

US EPA ARCHIVE DOCUMENT

Green Building: Reducing Energy Use, Traditional Principles and Modern Implementations



16th Annual Region 9 Tribal EPA Conference
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US EPA-Waste Management Division
October 22, 2008

Green Building

Environmental Impacts of Buildings

What Residents Can do to Reduce Energy Use

Green Building Principles and Vernacular Architecture

Culture Guiding Community Infrastructure and
Economic Development

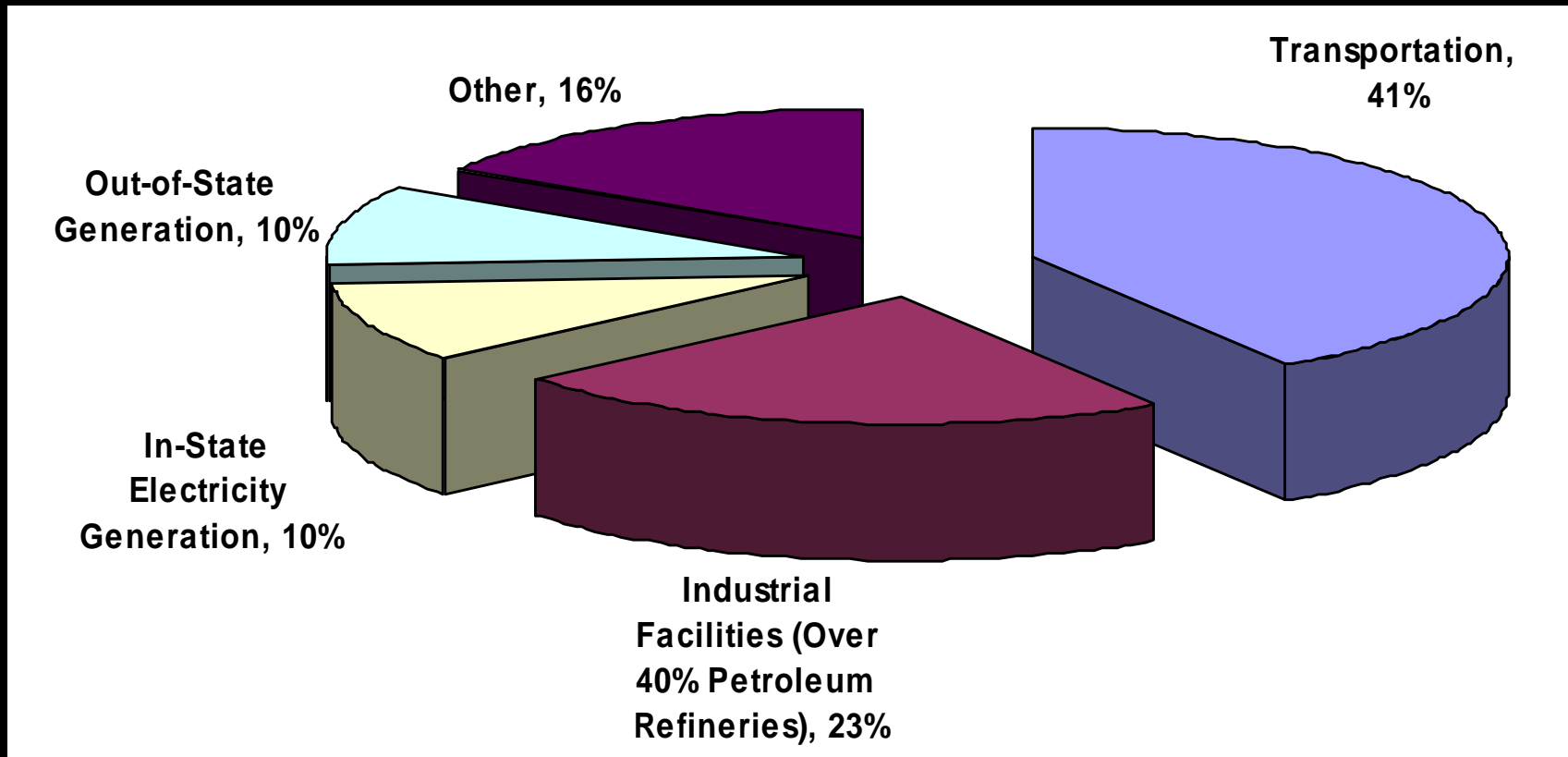
Conclusion: Resources and Handout

Environmental Impact of Buildings

In the US, buildings account for:

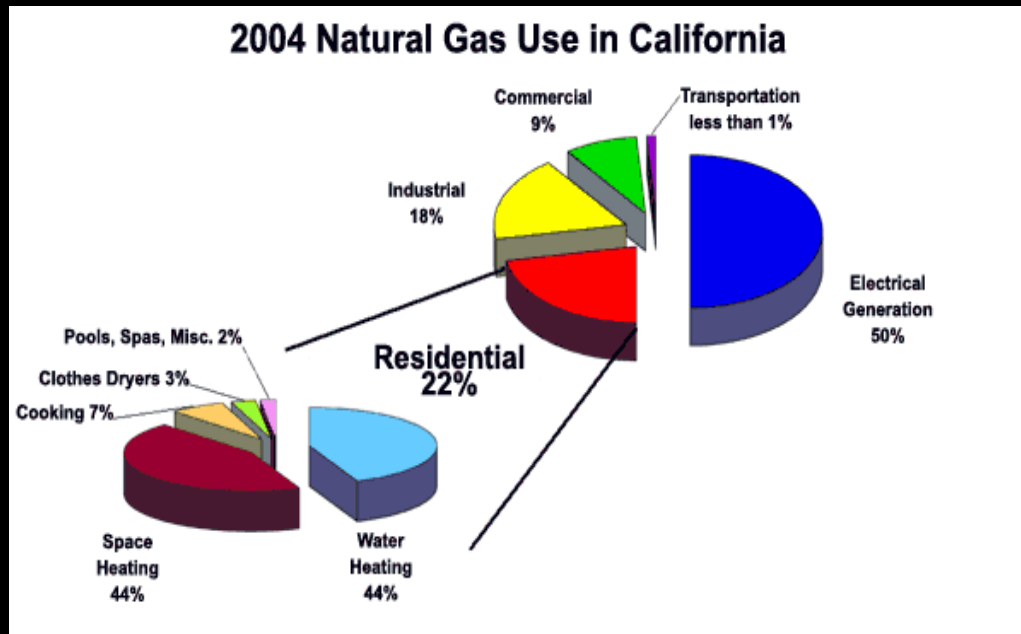
- 39 % of total energy use
- 12 % of the total water consumption
- 68 % of total electricity consumption
- 38 % of the CO2 emissions
- 25% of all water supplies
- 60% of all materials (excluding food and fuel)

California Greenhouse Gas Emissions Sources

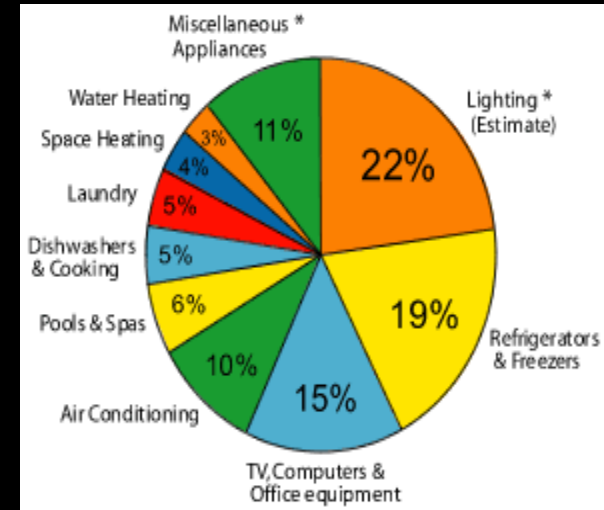


Source: California Energy Commission

Home Gas and Electricity Use in California



Space Heating
Water Heating



Annual Electricity Use Per California Household in 2004, CEC

Lighting
Refrigerators
TVs, computers
Appliances

How I Reduced Energy Use at Home

Changes I made:

- Space Heating
 - Water Heating
 - Lighting
 - Refrigerator
 - TVs, Computers,
 - Appliances
-
- The diagram consists of a central point from which five arrows point to the right. The arrows originate from the following categories in the left list: 'Lighting', 'Refrigerator', 'TVs, Computers,', and 'Appliances'. The arrows point to the following specific changes in the right list: 'Changed 37 Light bulbs', 'New ESTAR Fridge', 'New ESTAR Clothes Washer', and '13 New Double Pane Windows'. There is also an arrow pointing from the 'Space Heating' category to 'Sealed Air Leaks and Fireplace Flue'.
- Changed 37 Light bulbs
 - Sealed Air Leaks and Fireplace Flue
 - Insulated attic and floors
 - New ESTAR Fridge
 - New ESTAR Clothes Washer
 - 13 New Double Pane Windows

How I Reduced Energy Use at Home

Finding and Sealing Air Leaks



The fireplace chimney



The kitchen stove vent



Between the windows



Under the door to the garage



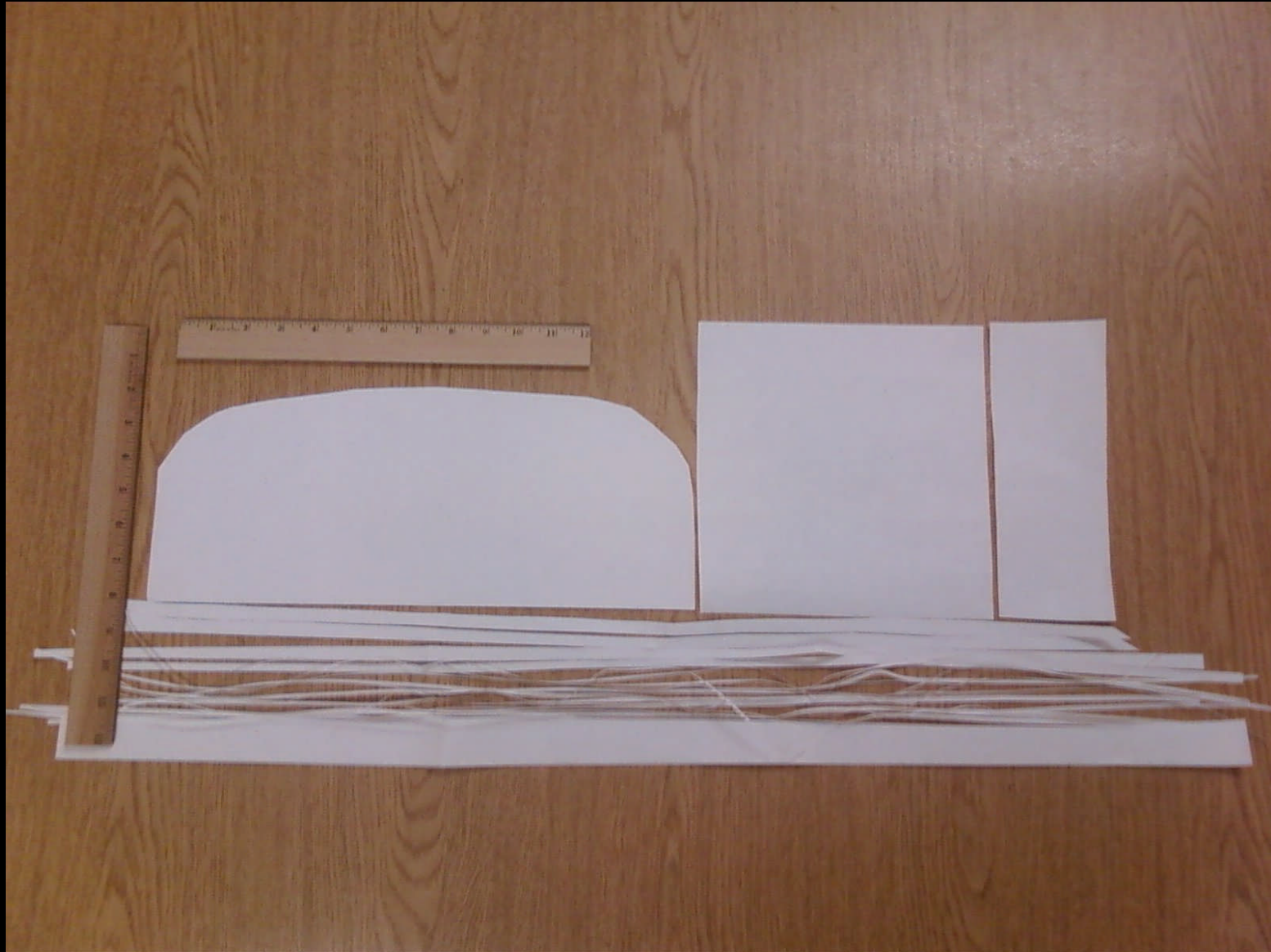
The kitchen window



The mail slot

How I Reduced Energy Use at Home

Adding up the Air Leaks

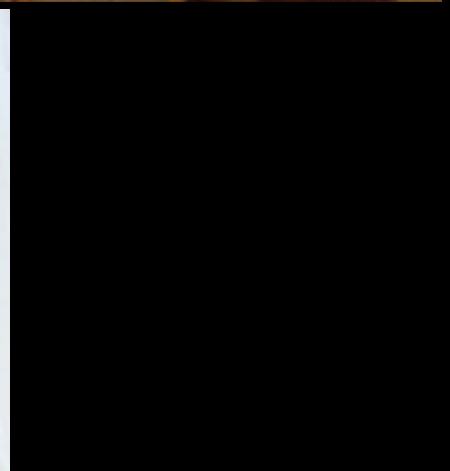
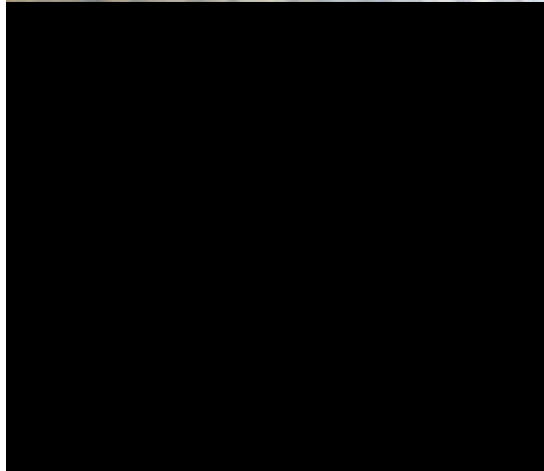


How I Reduced Energy Use at Home Weather-seal



How I Reduced Energy Use at Home

Weather-sealing a door on the inside



How I Reduced Energy Use at Home

Weather-sealing a door on the outside



How I Reduced Energy Use at Home

Double-Pane Windows



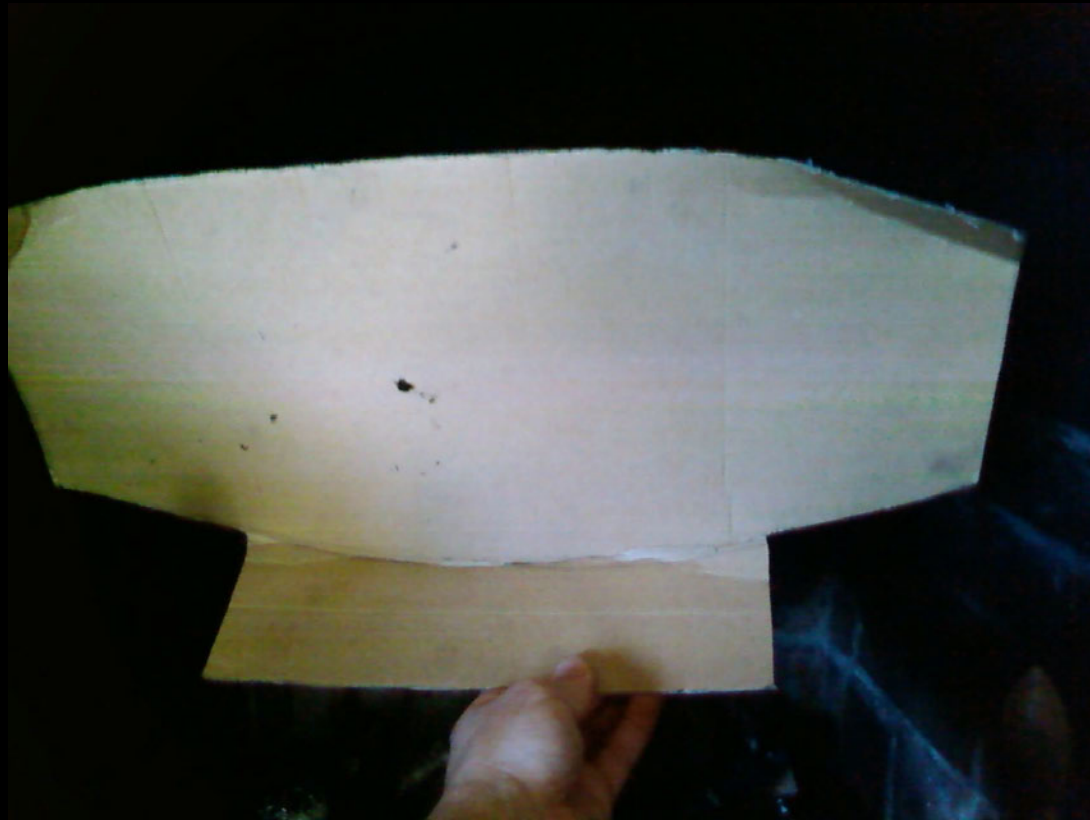
Old aluminum frame,
single-pane window



New, double-pane window

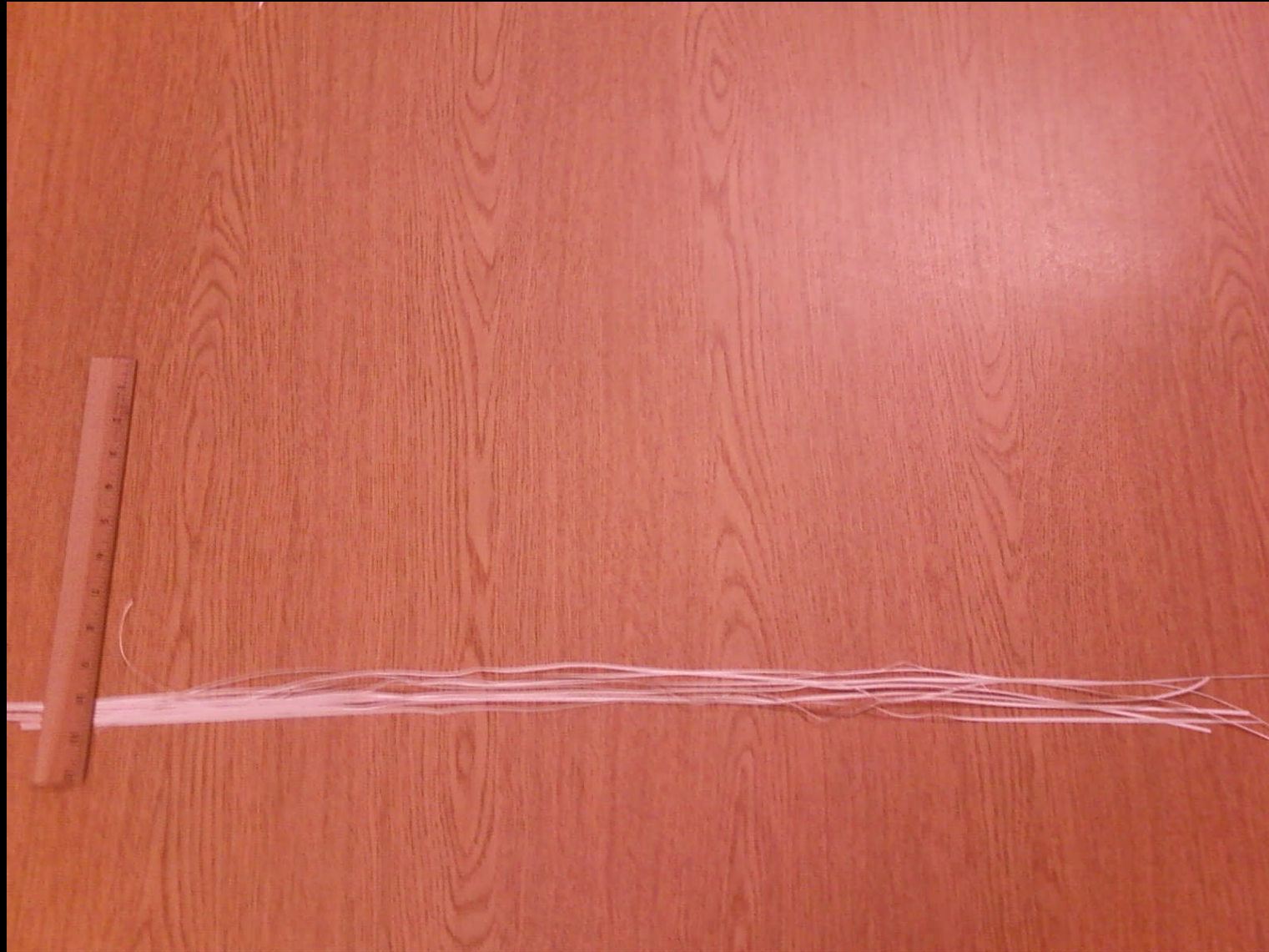
How I Reduced Energy Use at Home

Sealing the Fireplace



How I Reduced Energy Use at Home

Adding up the Air Leaks



How I Reduced Energy Use at Home Installing Insulation



In the attic above the ceiling



Under the floor above the garage

How I Reduced Energy Use at Home

Changes I Made	Cost	Savings per year	Pounds CO2 reduced	Pounds CO2/\$
Changed 37 Light bulbs	\$75	\$320	2,325	31
Seal Air Leaks and Fireplace Flue	\$100	\$100	700	7
Insulated attic and floors	\$1,200	\$400	2,800	2.3
New ESTAR Fridge	\$600	\$100	650	1.1
New ESTAR Clothes Washer	\$650	\$100	550	0.8
13 New Double Pane Windows	\$6,000	\$200	1,400	0.2
Grand Total	\$8,625	\$1,120	8,600	

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What is sustainable building design?

A truly sustainable project would be one that consumed resources in an amount less than or equal to the resources it created. Its waste must serve as fuel for some other process, so that there is, in effect, no waste at all...

...The concept of "green" design is a little less aggressive. It is about efficient use of resources, and a symbiotic relationship with the site. Vernacular architectural tradition offers many examples: the tipi, the igloo, the adobe house.

Vernacular Architecture

Vernacular architecture is a term used to categorize methods of construction which use locally available resources to address local needs. Vernacular architecture tends to evolve over time to reflect the environmental, cultural and historical context in which it exists.



Environmental Impact of Buildings

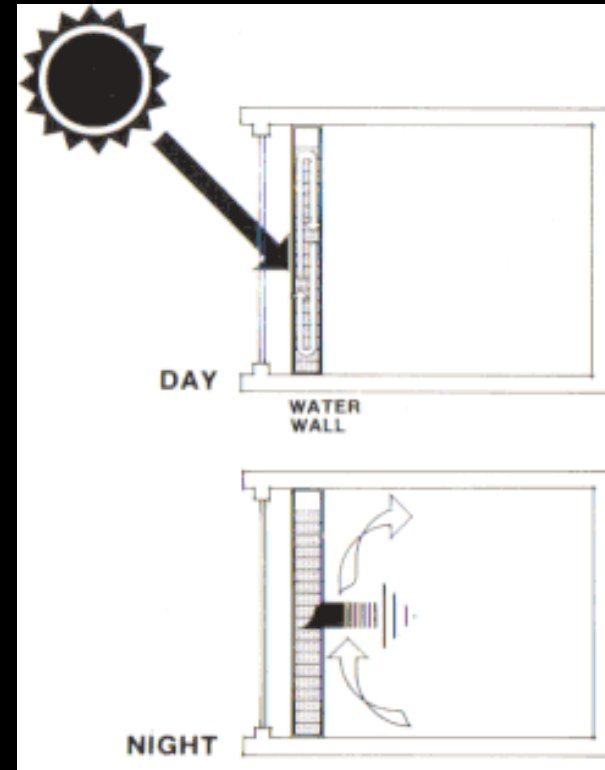
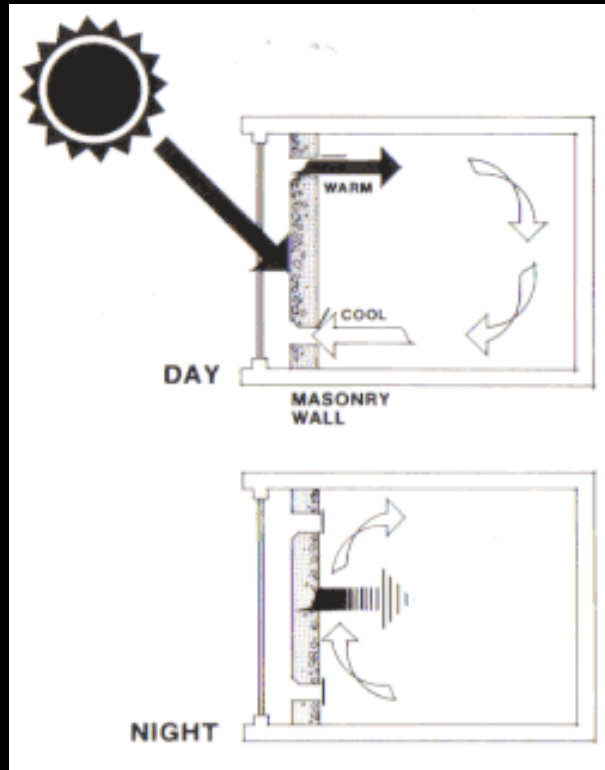
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Mesa Verde: Thermal Mass-Passive Heating/Cooling



Modern Implementation: Thermal Mass-Passive Heating/Cooling

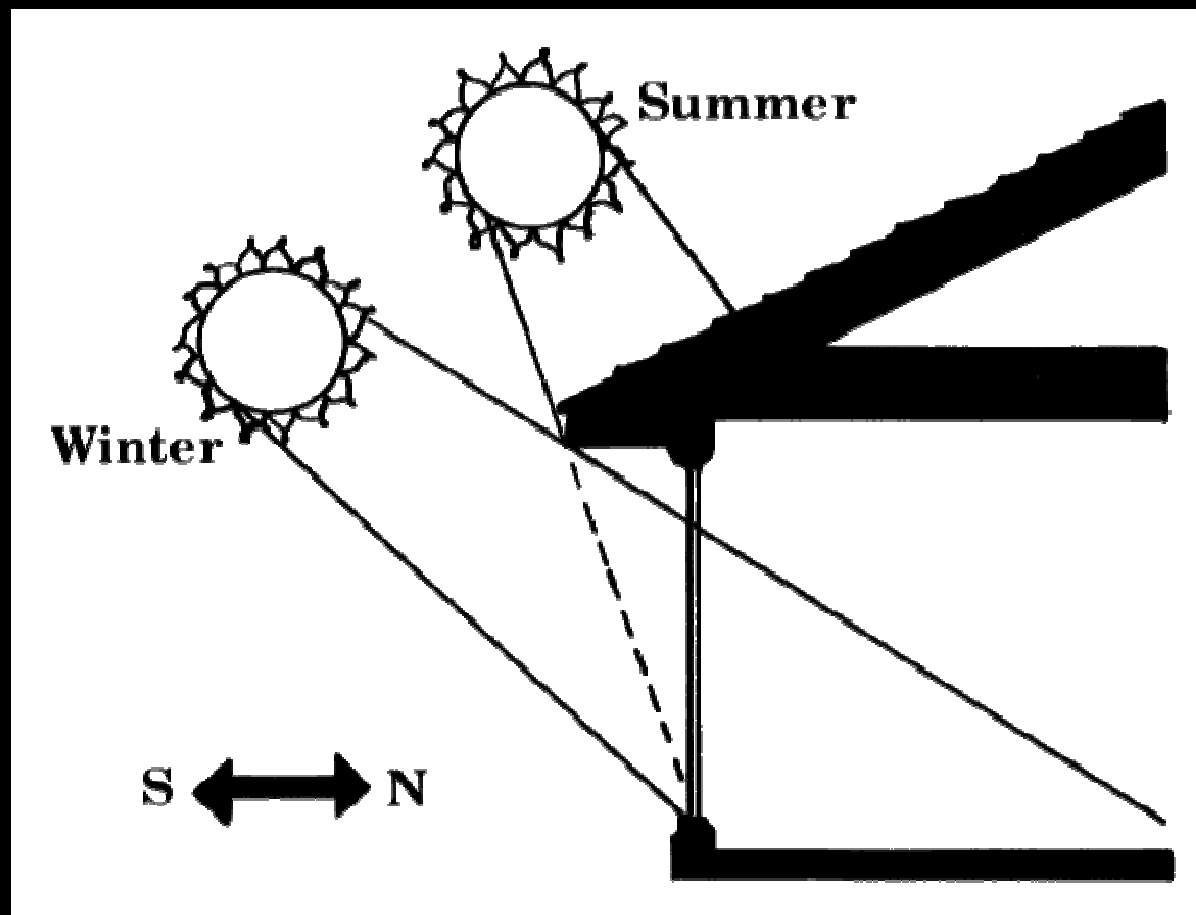


Modern Implementation: Thermal Mass-Passive Heating/Cooling





Winter Sun Shadow at Mesa Verde



Passive Solar Design

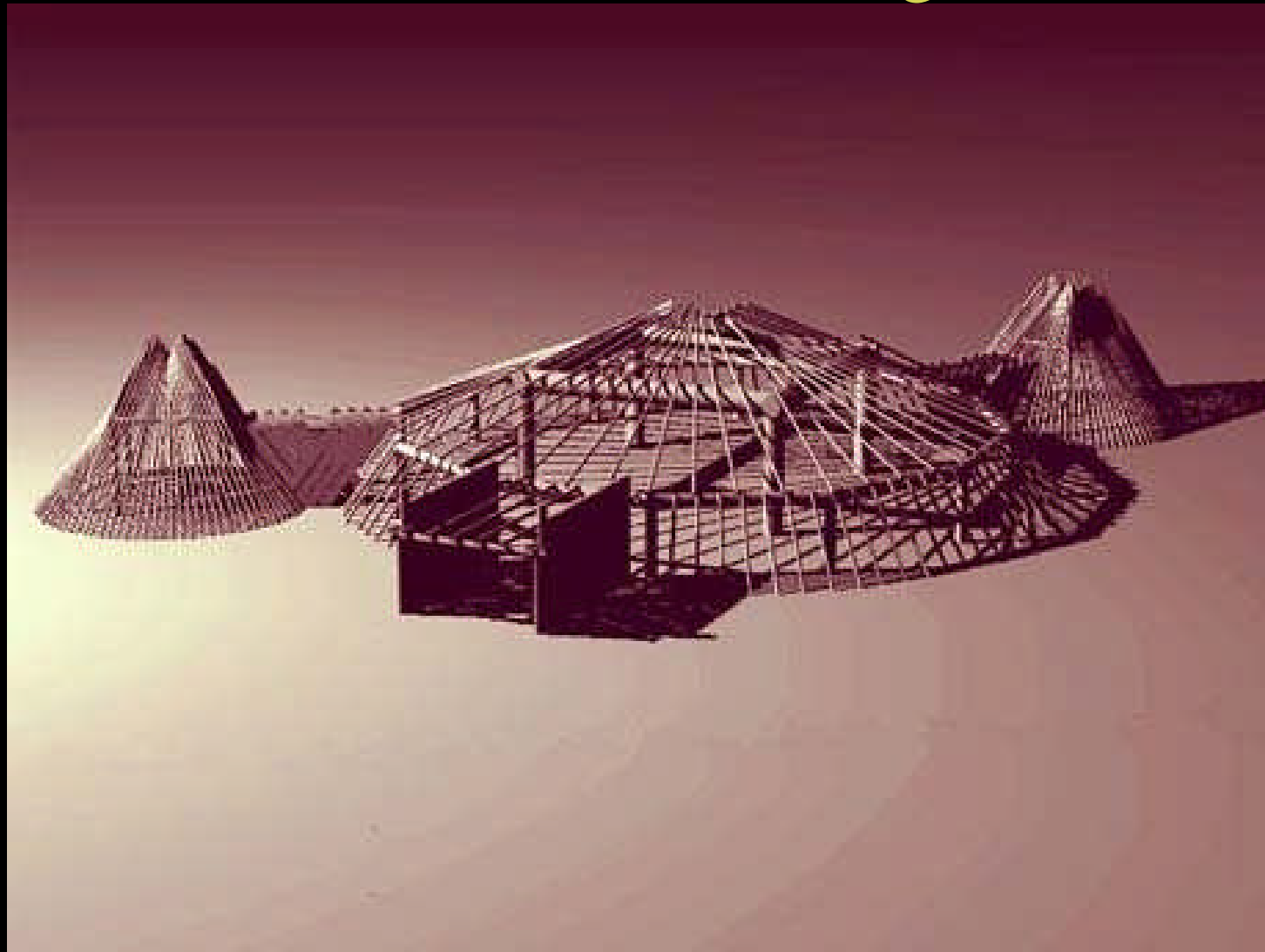
Passive Solar Design



Earthlodge: Natural Insulation



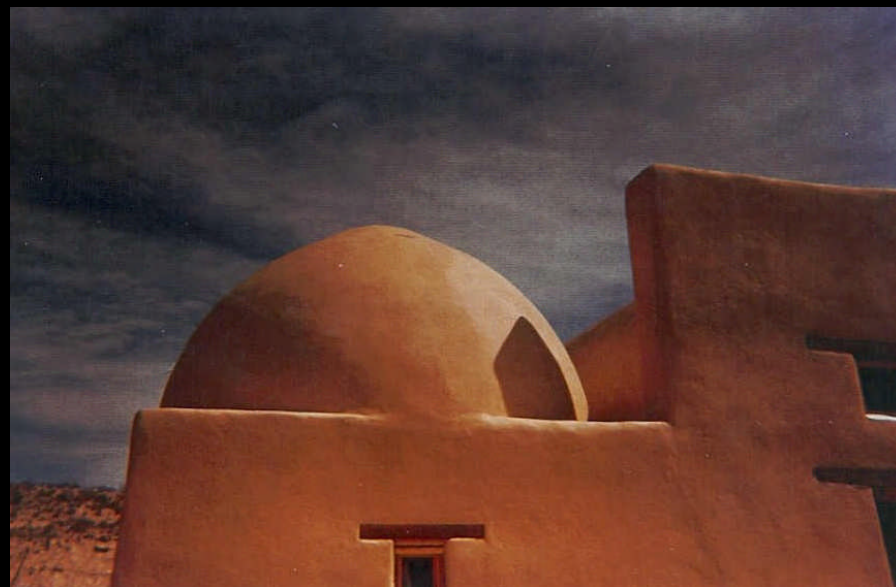
Earthlodge Framing: Sustainable Land Management



Earth House



Adobe: Passive Heating-Cooling



Earthships: Recovered Material and More



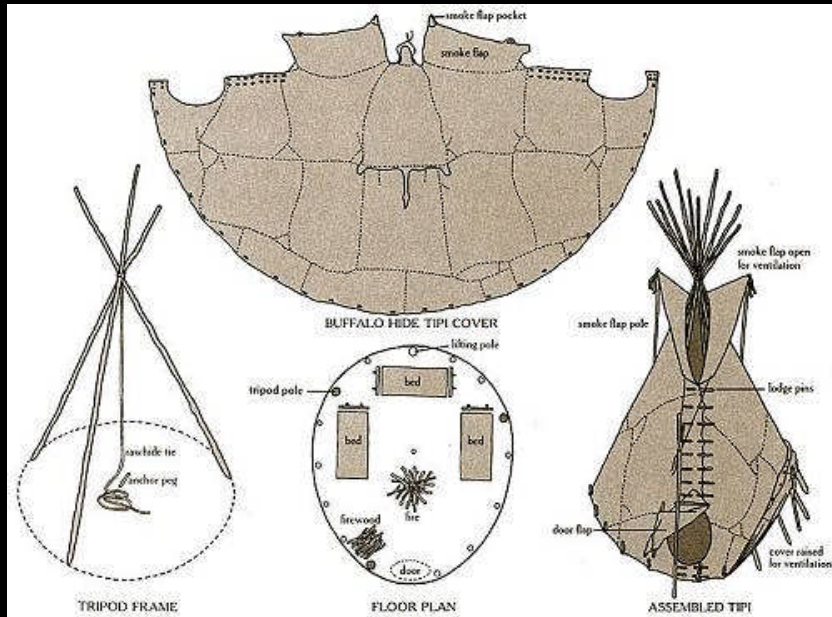
Hualapai



Taos



Tepee: Natural Ventilation; Mobility



Lifecycle Building Challenge 2008: Temporary Relief Shelter, Mobility

temporary relief shelter [a transient architecture]

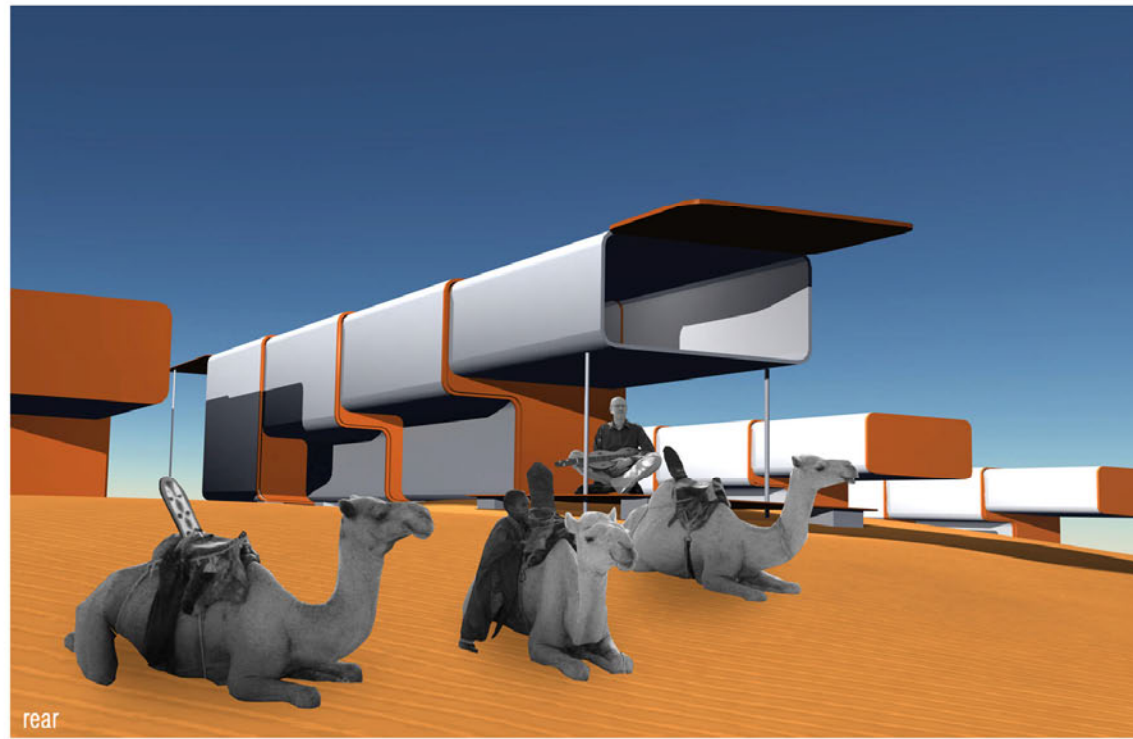
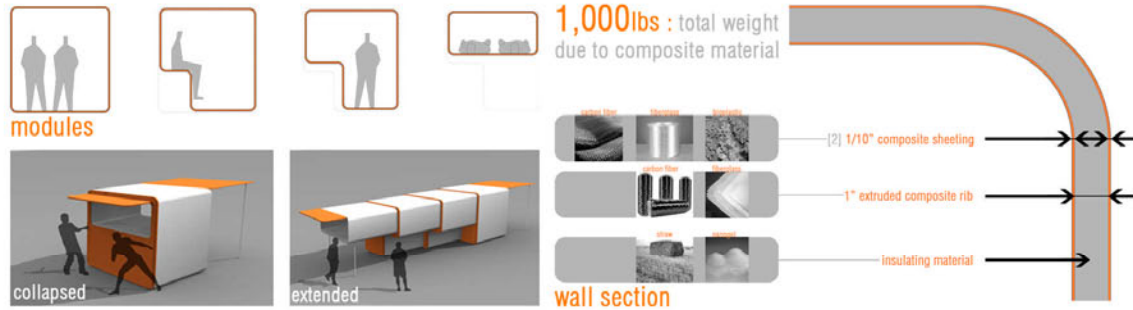


As information and international relationships have become ever **border less** and instantaneous, the acknowledgement of displaced people is continually apparent. Between natural disasters and military conflicts, millions of people annually are forced from their home, and in dire need of shelter.

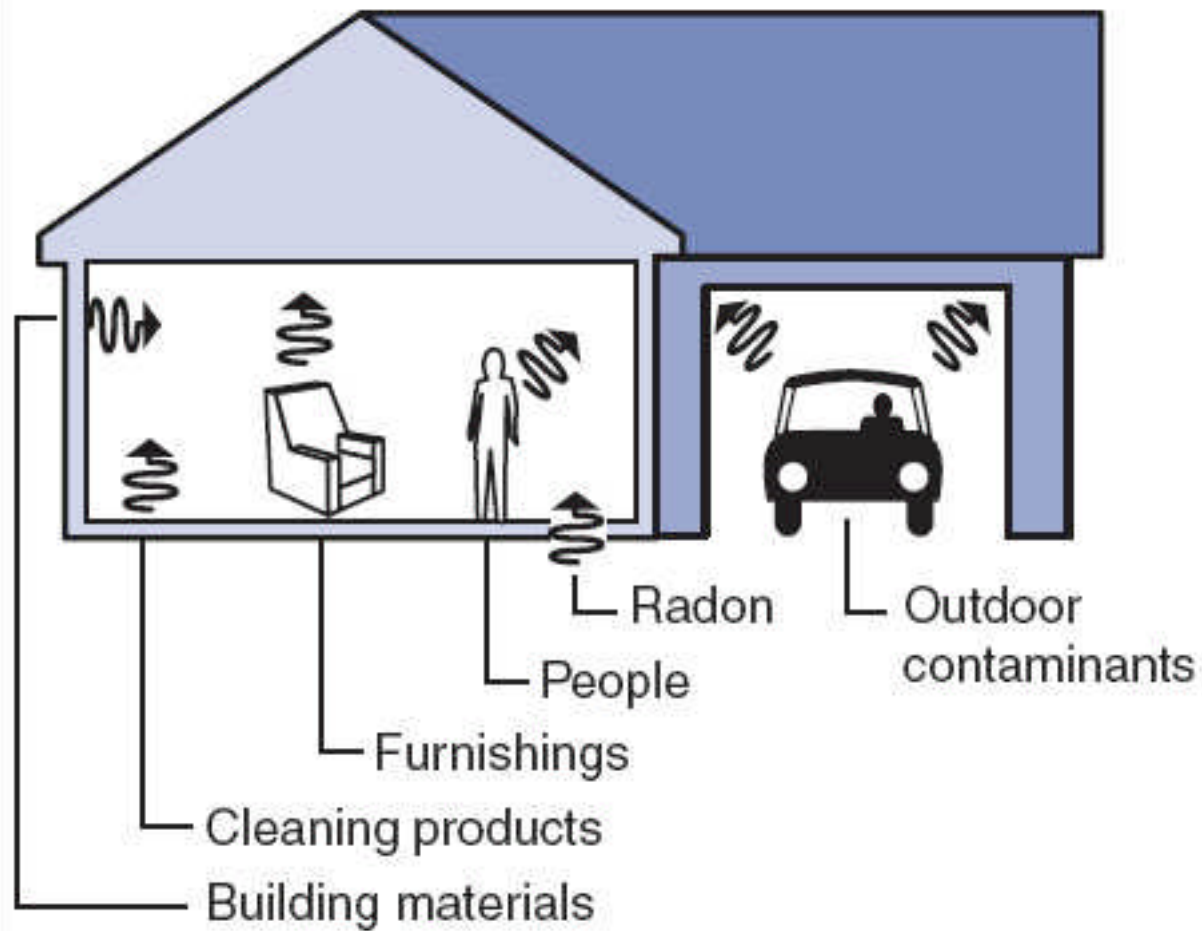
In an aid based response, a **re-usable** lightweight, highly transportable, rapidly deployable temporary shelter serves a basic, need based enclosure. Transient in nature, once deployed the unit is lived in, while a 'rebuilding period' transpires. Once re-habitation occurs, the shelter moves to the next place of need.



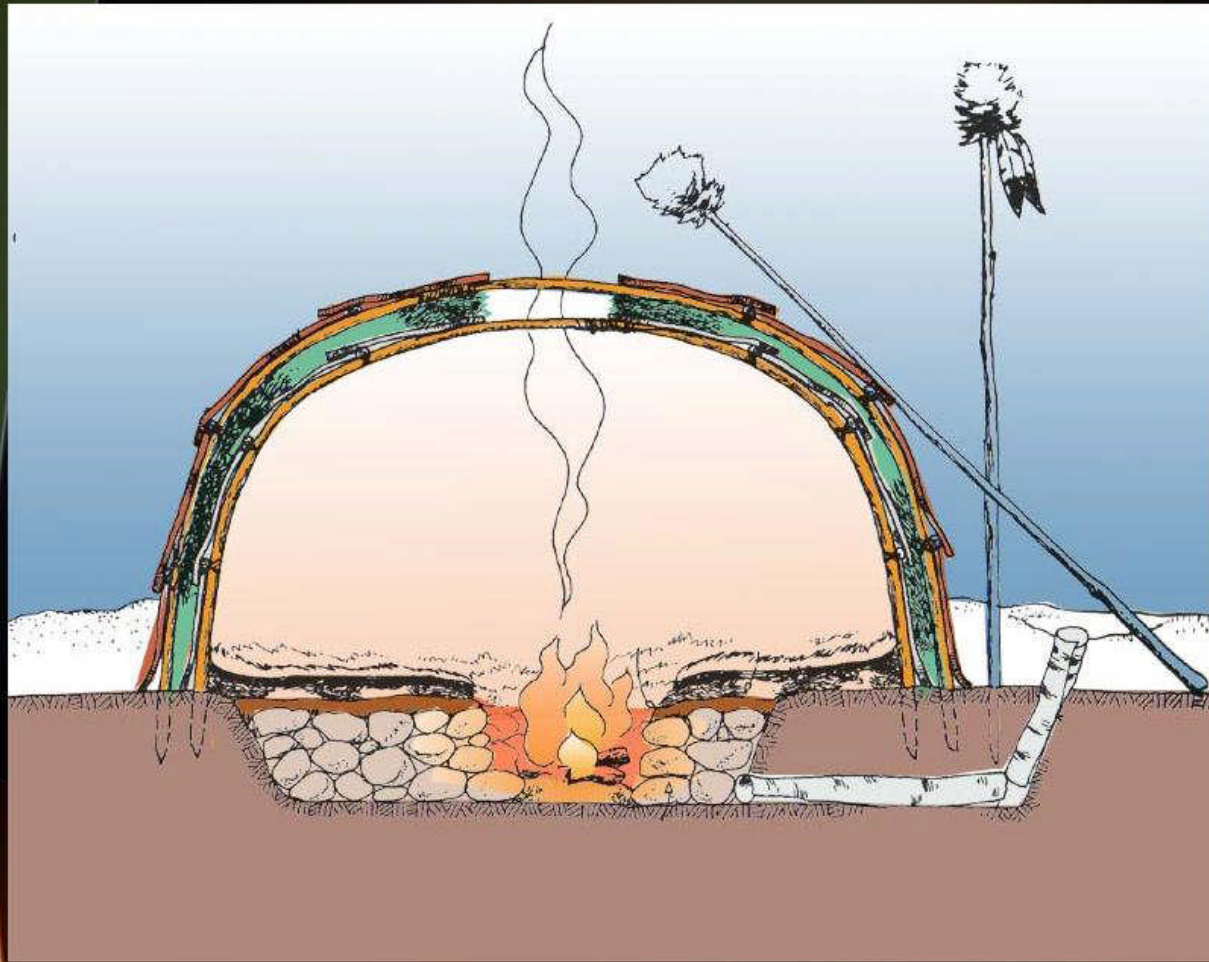
transport



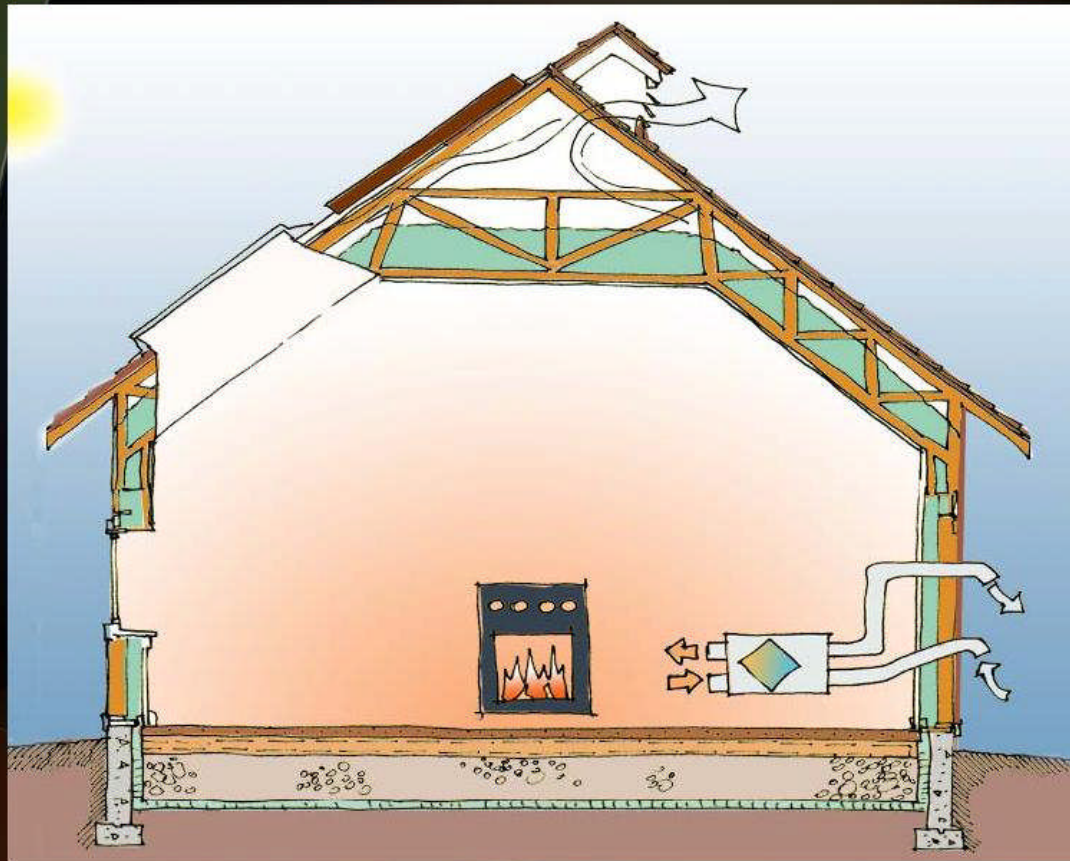
INDOOR AIR POLLUTION SOURCES



Wigwam: Natural Ventilation; Insulation; Thermal mass; Heat



Passive Solar Home: Natural Ventilation; Insulation; Thermal mass; Heat, Glass and Solar



Igloo: Insulation, Ventilation and Lighting



<http://img-tbhl.theonering.net/yabbfiles/Attachments/igloo.jpg>



<http://www.ri.net/schools/Narragansett/NES/Classrooms/Batchelder99/igloo.jpg>

Ice Hotel: Creating a Local Economy



Potawot Health Village: Integrating Medicine and Culture



Potawat Health Village: Integrating Medicine and Culture



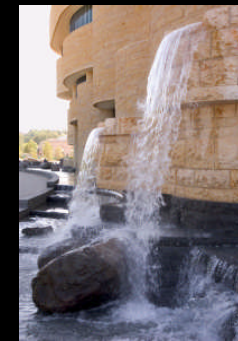
Ramona Reservation Renewable Energy Housing and Ecotourism Power System Project

First “off grid” reservation with full renewable energy power for all facilities on the reservation.



Native American owned facility that will train other rural/remote tribes to adapt this model to their residential and economic development needs.

National Museum of American Indian



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Tax Incentives and Rebates

- Site-built homes qualify for a \$2,000 credit if they reduce energy consumption by 50% relative to the International Energy Conservation Code standard.
- Manufactured homes qualify for a \$1,000 or \$2,000 credit depending on the level of energy savings achieved.
- Energy Efficient Homes Credit in the 2005 National Energy Policy Act
<http://www.irs.gov/pub/irs-drop/n-06-27.pdf>
- The tax credit for solar water heaters and solar panels was extended under the October 3, 2008 “Emergency Economic Stabilisation Act of 2008.”
- For more on Federal Tax Credits for Energy Efficiency go to:
http://www.energystar.gov/index.cfm?c=products.pr_tax_credits

Resources

- California Integrated Waste Management Board

<http://www.ciwmb.ca.gov/GreenBuilding/>

- Building and Buying Green in Indian Country: A Practical Guide for California Tribes

<http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1069>

- U.S. Green Building Council

<http://www.usgbc.org/>

- Rural Information Center

http://ric.nal.usda.gov/nal_display/index.php?info_center=5&tax_level=2&tax_subject=211&topic_id=1164

- Department of Energy: Tribal Energy Program

<http://www.eere.energy.gov/tribalenergy/>

- U.S. Housing and Urban Development Office of Native American Programs

<http://www.hud.gov/offices/pih/ih/index.cfm>

- California Coalition for Rural Housing

<http://www.calruralhousing.org/rural-housing-toolbox/native-american-housing-resources>

Resources

- Sustainable Development Institute
<http://www.sustainabledevelopmentinstitute.org/TribalGreen.asp>
- Red Feather Development Group
<http://www.redfeather.org/>
- Native American Indian Housing Council
<http://www.naihc.net/>
- Housing Assistance Council
<http://www.ruralhome.org/>
- Build it Green
<http://www.builditgreen.org/>
- The Adobe Alliance
<http://www.adobealliance.org/>
- Builders Without Borders
<http://builderswithoutborders.org/>
- Flex Your Power
<http://fypower.org/>