Sustainable Living

- 31 Years Of “Pocket Change”

  For Utility Bills

Who we are.
Those Two Ancient Middle Age Teenagers
Rich & Marian Taschler

Our Journey

What we did
What we learned
Results
What others did

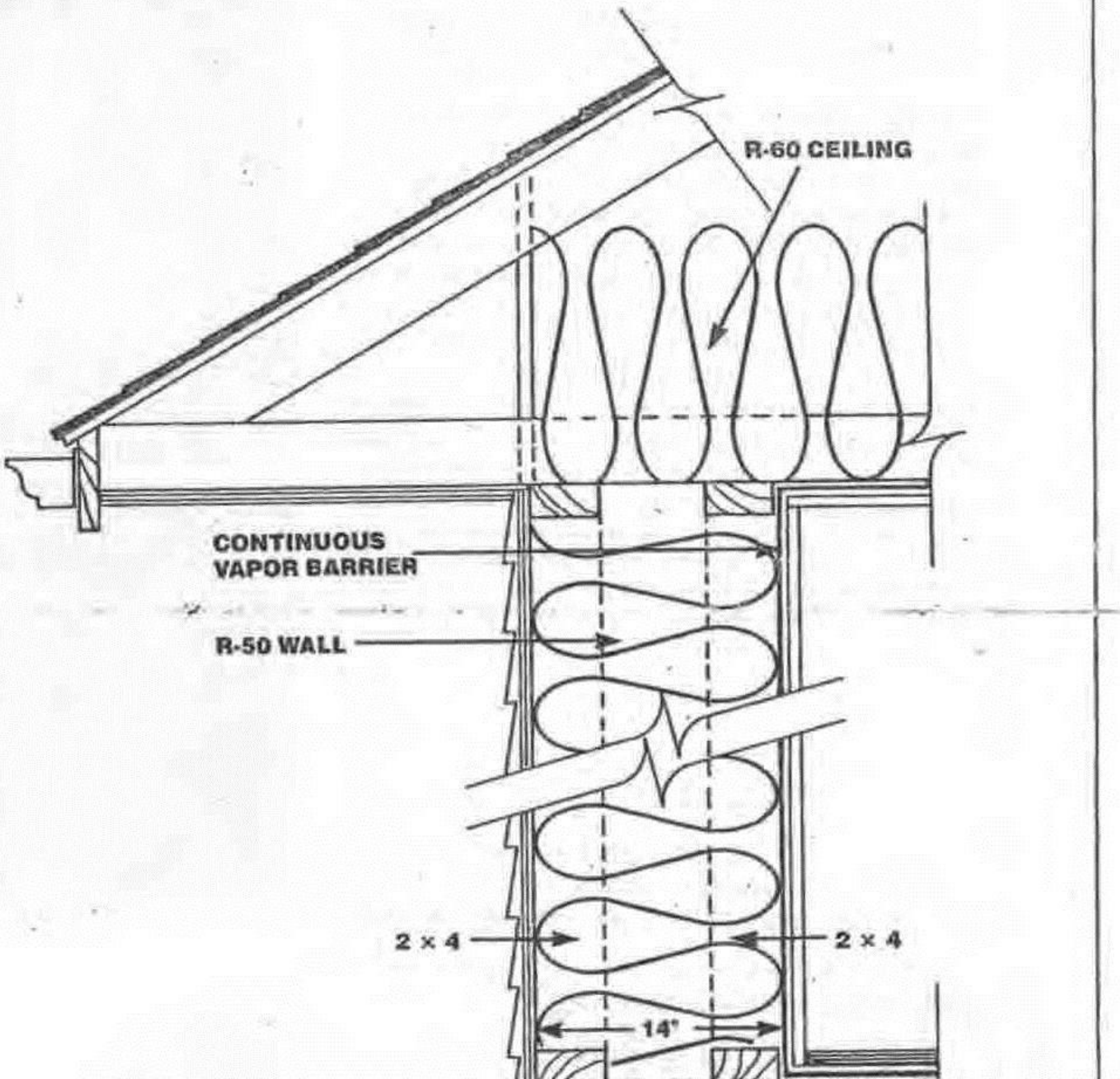
Cause & Effect

- The Energy crunch in the home 1970’s- 80’s.
- Electric heaters of multiple types became all the rage. Sales skyrocketed.

- But that approach went after the EFFECT of heat loss, NOT the CAUSE.
- We went after the CAUSE of heat loss in the house via insulation.

15” Of Insulation

THE ZERO-HEAT CONCEPT



Installing Rafter Vents

To completely cover your attic floor with insulation out to the eaves you need to install rafter vents (also called insulation baffles). Complete coverage of the attic floor along with sealing air leaks will ensure you get the best performance from your insulation. Rafter vents ensure the soffit vents are clear and there is a channel for outside air to move into the attic at the soffits and out through the gable or ridge vent (see Attic Air Flow graphic on Page 4.5).

To install the rafter vents, staple them directly to the roof decking. Rafter vents come in 4-foot lengths and 14-1/2 and 22-1/2 inch widths for different rafter spacings.

Rafter vents should be placed in your attic ceiling in between the rafters at the point where your attic ceiling meets your attic floor. Once they are in place, you can then place the batts or blankets, or blow insulation, right out to the very edge of the attic floor. Note: Blown insulation may require an additional block to prevent insulation from being blown into the soffit (see Page 4.5). A piece of rigid foam board placed on the outer edge of the top plate works very well for this.

3. PLACE RAFTER VENTS

Place rafter vents in between the rafters where the ceiling meets the floor.

Photo courtesy of Doug Anderson

4. ADD INSULATION

Add insulation around the rafter vent and out to the edge of the attic floor.

Photo courtesy of Doug Anderson

Attic Air Flow

The outside air flows through the soffit, along the rafter vent and out through the gable or ridge vent.

A RAFTER VENT

B SOFFIT VENT

C RIDGE VENT

NOTE: Gable vent not shown in this diagram.

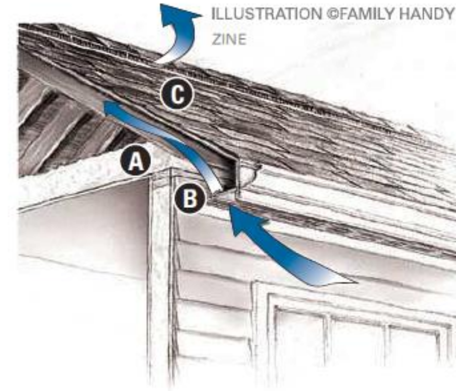


ILLUSTRATION ©FAMILY HANDY ZINE

For additional information on Indoor Air Quality (IAQ) issues related to homes such as combustion saf indoor air contaminants, and proper ventilation, visit: **http://www.epa.gov/iaq/homes/hip-front.html.**

GLOSSARY

ENERGY STAR – ENERGY STAR is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency. To learn more about the wide variety of energy-efficient ENERGY STAR products and processes visit **http://www.energystar.gov.**

Seal and Insulate with ENERGY STAR – A process recommended by the ENERGY STAR Program for improving the envelope of a home to make it more comfortable and energy-efficient. The process includes sealing air leaks and adding insulation where cost-effective.

Air Duct – A hollow conduit or tube (square or round) that circulates air from a forced-air heating and/or cooling system to a room (supply duct) or returns air back to the main system from a room (return duct).

Air Leak – A hole, crack, or gap where air can leak in or out of a house. Air leaks can make a home feel drafty or uncomfortable and waste energy (See Page 1.3).

Gable Vent – A screened vent installed at or near the peak of a roof gable that allows warm attic air to escape.

Insulation – A material that is designed to slow down the flow of heat in or out of a building structure.

Joist – A beam used to support floors or roofs (See Page 3.2).

Kneewall – A short wall in a room with a sloped ceilin usually formed when the room ceiling follows the roof a house (See Page 1.3).

Rafter Vent – A vent leading from the soffit into the att through the space between the attic rafters. This vent air to correctly flow past insulation into the attic spac Pages 4.4 or 4.5).

Recessed "Can" Light – A metal light fixture (or can) t in-set into the ceiling. These fixtures can be a big sour leaks when installed in the upper floor of a home (See 1.6 and 4.3).

Ridge Vent – A screened vent installed along the top r roof that allows warm attic air to escape (See Page 4.

Sill Plate – A wood plank that lays flat on top of a con masonry foundation or wall that supports a floor or ce (See Page 3.2).

Soffit – The underside of a building overhang, beam, o especially the underside of a stair or roof overhang (S Page 4.5).

Soffit Vent – A screened vent in a house soffit that allo to flow into the attic or the space below the roof shea This helps keep the attic cool in the summer and allow moisture in the attic to evaporate (See Page 4.5).

2x6” Studs
vs
Double Wall with staggered studs

- Why, over the years, have I had so many people whose homes were built using 2x6 studs come to me with their tales of woe seeking a solution to their high energy costs.
- 2 Sources of the problem.
  1.) Wood conducts heat
  2.) Micro channels
- The double wall eliminates both problems.


6209

Our Super Insulation Retrofit

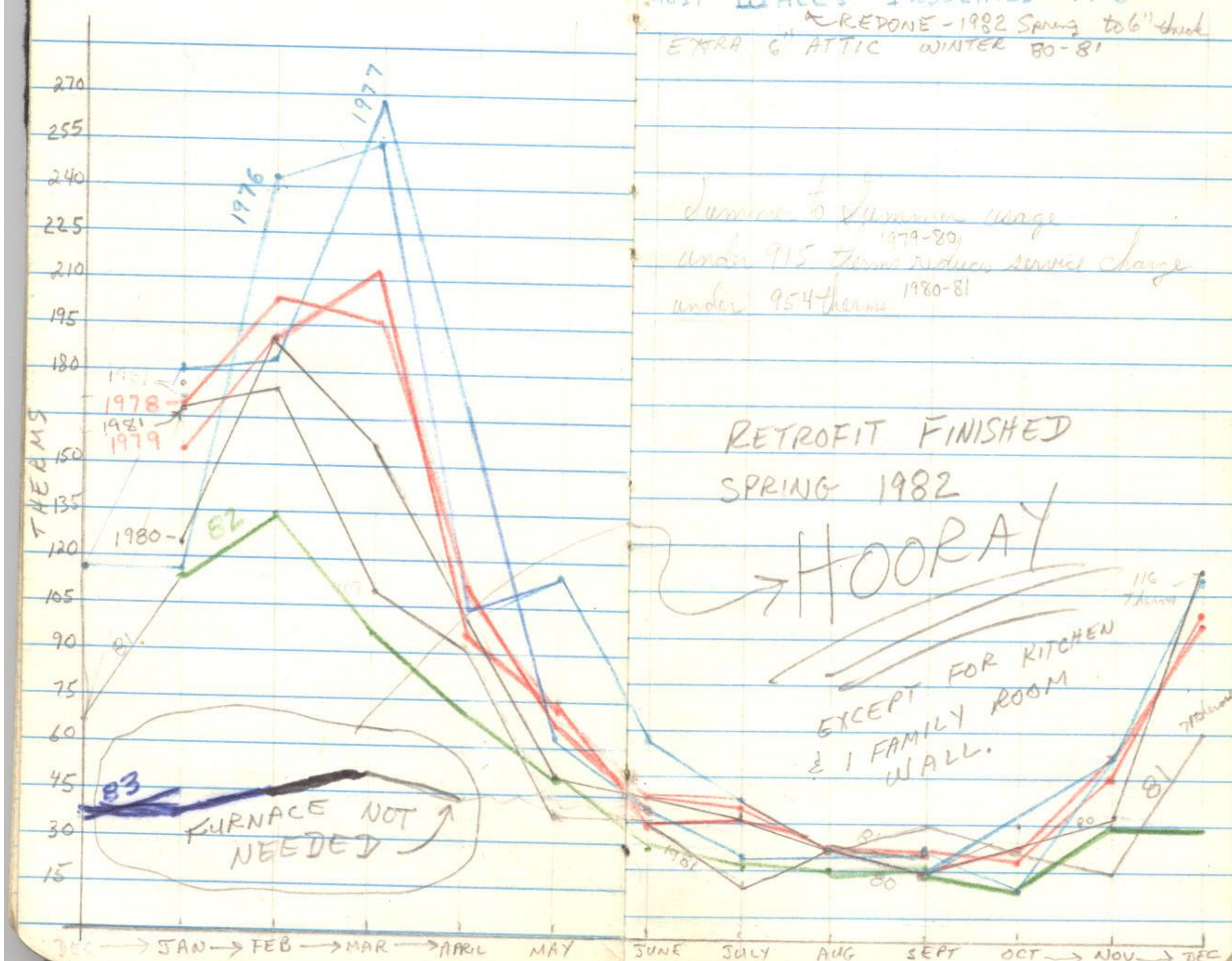
- Begun in 1976 doing 1 or 2 rooms each year.
- Completed 1983 at which time we turned our furnace **OFF**. Washington Gas **DESCENDED** upon our house. (They have to get money [2.5 million] to pay for their fraud against the federal gov't.).
- Costs: $2300 for materials -$2000 Federal rebate
- **$300**
- 23 Single Pane Windows BUT we had 3 children and their stereos, TVs, a gazillion hot showers, cooking, etc., etc., compensated for no furnace.

GAS USAGE

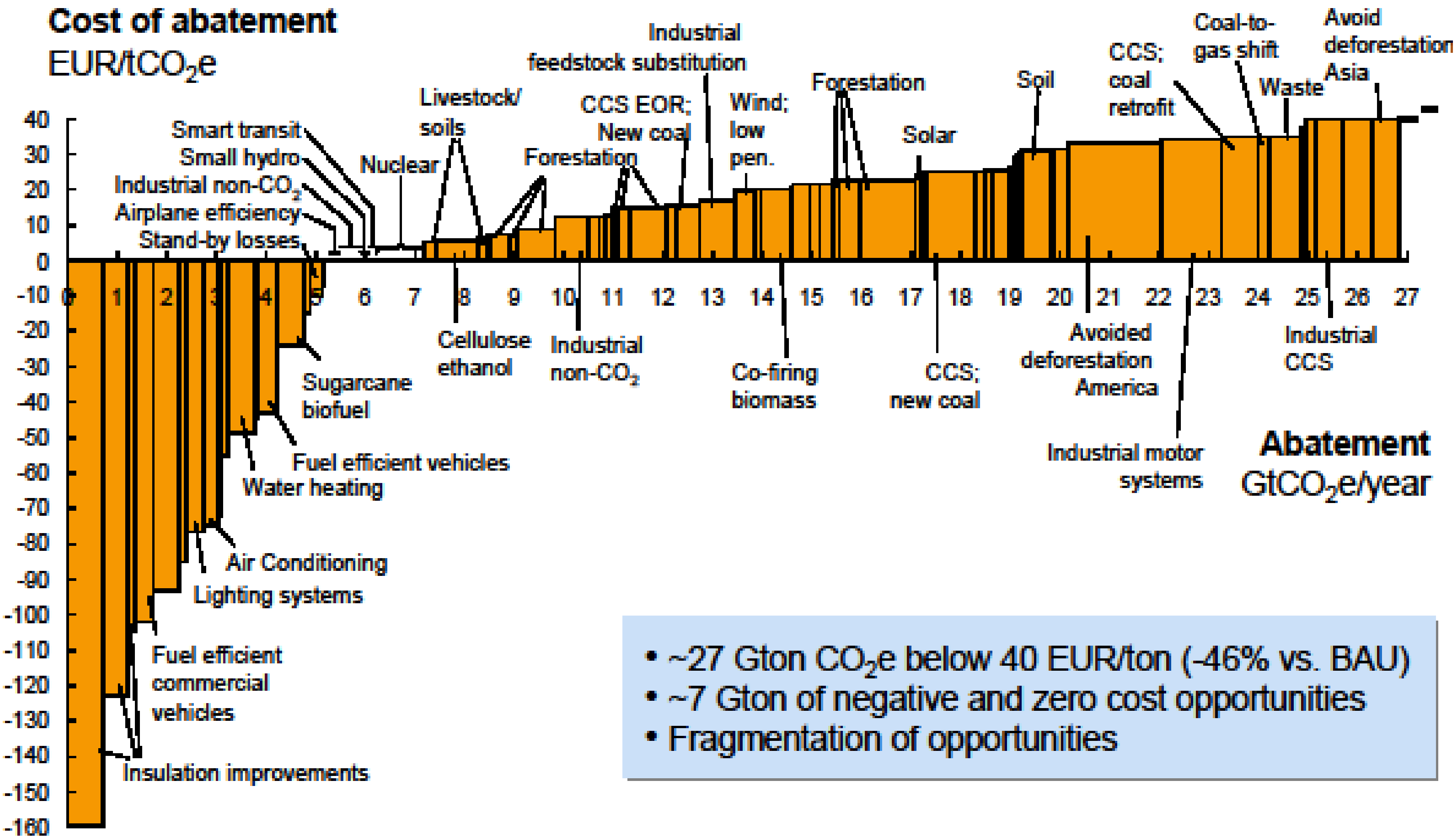
ATTIC INSULATED - SUMMER 1975

MOST WALLS INSULATED - 1978 ↖REDONE - 1982 Spring to 6" thick

EXTRA 6" ATTIC WINTER 80-81



Global cost curve of GHG abatement opportunities beyond business as usual



- ~27 Gton CO$_2$e below 40 EUR/ton (-46% vs. BAU)
- ~7 Gton of negative and zero cost opportunities
- Fragmentation of opportunities

VATTENFALL

Our House 25 years Later

Do we have mold or otherwise damage the house from what we did?

We removed the sheet rock from 2 walls.

<u>No! It looked like the day we insulated.</u>

Benefits of Super Insulation

- Sound Proofing from outside noise.
- A comfort factor that makes you never again want to live in a 'regular' house.
- Reduce or eliminate heating bills

  No furnace or smaller less expensive furnace
- Reduce electric usage (heating/cooling).

  Smaller less expensive central air conditioner
- Solar Hot Water & Solar Electric are Icing On The Cake

1990 we became Empty Nesters

- Do we need a Furnace?
- House evaluated resulting in 2 alternatives.
- 1. A small space heater at each end of house.
- 2. Smallest apartment furnace available on the market, **but there are none small enough**.
- And **no central air conditioner unit available is small enough**.
- 2014 - **STILL no central units small enough**.

Our Home's (3000 sq. ft.) Energy Costs (Gas + Electric)

- 2012 $545.41
- 2013 $522.63
- 2014 $614.88
- And YES, we heat/cool the entire house.

- Our **Energy Star Rating (Out of 10 Possible)**
- 2011 9.8 (Before Solar Electric)
- 2012 9.9 (After Solar Electric)
- 2013 9.9
- 2014 9.9

The First Solar Subdivision In The USA

- Where - Just a few miles outside Chicago
- When – 1940
- Actually, half the subdivision homes were solar and properly insulated. They sold out fast.
- BUT – WWII came, the Depression ended, fossil fuels were cheap so no need to properly insulate homes.
- **BUT we are beginning to catch up to where we were despite the chicanery of the fossil fuel moguls.**

- Did you know that since 1980, homes have been built in Alaska, Canada and across the Northern USA that are so well insulated that furnaces are

NOT installed OR needed?

Saskatchewan

- Insulation
- Walls R40
- Ceiling R60

bule, a virtually airtight door that leads into the living area. The three doors function as an airlock, preventing blasts of cold air from finding their way into the home. Because the house is so well-sealed, closing the innermost door is a bit of a surprise. As the door swings shut for the last few inches of travel, you can actually feel air resistance try to keep the door open. It's a little like trying to close the door on a Volkswagen *Bug*.

But conservation doesn't end with airtight construction and heavy insulation. In standard homes, a significant amount of energy literally goes down the drain as hot dirty water from washing, cooking, and bathing. But the Conservation House is equipped with a water-to-water heat exchanger which operates much like the air-to-air heat exchanger described earlier, using waste heat from the outgoing water to preheat the cold incoming water on its way to the water heater. About 50 per cent of the heat that otherwise would end up in the sewer is recovered in this way.

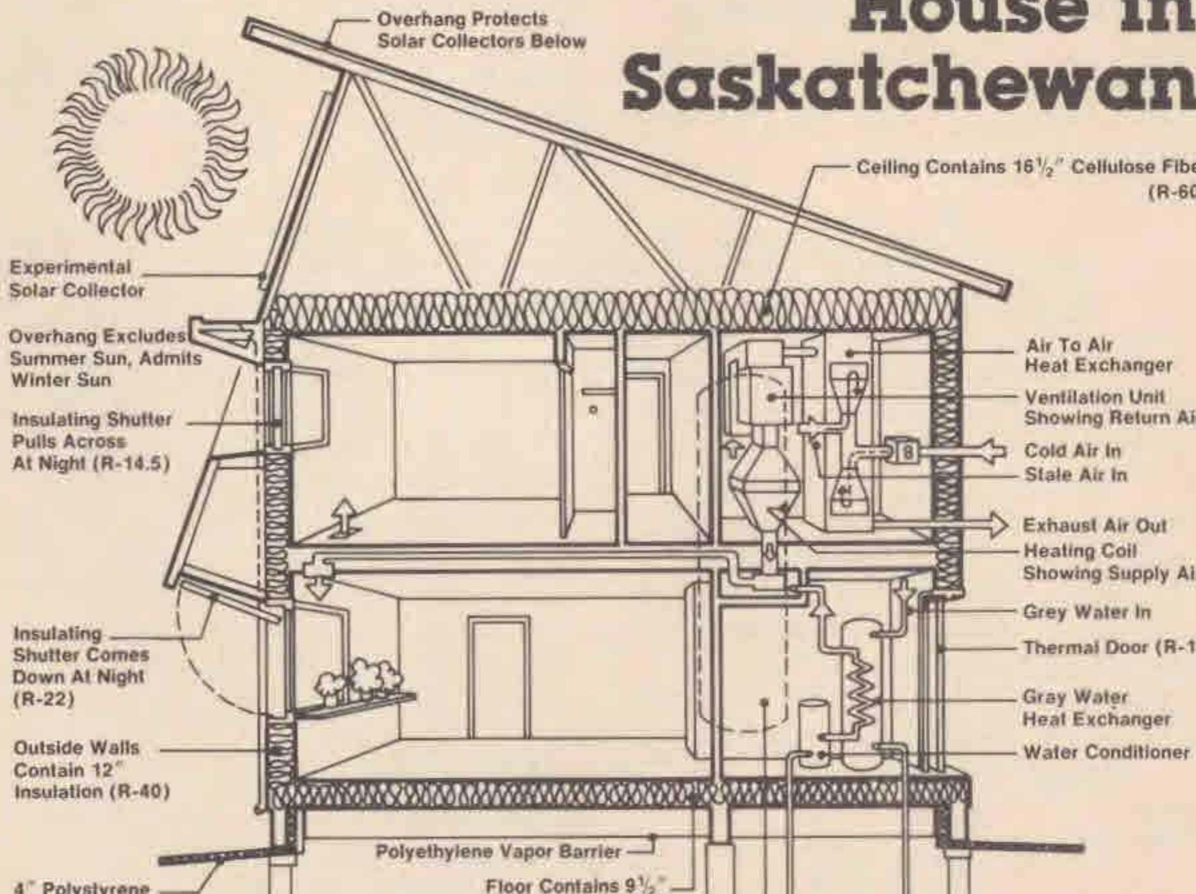
Every kitchen appliance has been selected for efficiency, every tap is equipped with water-conserving devices to minimize waste. All interior walls are light-colored to enhance natural illumination, and to reduce the need for artificial lighting.

All these steps add up to impressive energy savings. The sun, along with incidental heat given off by lights, appliances, and people, provides around 75 per cent of the energy required to warm the house. The remaining heat is sup-

Thick R-22 shutters fold down over the home's largest windows at night. They're electrically operated from switches mounted in the living room.

The smaller windows in the house are equipped with interior sliding shutters, which are closed at sunset, and opened at breakfast.

The Conservation House in Saskatchewan

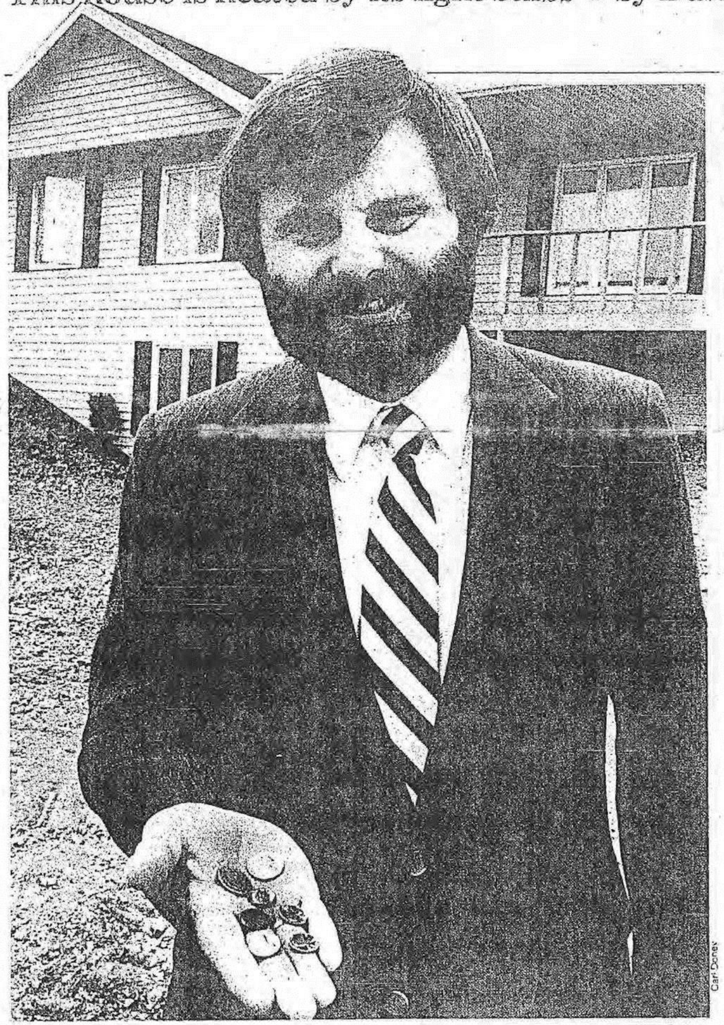


Upstate New York

- Walls 14” R value of 50
- Attic R 60

A 64-CENT HEATING

This house is heated by its light bulbs • by David



John Magar is in the business of giving people what they want. He's been building custom homes in and around Livonia, New York, for 11 years. Livonia, 25 miles south of Rochester, had some 1200 residents the last time anyone checked. "In a small town like this," Magar told me, "you'd better do a nice job, or you're not going to last. Bad word spreads fast." Every time Magar puts up a house, he puts his reputation on the line. That went double in 1982, with the housing industry looking like it was down for the count. It wasn't the time—and Livonia wasn't the place—for taking chances.

It was then and there, though, that Magar decided to gamble. When Helen and Carl Chichester came to him with a set of plans and asked him to build them a house in nearby Cuylerville, he put them off. Magar told the Chichesters to wait until he returned from a seminar in New York City. A seminar on superinsulation.

Magar came back inspired. He'd seen what was involved in superinsulated con-

Massachusetts

- Walls
- 9” Thick giving R Value of 35

Double walls, superinsulation, and $50 annual fuel bills

The No-Frills, No-Furnace House That Gene Built

by Frederic S. Langa

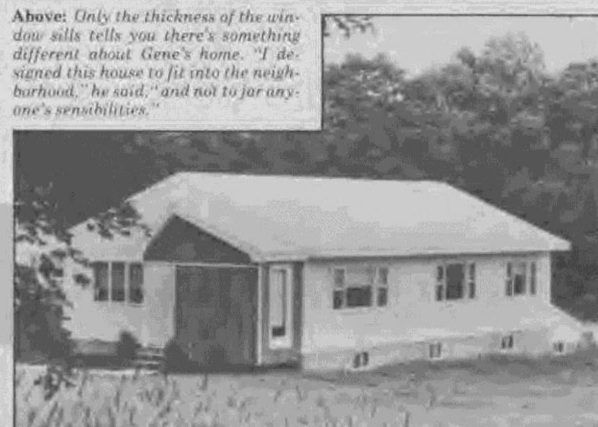
"Something's radically wrong with the gospel according to conventional home builders." Gene Leger was speaking about his favorite subject—energy-efficient housing—and as he warmed to the theme, his voice began to boom. "If you follow the advice most builders give, you either end up with a house only half as efficient as it could be, or an efficient house you can't afford."

Gene believes he's found a way to deliver the benefits of efficient construction without the high costs. Along with a handful of other builders and contractors around the country, Gene designs his homes with super-insulated double walls.

"I did a thorough analysis of different wall structures before we bought our first nail, in order to see what would work best," Gene recalls. "First, I looked at mass walls, which have worked well in sunny climates, and are becoming popular throughout the nation. After all, massive homes are relatively easy to build: Any concrete supplier can drive to your site and literally pour you a house with high mass and relatively low R in the walls, so that thermal energy can enter the house and 'charge' the mass with heat. But here in Massachusetts and in other cold, cloudy climates, the benefits of massive construction are outweighed by the high cost of masonry. You end up with an expensive house

Location: Pepperell, Massachusetts
Living Area: 1100 square feet
Selling Price: $53,900 in January 1980 (includes building lot)
Heating System: Baseboard hot water
Owner: John Gallant
Builder: Gene Leger (Vista Homes)

Above: *Only the thickness of the window sills tells you there's something different about Gene's home. "I designed this house to fit into the neighborhood," he said, "and not to jar anyone's sensibilities."*



Belgium

- **New Law of the country**

- **ALL NEW CONSTRUCTION MUST BE SUPER INSULATED**

New “Energy Star” homes by local builders in 2012

- Energy Star Rating of 3 out of a possible 10.
- They use the super efficient (90+%) large furnaces. (And just as expensive to replace).
- Just think, they make more money off of expensive furnaces/air conditioners. The fossil fuel (oil/gas/electric) moguls (I refer to them as mongrels) love it and the building trade loves it.
- **And the consumer gets to pay and pay and pay them!**
- Compare that to our Energy Star Rating of 9.9
- And our oversized 80% efficient Apartment furnace with its inefficient oversized ductwork.

Fast forward 30+ years to 2014

- A new “Net Zero” DREAM HOME, which is:

- A passive solar home in Falls Church, Va.
- And uses the same basic concepts.
- The materials and equipment have improved.
- Note the large and numerous windows which the owners love.


7619

NoVa Passive House

7619 LeonardDrive
Falls Ch VA 22043
Owne.: Caroline and Nelson Labbé

Climate Zone 4A
Bedrooms: 4 Bathrooms: 3
Living Space: 2,200 sf
Conditioned space: 3,600 sf

Designer: Peter Henry Architecture
Website: pgharch.com

Builder: Dobson Building and Remodeling
Website: dobsonbuilding.com

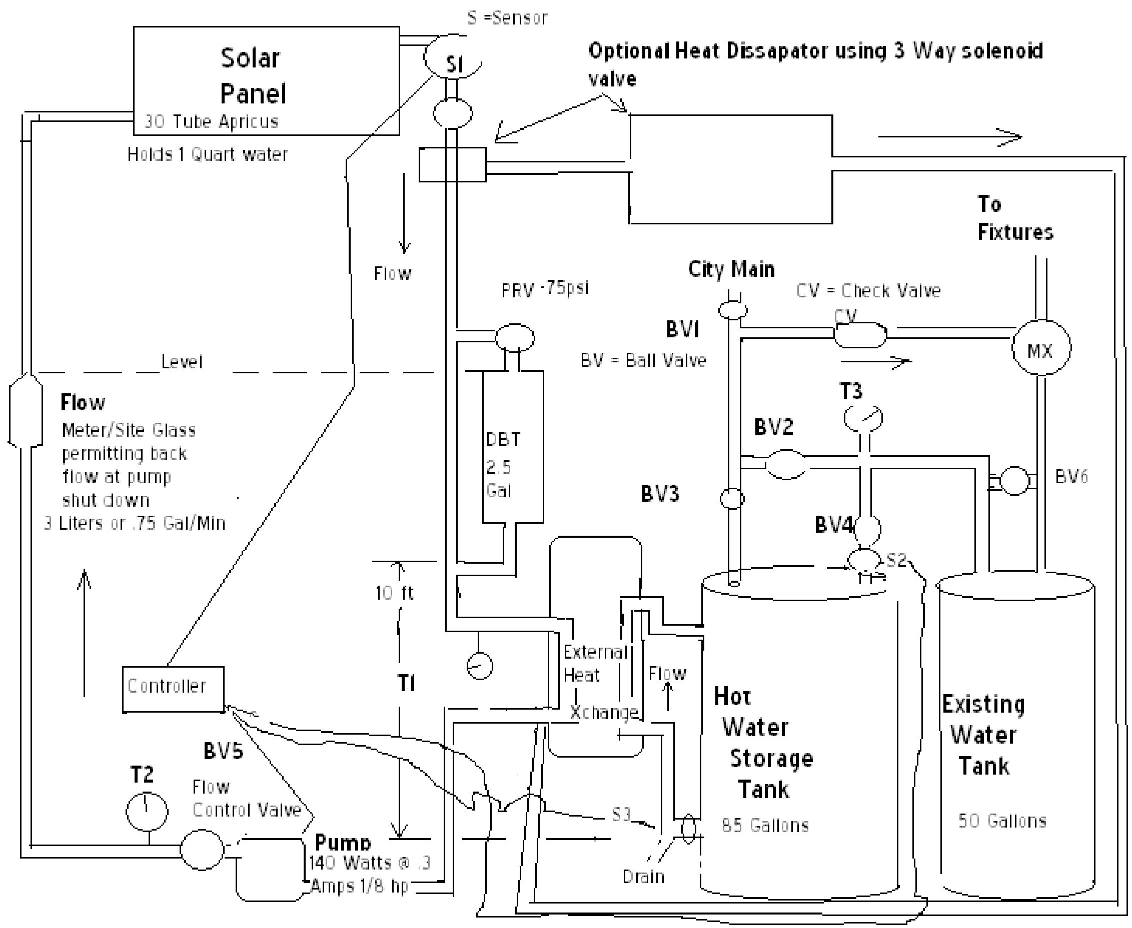
Energy Rater: Richard Lensis, Energy Masters of Virginia, 703-367-0336

Construction: Foundation: Full Basement poured con
Basement insulation: EPS foam boar 7" under entire slab, 2” under footing, 6" on exterior of basement walls
Wall frame: Double wall with staggered studs, advanced frame construction
Wall sheathing: Zip System sheathing
Wall insulation: Cellulose dense packed, 9.5"thick, EPS board 2" on exterior of Zip sheathing
Wall air barrier: Zip System sheathing and tape
Siding: James Hardie fiber-cement siding installed over $^{3/4}$ rainscreen
Windows: Thermotech Fiberglass Fenestration windows with triple glazing
Roof frame: Truss construction to create unconditioned ventilated attic
Roof sheathing: *5/8"* OSB
Ceiling insulation: Cellulose, 24" on attic floor
Ceiling air barrier: Zip sheathing sealed with tape
Roofing: Asphalt shingles

Energy: Passive House certified
HERS Rating: 37
Blower-door test results: *0.55* ach@50Pa
PHPP specific space heat demand: 4.27 kBTU/sft.yr
Actual energy use (Sep 2013 - Sep 2014): average 652.7 kWh/month
High: 1154 kWh, Feb 2014
Low: 342 kWh, Oct 2013
Energy sources: Completely electric
Space heating and cooling: Fujitsu Halcyon minisplit heat pump, supplemented by a coil in the ventilation ductwork that circulates fluid through a buried ground loop
Ventilation: UltimateAir DX200 energy recovery ventilator
Domestic Hot Water: GE GeoSpring heat pump water heater
Appliances: Energy Star rated appliances, induction cooktop, condensing clothes dryer
Lighting: LED light fixtures throughout house, CREE screw-in bulbs BA 19, Commercial Electric T47 recessed-look ceiling fixtures, FElT Electric BR30 flood recessed fixture bulbs

Water Efficiency:
Low-flow plumbing fixtures
Toto 1.28 gpf toilets
Delta H20 showerheads
Two rain barrels (with more planned) used for watering the garden and flowers

Solar Hot Water System Diagram




GreenBrilliance
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