED WALKWAYS AND APPLIED TO APPARATUS WITHIN THE HOME THAT TAKE CONSTANT MANIPULATION IN ORDER TO GENERATE SMALL SCALE ELECTRICAL POWER.

### WHAT IS MICRO GEN?

GRAPHENE IS APPROXIMATELY 100X BETTER CONDUCTOR OF ELECTRICITY THAN SILICON. IT'S ALSO STRONGER THAN A DIAMOND AND INCREASINGLY THIN - ONE MICRON THICK.

MADE UP OF ORGANIC LEAD ZINCORATE TITANATE NANORIBBONS PLACED ON SILICONE RUBBER SHEETS THEY GENERATE ELECTRICITY BY TURNING MECHANICAL ENERGY INTO ELECTRICAL ENERGY

### WHY USE MICRO GEN?

ENERGY HARVESTING 2 MAIN ADVANTAGES

- THE COST (ELIMINATING BATTERIES AND COSTLY REPLACEMENT COSTS)
- THE ABILITY TO HARVEST POWER IN MANY DIFFERENT LOCATIONS.

WALKING, MOTORS, BRIDGES  
LIGHTING, SUNLIGHT INSIDE ROOMS  
BODY HEAT, VEHICLE WASTE HEAT  
BROADCASTING, WIRELESS LAN EMISSIONS

### HOW TO USE MICRO GEN?

MICRO POWERED GENERATORS

### WHERE TO USE MICRO GEN?

SMART CLOTHING  
DIGITAL DISPLAYS  
UTILITY METERS  
ALARM SYSTEMS

AMBIENT VIBRATION CAUSES A TINY MICRO FLAP EMBEDED TO BEND BACK AND FORTH. THIS GENERATES ELECTRICAL CURRENT

## Program: Emerging Scholars Project Title: "Innovative Wall Systems and Their Efficiencies" Undergraduate Researcher Assistant: Agata Scarlen Whyte Faculty Mentor: Professor Alexander Aptekar

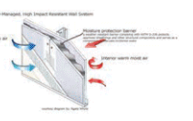
### A Water Mangered, High Impact Resistant Wall System

Cement Board Stucco is a water-managed wall system designed to provide increased high-impact and weather resistance and improved dimensional stability where insulation barrier is not required. To meet the code requirements, it is applied over the following acceptable sheathings: Exposure 1 or exterior plywood (grade C-D or better); Exposure 1 G11 glass mat gypsum substrate meeting ASTM C 1177 or water resistant core gypsum (ASTM C 1396). It combines the strength and ductility of the wall system with the performance and beauty of reinforced base coat/finish finished finishes. Finishes offer performance enhancement options ranging from exterior masonry resistance to added flexibility. Behind the system, a weather resistant barrier complying with ASTM D-2268 protects approved sheathings and other structural components and serves as a component to evacuate incidental water. Cement Board Stucco allows to enclose and finish a project in as little as two days, speeding occupancy.

### Interior Applications

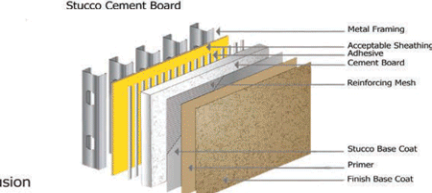


### Exterior Applications



## NEW YORK CITY COLLEGE OF TECHNOLOGY

the senior-level college of technology of The City University of New York



**Conclusion**

**Pros**  
Durability/Strength: Moisture resistant, durable Permaloc Cement Board substrates applied over a primary sheathing provide extraordinary impact and puncture resistance to the system.  
Weather Resistance: 100% Acrylic base coats and finishes repel weather at the system's surface.  
Water-Managed Design: The water-managed design of the system provides exterior drainage of incidental water that might enter around or through window or door openings and penetrate behind the cladding in frame construction. Design Options: Cement Board Stucco provides the popular stucco look, including the attachment of special pre-molded shapes and a wide variety of finish texture and color options in standard colors and custom colors.

**Cons**  
Use is limited to low-rise commercial applications. This veneer construction will tend to reveal planar irregularities in the frame construction. Minor cracking at joints might become visible in the finished exterior surface. Reinforcing mesh must be embedded in basecoat.

**References**  
ASTM C1396 Specification for Portland Cement.  
ASTM D2268 Test for Moist Seal and Penetration of Water Vapor.  
UL 723,ASTM E84 Test for Surface Burning Characteristics of Building Materials.  
<http://www.stucco.com/>  
<http://www.nationalgypsum.com/>

**Acknowledgments**  
CITY (The City University of New York), NYCT (New York City College of Technology), NYCT Dean: Yisa Shafiqi Smith, Professor Alexander Aptekar - Faculty Mentor, STA Vice President: Chantal Manning (for outstanding leadership and guidance), STA Secretary: Yaela Dyming (for providing useful program understanding), STA Secretary: Nela Cior (for high-impact and rapid responses).

## Solar Decathlon: Modular Design

Student Researcher: Geury delacruz  
Faculty Mentor: Prof. Alexander Aptekar

Modular construction is a process where they manufacture a section of a building or house called a module on the factory, then it gets shipped to the site where it gets arranged and assembled. Some of the advantage of a modular home is that it speeds up construction time by 50% compared to a typical construction, very flexible in terms of expanding a unit or adding floors, and environmental friendly because it can be relocated or refurbished for new use and uses less on site traffic like machinery and man power. In this project I am going to design a modular apt in NYC to meet the demand for affordable housing that is also energy efficient.

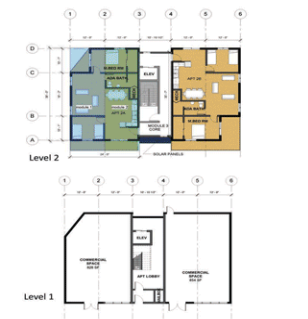
**System types**  
Types of modular construction consist of Shipping Container, wood or steel stick framing and precast concrete

Most popular choice for a container home is the hi cube container because it has a height of 9'-6" compared to other at 8' is easy to transport, has low construction cost. But they are limited to a small space and low ceiling.

**modular Sizes**

Most modular manufacturers build modular sizes in at least three widths, typically 12 feet, 13 feet, and 13 feet 9 inches. The maximum allowable height for truck transport is 13 feet 6 inches. Maximum widths and heights are determined by the federal and state transportation regulations as well as by each factory's production system.

my design will be using two 12' module  
To create a house that can also stack up into apt by adding a modular core. They can be two apt per floor or a single for smaller lots. Each apt 795 SF



2 module connecting  
With bolt to join the joist. They are under an access panel that will be hidden  
When the finished floor gets placed  
light steel construction will be to comply with the nyc building codes.

Image of module 1  
8" metal joist can span a max of 15'-0" @ 12 in apart for 300# live load. Each wall was placed to minimize the span of the joist

# REQUEST FOR PROPOSAL

DUE DECEMBER 20, 2013

