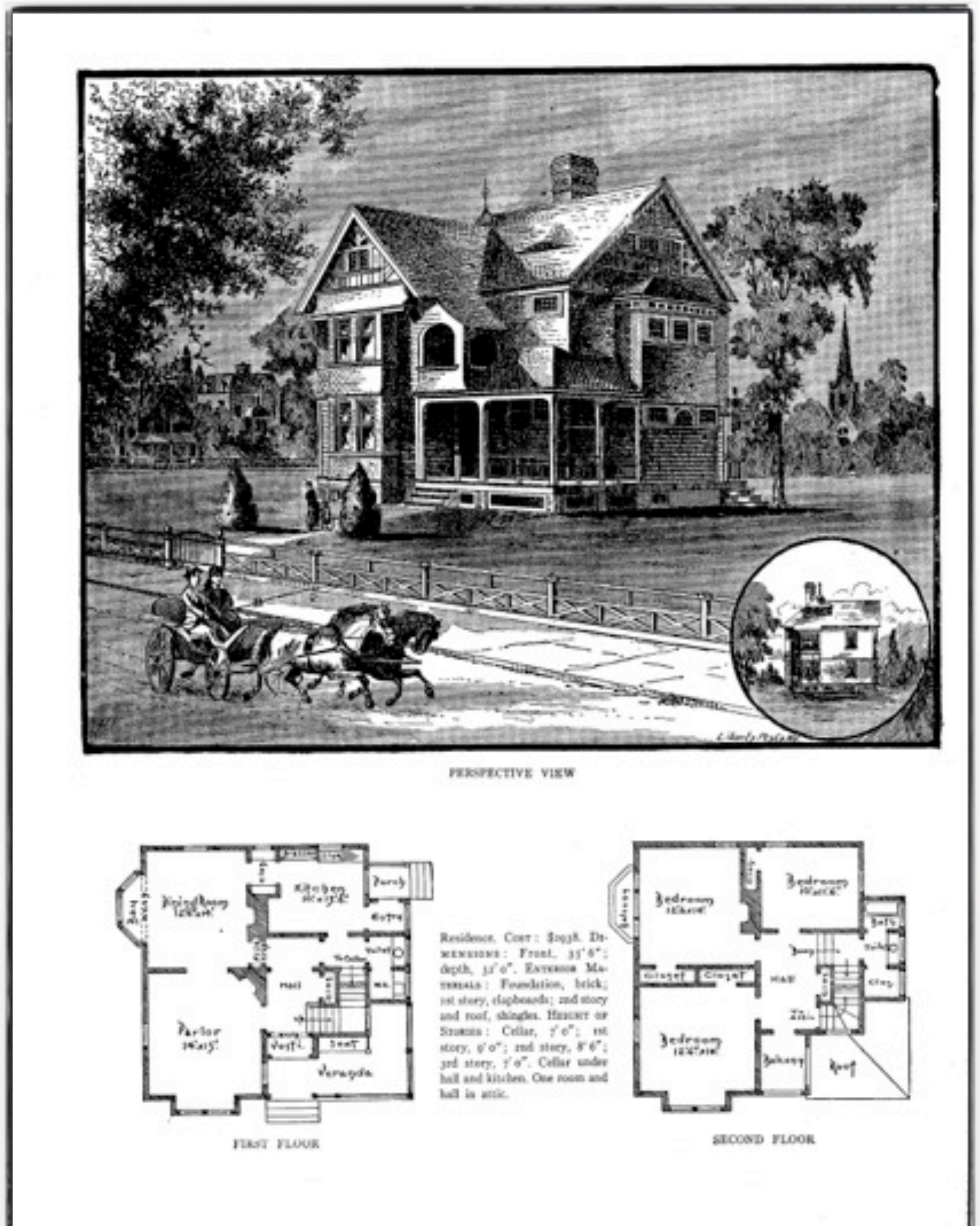
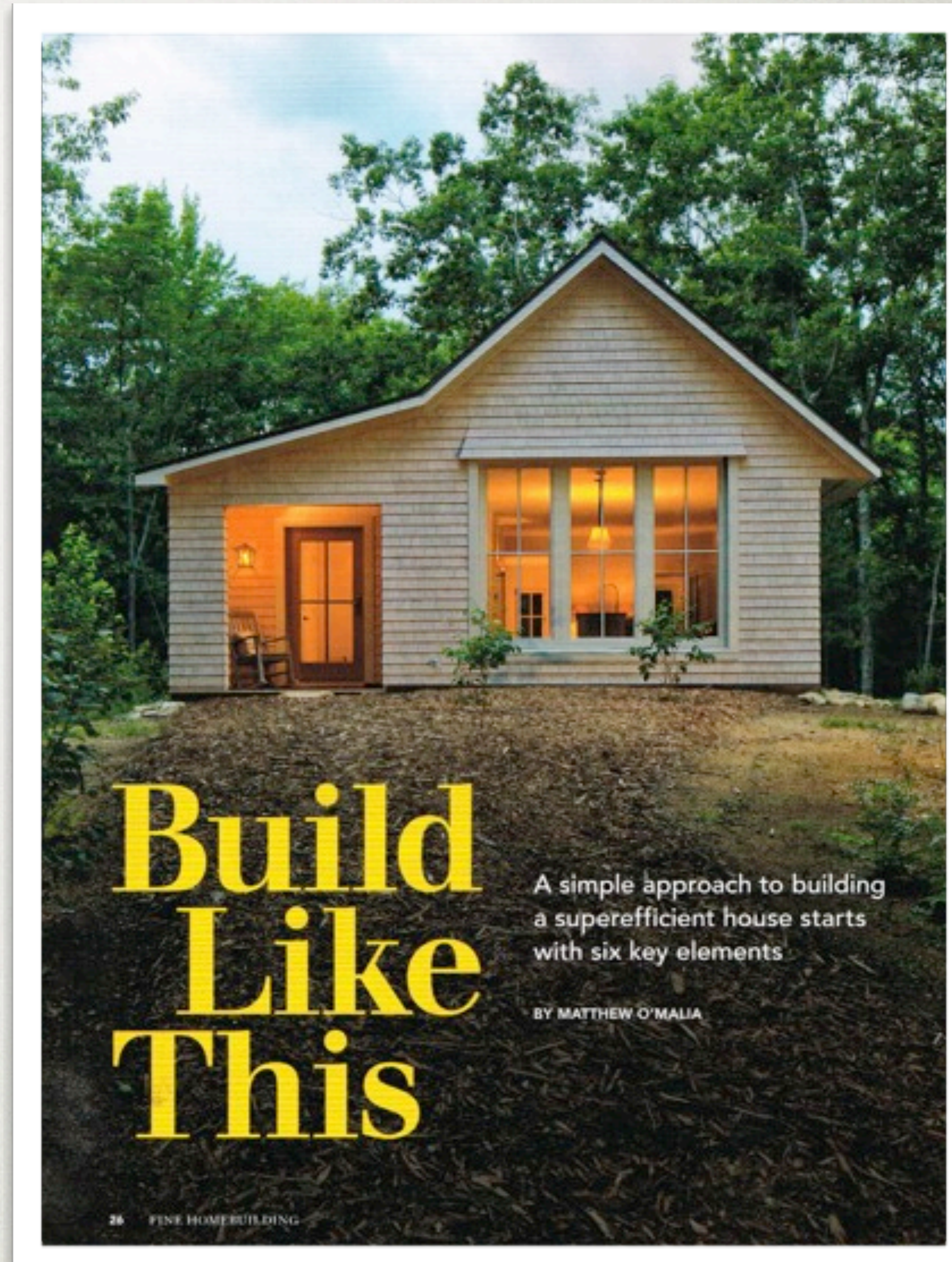
DREAM HOME GOES GREEN

Bruce Fleming-Smith MRAIC LEED AP BD+C
OCEANSIDE DESIGN www.oceansidedesign.ca

DREAM HOME GOES GREEN



DREAM HOME



WHAT'S YOUR DREAM HOME?

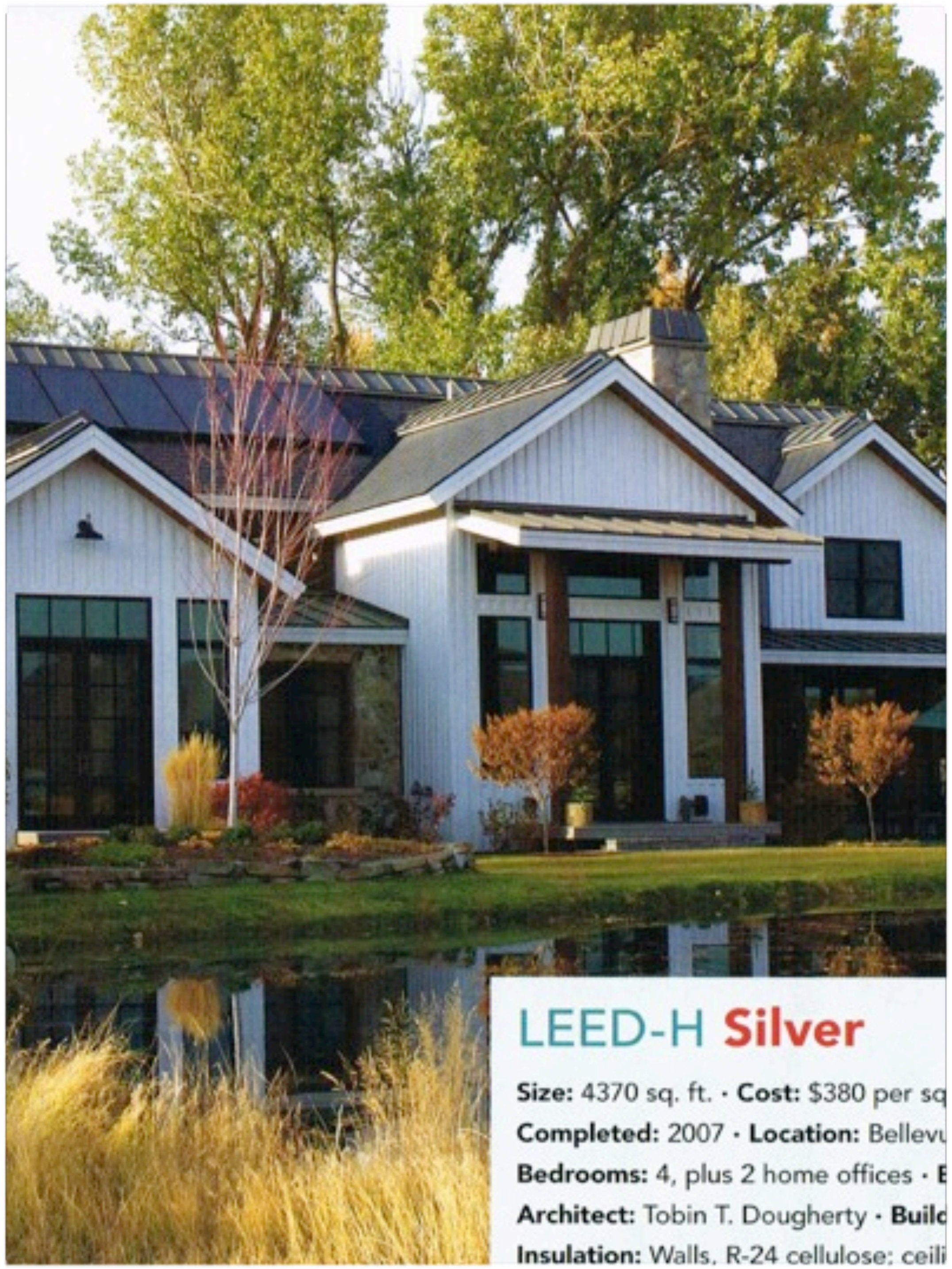
- cottage organic

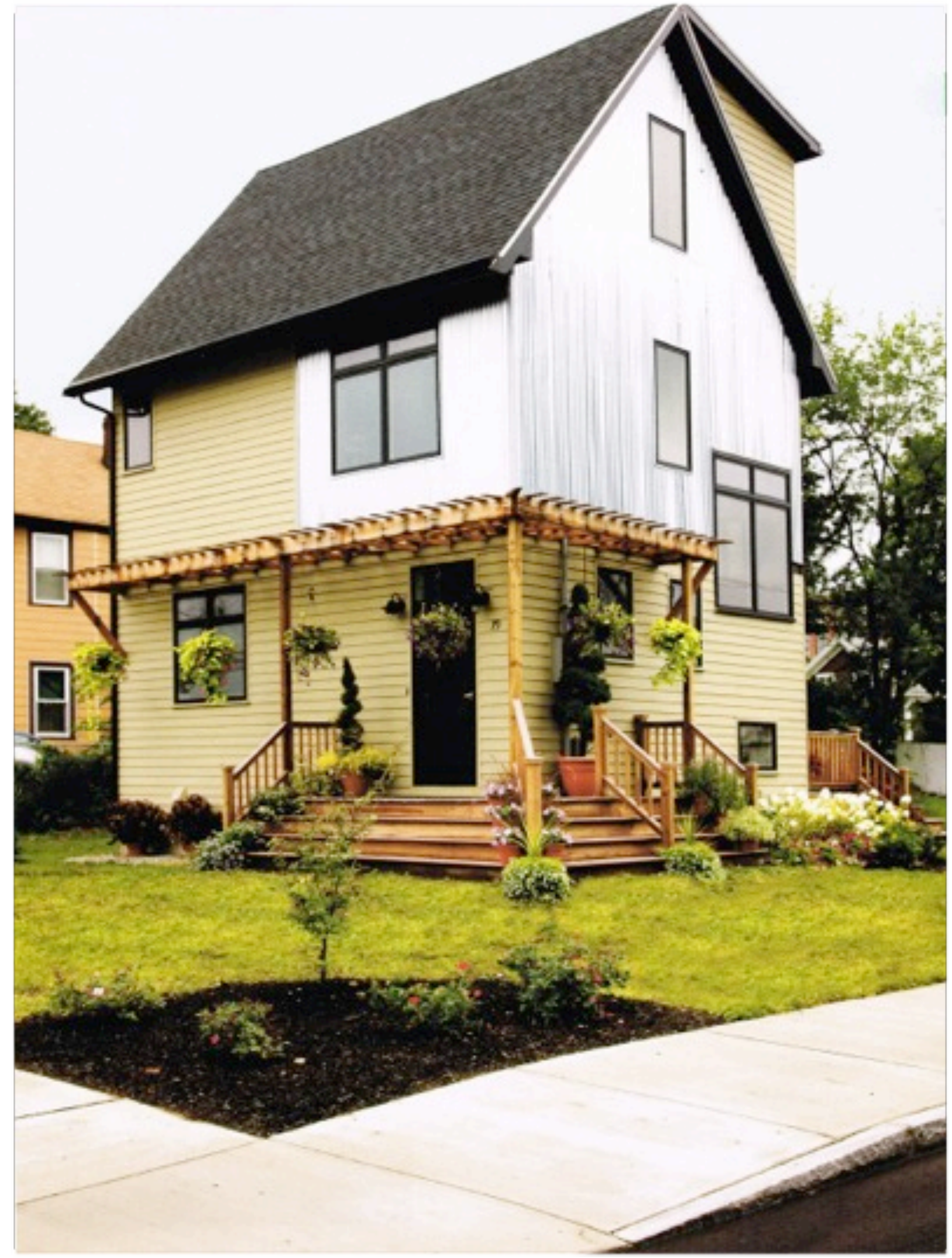
DREAM HOME

WHAT'S YOUR DREAM HOME?

- cottage organic
- purist perfection

DREAM HOME

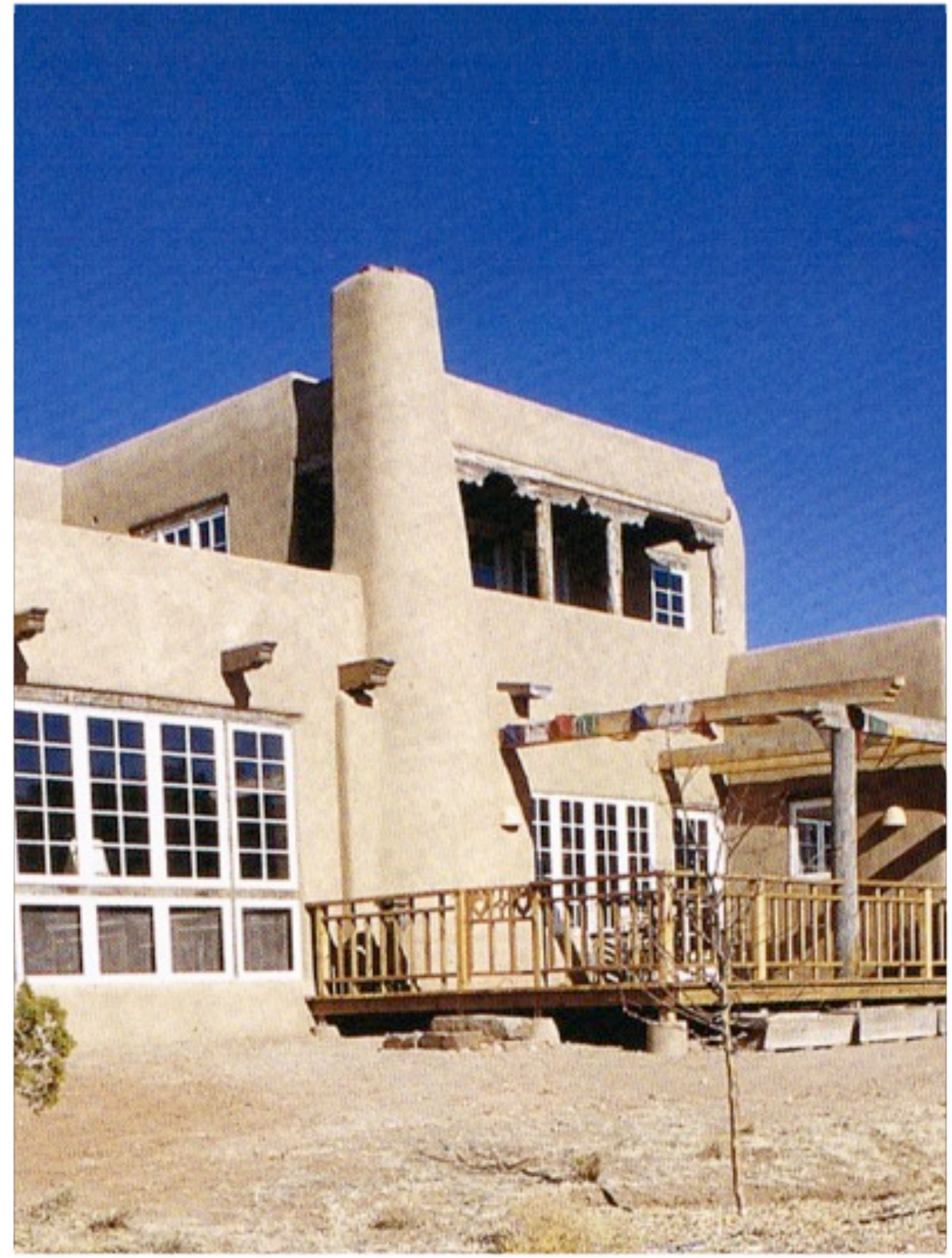




WHAT'S YOUR DREAM HOME?

- cottage organic
- purist perfection
- LEED certified

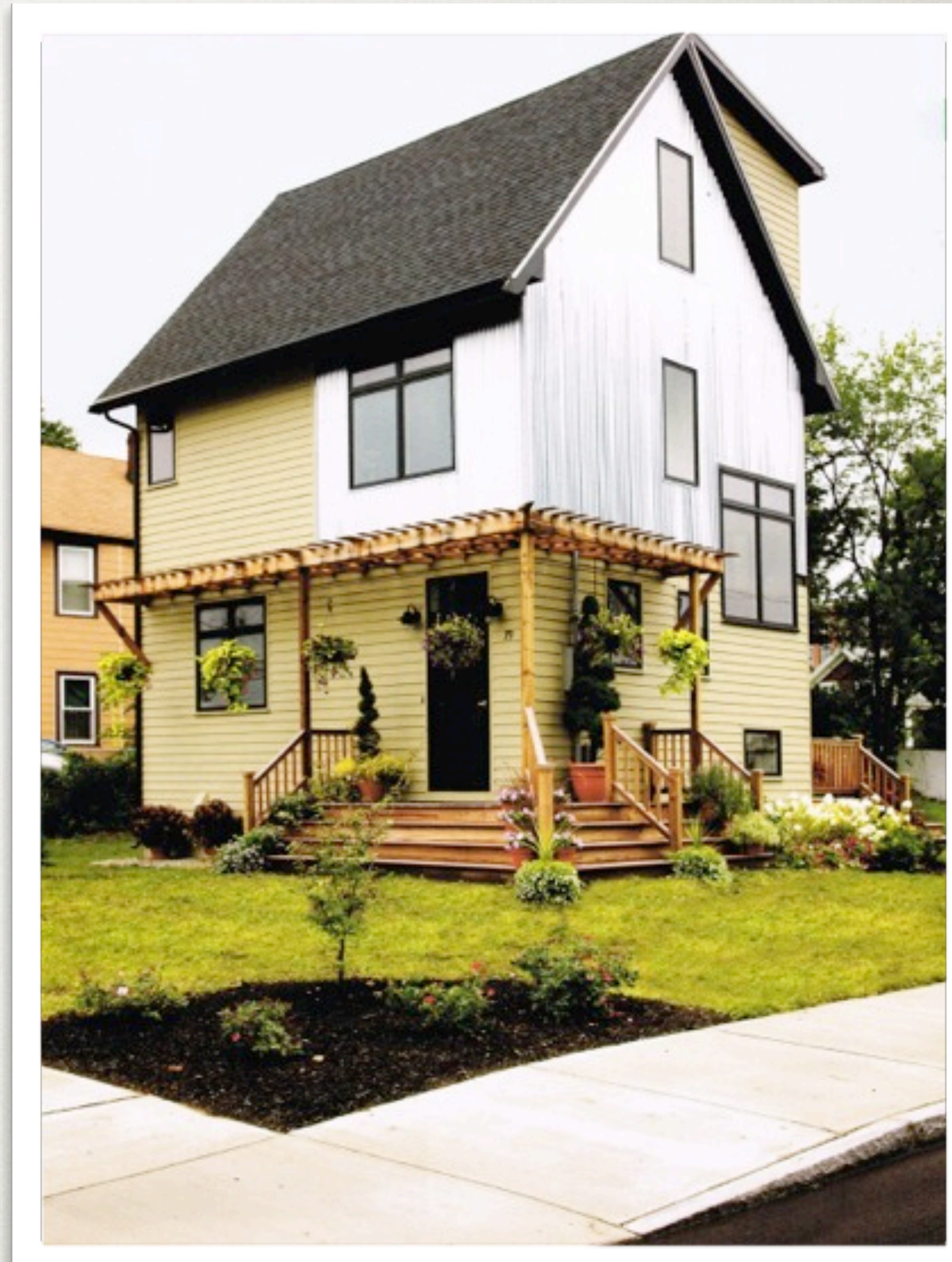
GREEN HOMES



WHAT'S GREEN?

- The "natural home"

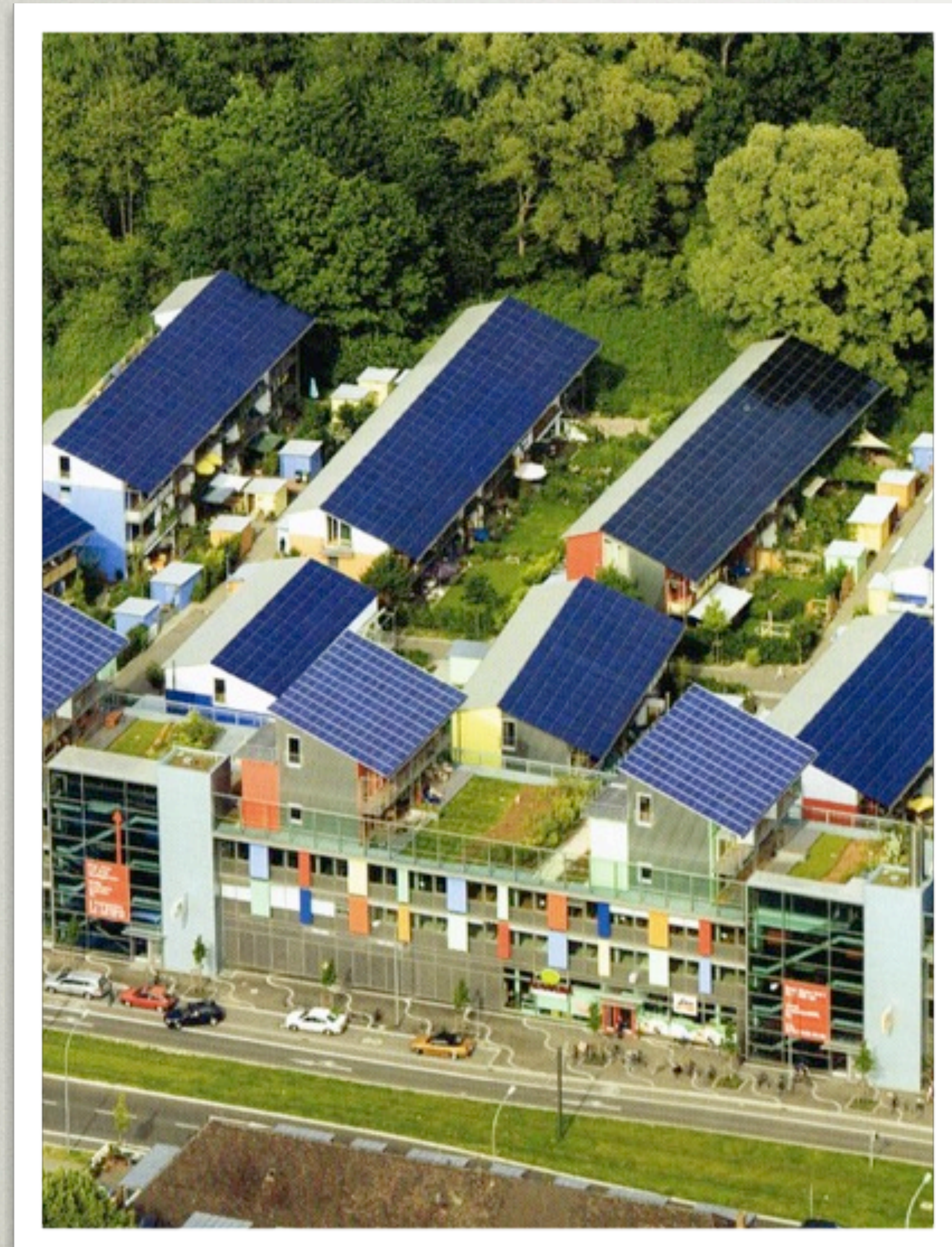
GREEN HOMES



WHAT'S GREEN?

- the "natural home"
- the LEED certified home

GREEN HOMES



- the "natural home"
- the LEED certified home
- the "net zero energy home"

WHAT'S GREEN?

GREEN HOMES

- the “natural home”
- the LEED certified home
- the “net zero energy home”
- the “Passive House”

WHAT’S GREEN?

DREAM HOMES - AN EVOLUTION

- EARLY PRECEDENTS
- TURN OF THE CENTURY
- EARLY MODERNISTS
- POST WAR
- FROM THEN TO NOW

GREEN HOMES - AN EVOLUTION

EARLY PRECEDENTS

- 15th C timber & thatch cottage
  Sussex England

GREEN HOMES - AN EVOLUTION

EARLY PRECEDENTS

- 300 year old German Fachwerk farm house

GREEN HOMES - AN EVOLUTION

EARLY PRECEDENTS

- Dutch Farmhouse 1750
- 1/3rd of space was farmers home
- early 19thC had 12 residents

GREEN HOMES - AN EVOLUTION

EARLY PRECEDENTS

- Irish tenant farm
- typical of low & middle class farms

GREEN HOMES - AN EVOLUTION

EARLY PRECEDENTS

- early New England saltbox
- early Cape Cods date back to 1600's
- 1780 farmhouse typical of colonists of the New England seaboard

GREEN HOMES - AN EVOLUTION

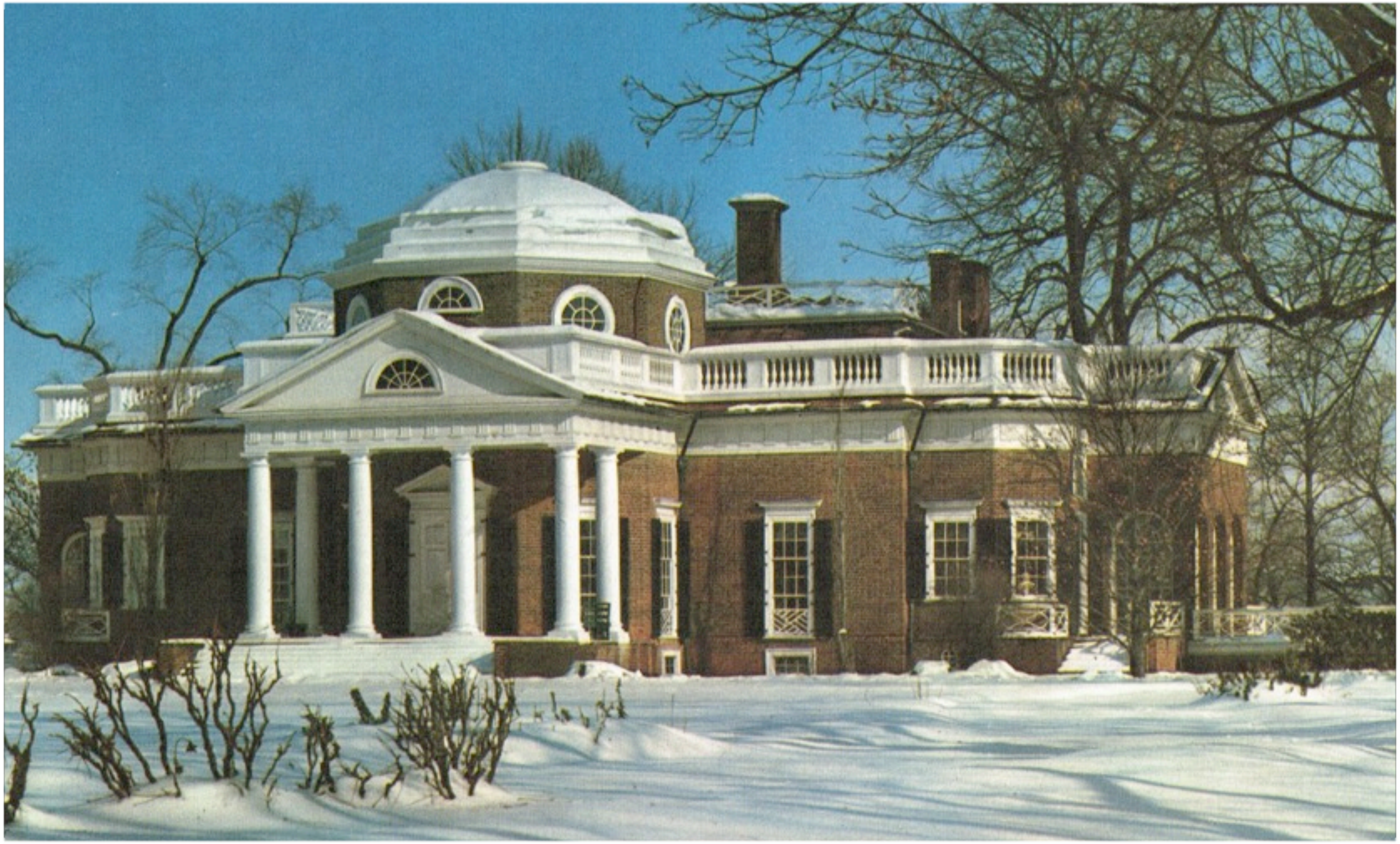
1796 Count Rumford's new fireplace design is published

- brick Portsmouth house begun 1716
- N.J. farmhouse begun 1775 as 2 room cottage
  2nd storey added 1800 - porch & kitchen in 1840
- 3 storey Portsmouth mansion built 1807

EARLY PRECEDENTS

GREEN HOMES - AN EVOLUTION

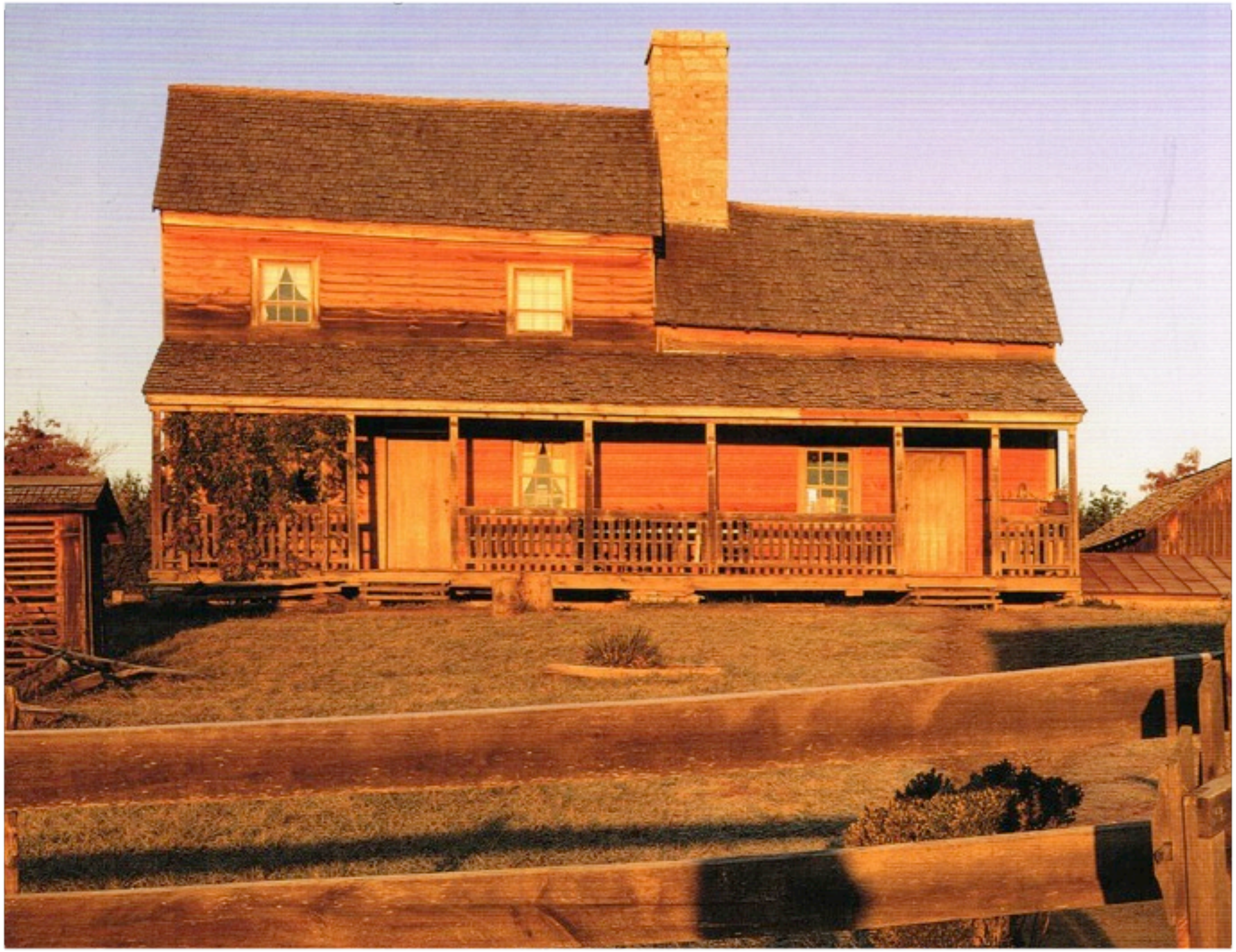
1871 Chicago fire
1872 Yellowstone Park est.



EARLY PRECEDENTS

- Thomas Jefferson's Monticello
- built originally as a "plantation home" 1772 - 1809
- modeled on European precedents

GREEN HOMES - AN EVOLUTION



EARLY PRECEDENTS

- 2 storey section built 1830
- kitchen wing & porch built 1840
- open kitchen fire typical mid 19th C

GREEN HOMES - AN EVOLUTION

1882 1st steam gen. central electric power plant - N.Y.

EARLY PRECEDENTS

- prosperous 1858 Wisconsin Fachwerk
- cast stove replaces open hearth fire
- a green revolution in thermal comfort, fuel efficiency, and indoor air quality

DREAM HOMES - AN EVOLUTION

- Cabins (built 1901)
- Cottages (built 1891)
- Castles (built 1895)

TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

- The "Country House" as Dream Home

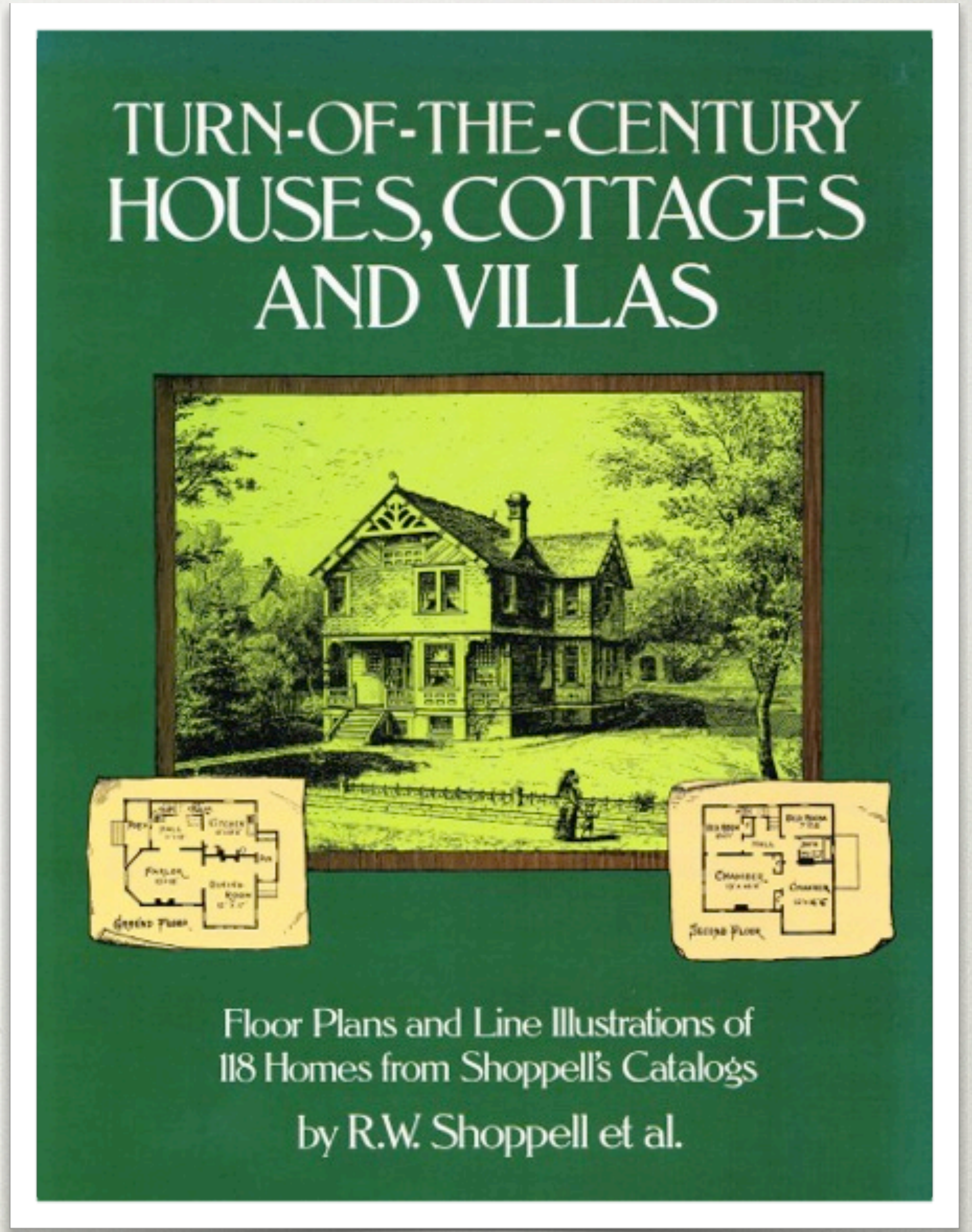
- Architect designed country homes for the wealthy

- Catalogue plans for the average middle and upper-middle class citizen

TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

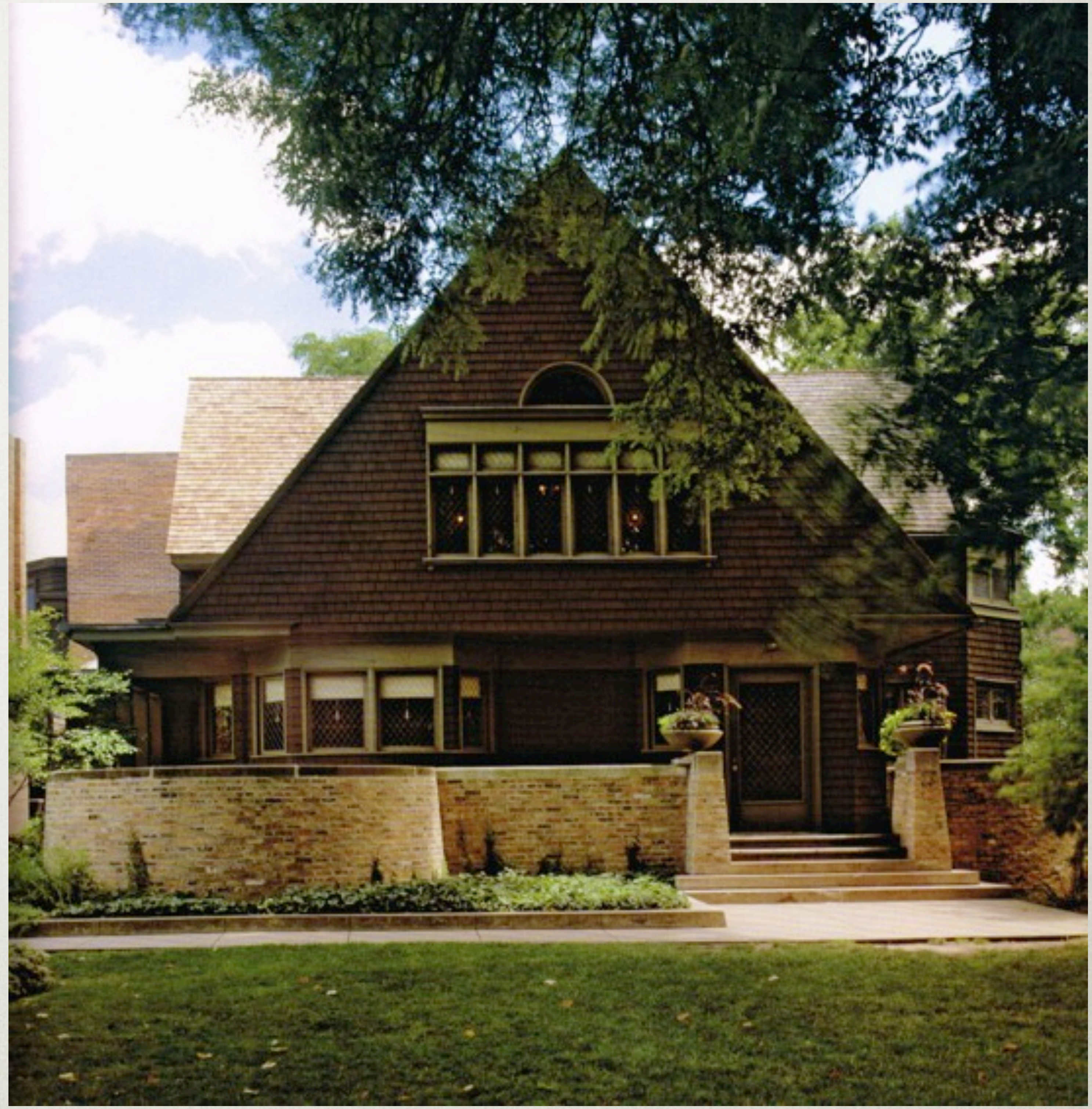
- "Shoppell's modern Houses"
- catalogue of home plans published from the 1880's through to 1900
- stylistically eclectic but with an emphasis on late Victorian patterns & detailing



TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

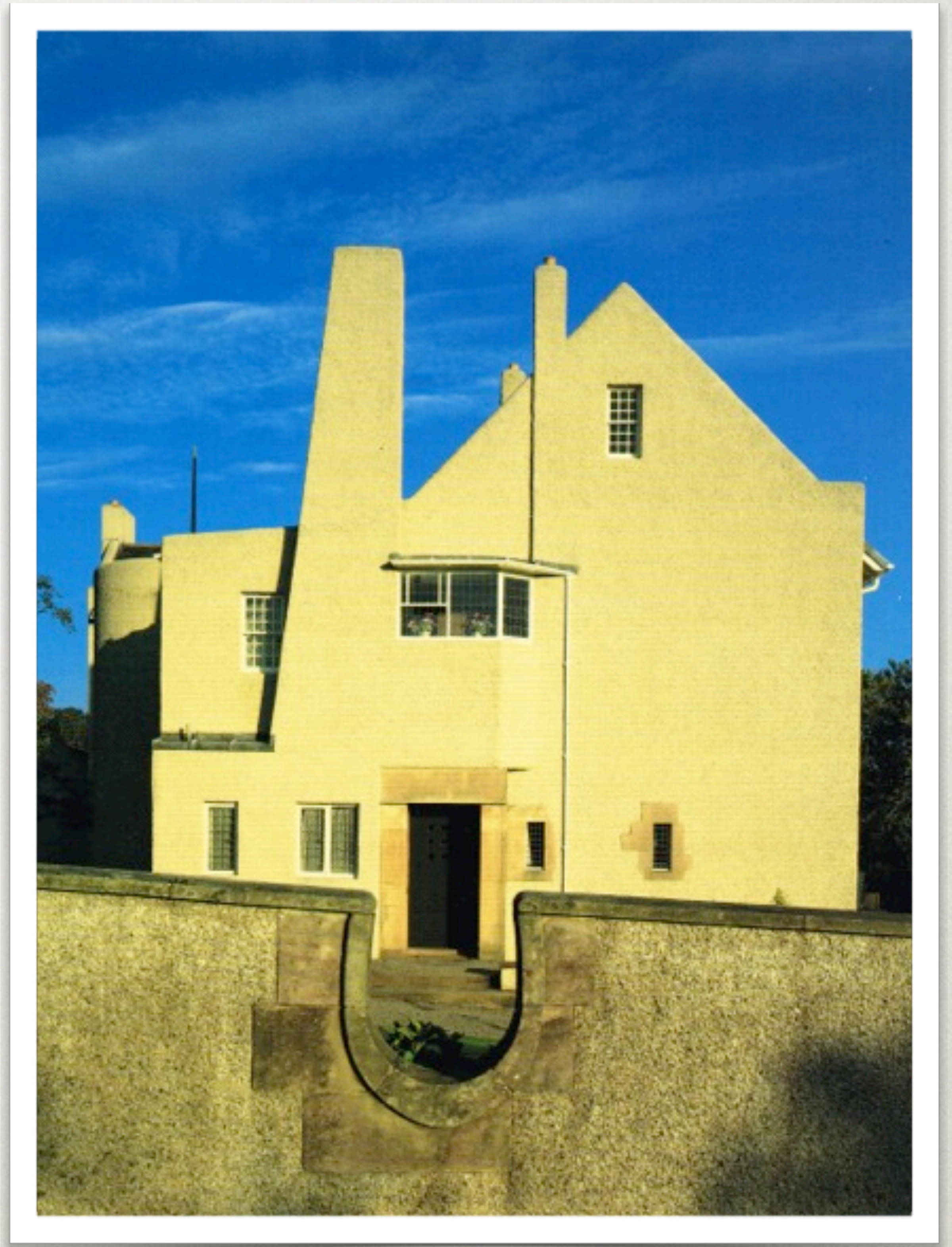
1892 Sierra Club founded



- Frank Lloyd Wright home
- Oak Park Illinois 1889 -97

TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

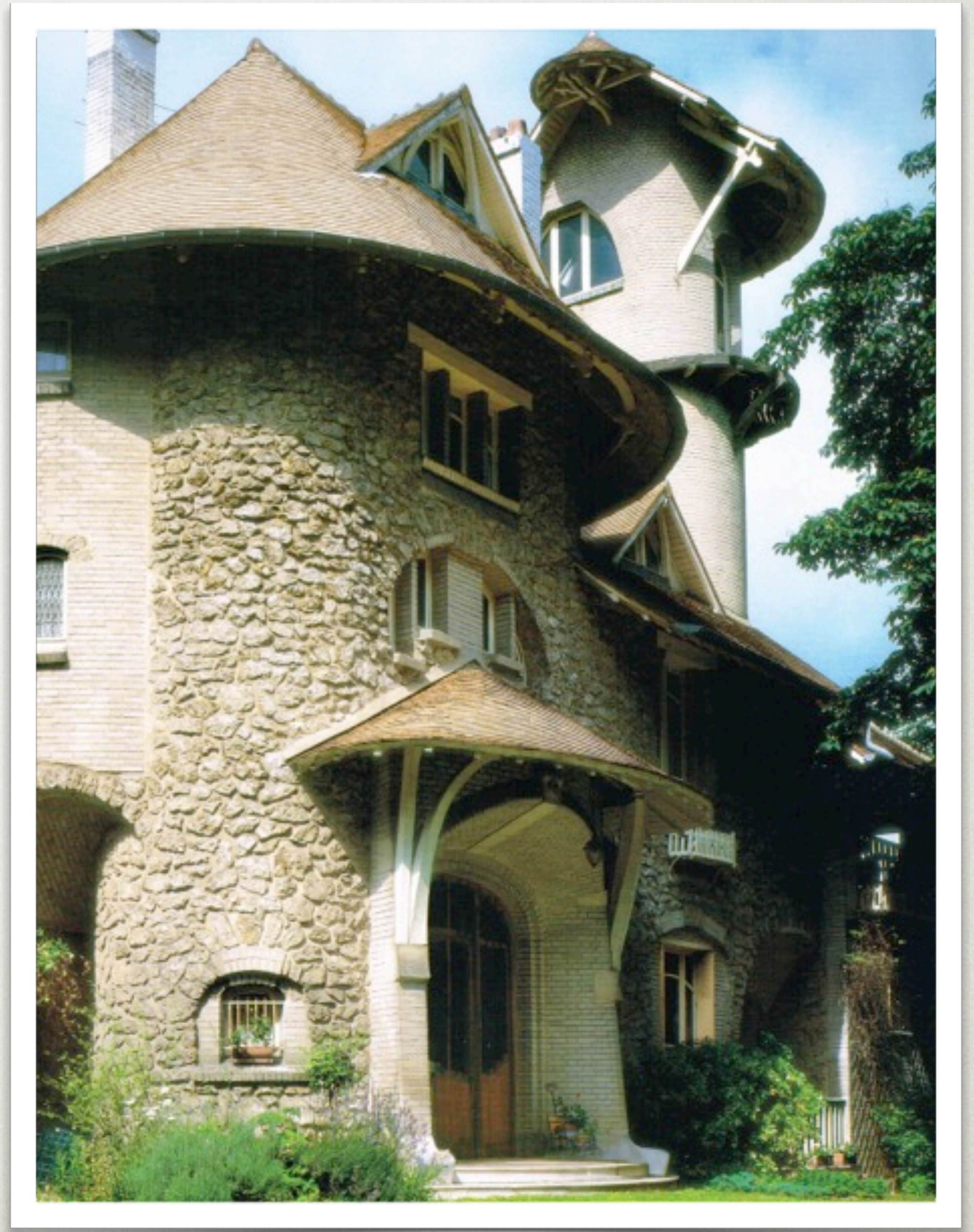


- Hill House 1903
- Charles Rennie Mackintosh
- Helensburg Scotland
- designed from the inside out Hill house avoided any facadism in favour of an unadorned formal simplicity

TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

- Villa Orgeval 1902-04
- Hector Guimard
- French art noveau villa employed fantastic organic forms & detailing to emphasize the relation of the house to nature



TURN OF THE CENTURY

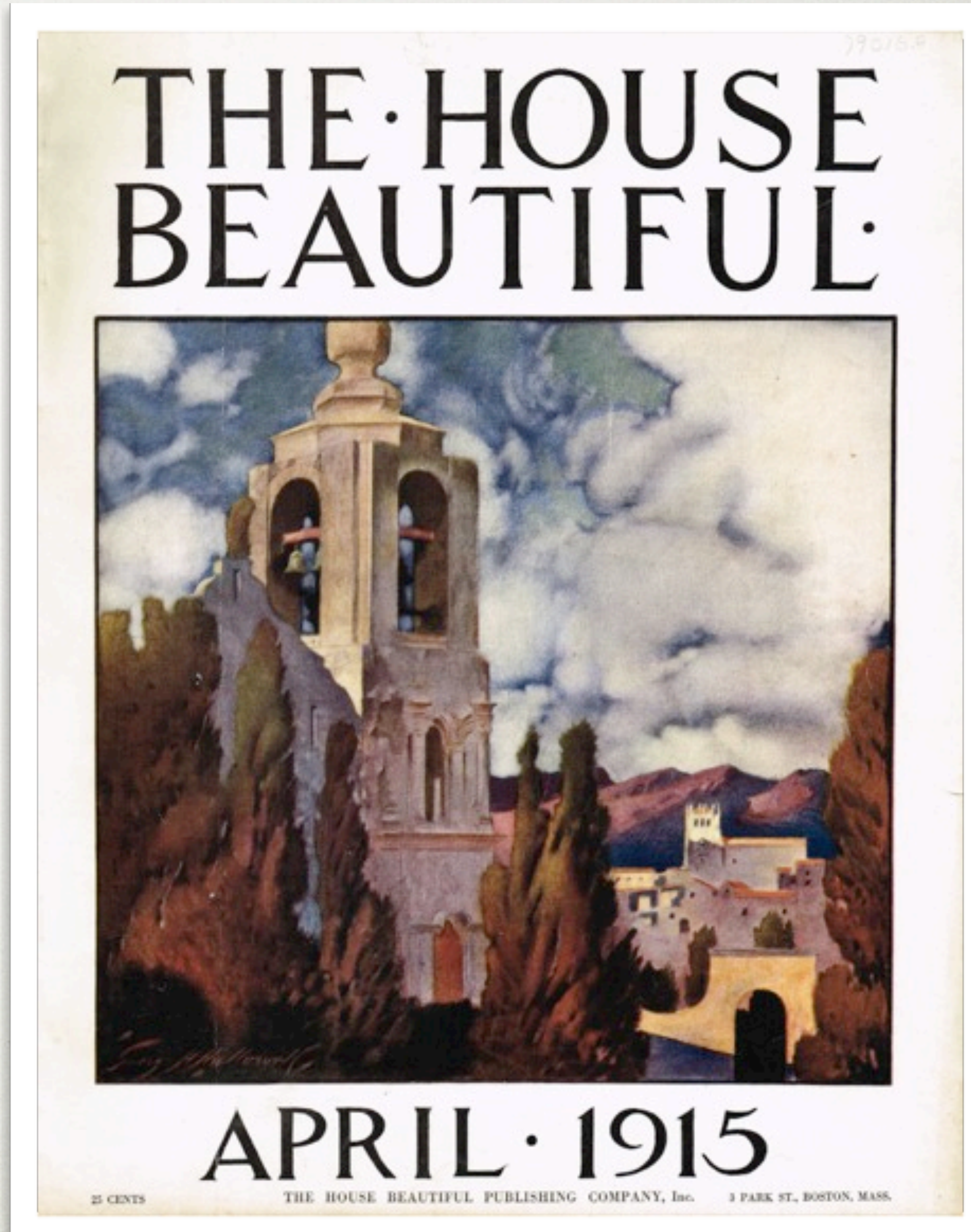
DREAM HOMES - AN EVOLUTION

- Frank Lloyd Wright's Prairie Houses
- Davidson House NY 1908
- Robie House Chicago 1908
- small Prairie House 1912

TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

- front cover evokes both the charm of the countryside with the civility of the city
- Acme Quality paints is suggested here as the best replacement for “unsanitary wallpaper”
- the add for an “electric light plant” is a reminder that at this time nearly 1/2 the population lived without electricity



TURN OF THE CENTURY

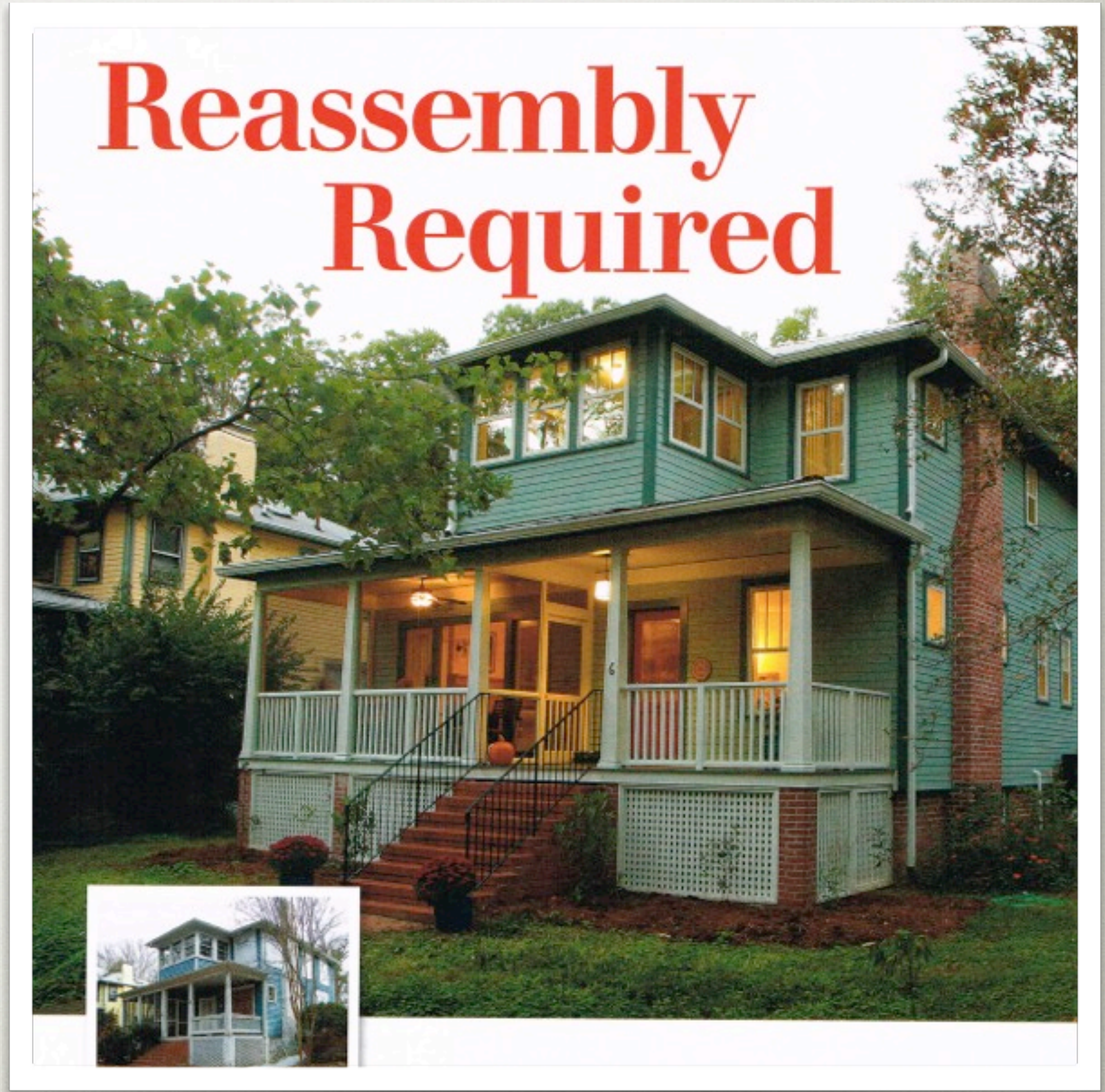
DREAM HOMES - AN EVOLUTION

- 2013 edition of FineHomebuilding features article on the renovation of this 1915 "kit house"

- the owner renovated to LEED silver standard

- FHB's article shows some pages from Aladdin's 1915 homes catalogue

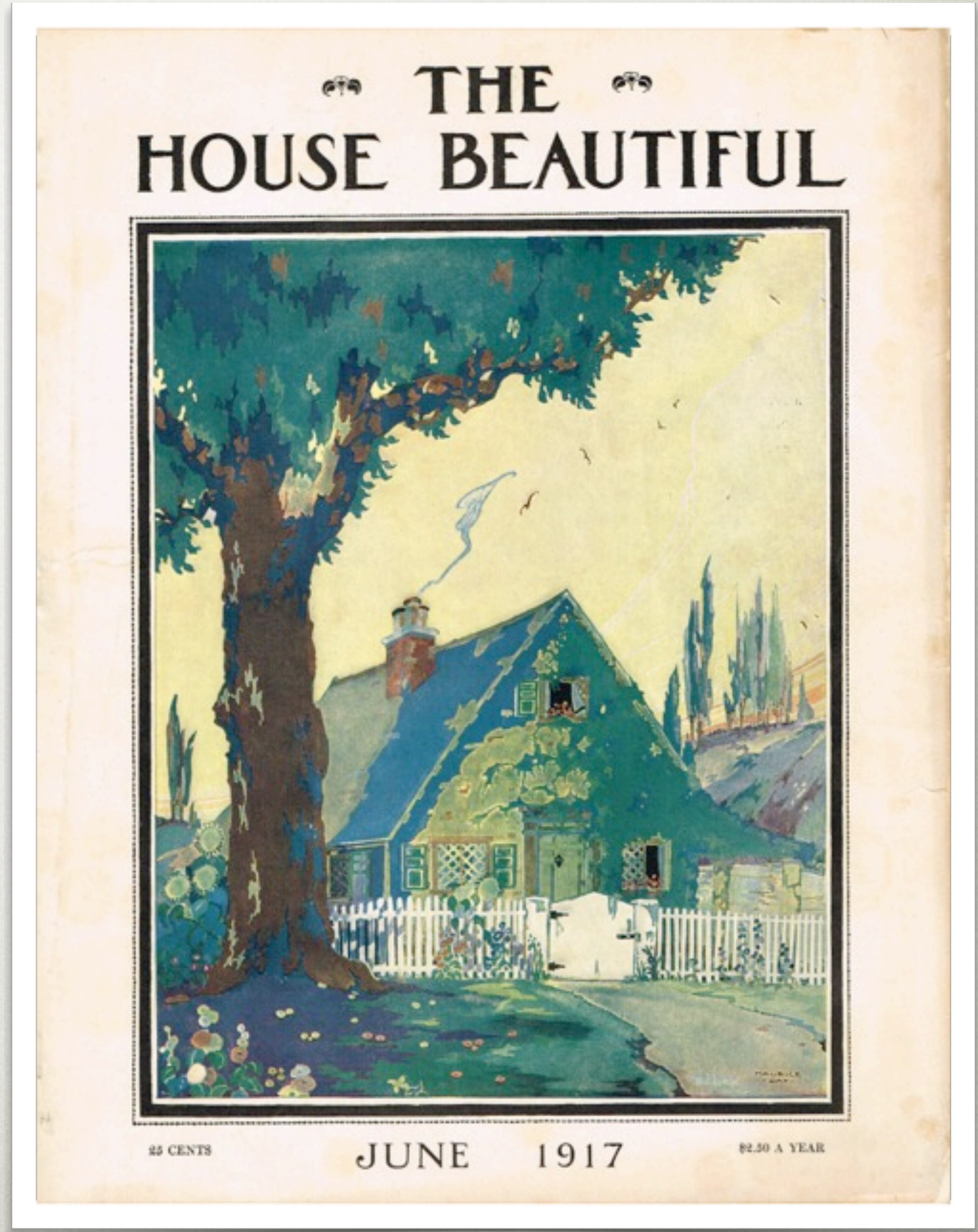
- kit home wood was factory cut so as to reduce waste - FHB says "we may think that green building is new, but back in the 1910s, low energy costs, minimal waste, and quality construction were sold as common sense.



TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

- cover image for the June 1917 edition shows a “country home”
- longevity & safety is evoked in add for masonry wall blocks - a precursor to ICF walls of today
- the hollow wall tiles insulate and fireproof - as the add says, “for a nominal expenditure over criminally dangerous wood...”
- refrigeration = health, hygene, efficiency, convenience & style
- Bossert Houses “are not ready cut lumber, but completely built houses” not to different from 21st C pre-fabs



TURN OF THE CENTURY

DREAM HOMES - AN EVOLUTION

1931 Figidaire introduces AC for homes

EARLY MODERNISTS

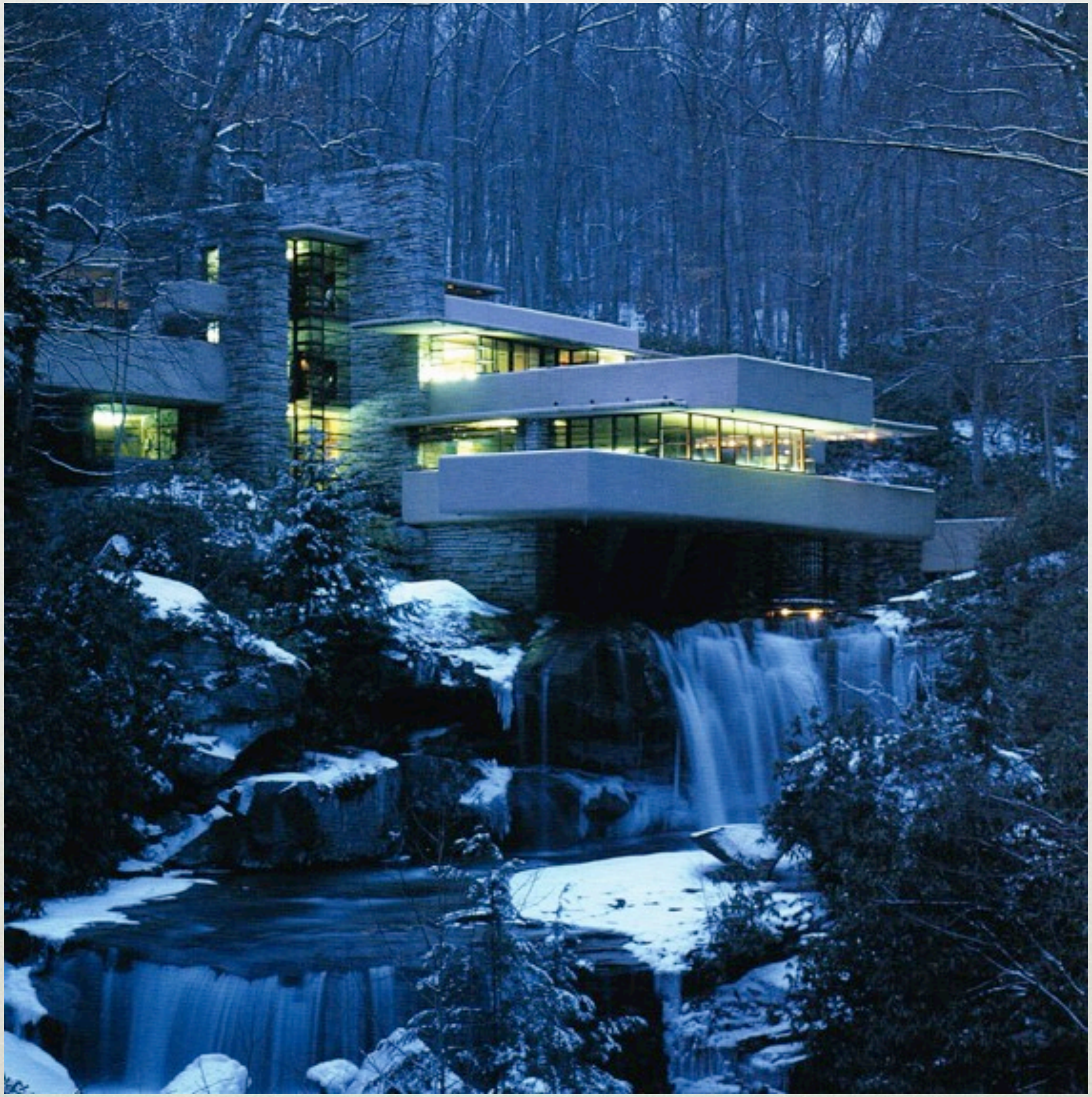
- Tugendhat house Czechoslovakia 1928 Mies van der Rohe
- Villa Sayoye France 1928 Le corbusier

DREAM HOMES - AN EVOLUTION

- Greystone 1925 Beverly Hills tudor
- Thetis Island country house 1927
- PL James house Uplands Victoria 1929

EARLY MODERNISTS

DREAM HOMES - AN EVOLUITION



EARLY MODERNISTS

- Frank Lloyd Write 1935 Falling Water
- Kaufmann Residence

DREAM HOMES - AN EVOLUTION

1938 Owings Corning begins production of F.G. insulation

EARLY MODERNISTS

- Hagerty house Mass. 1938 Walter Gropius
- stone walls tie the house to the site
- cubic purity of the white & glass contrast

DREAM HOMES - AN EVOLUTION

EARLY MODERNISTS

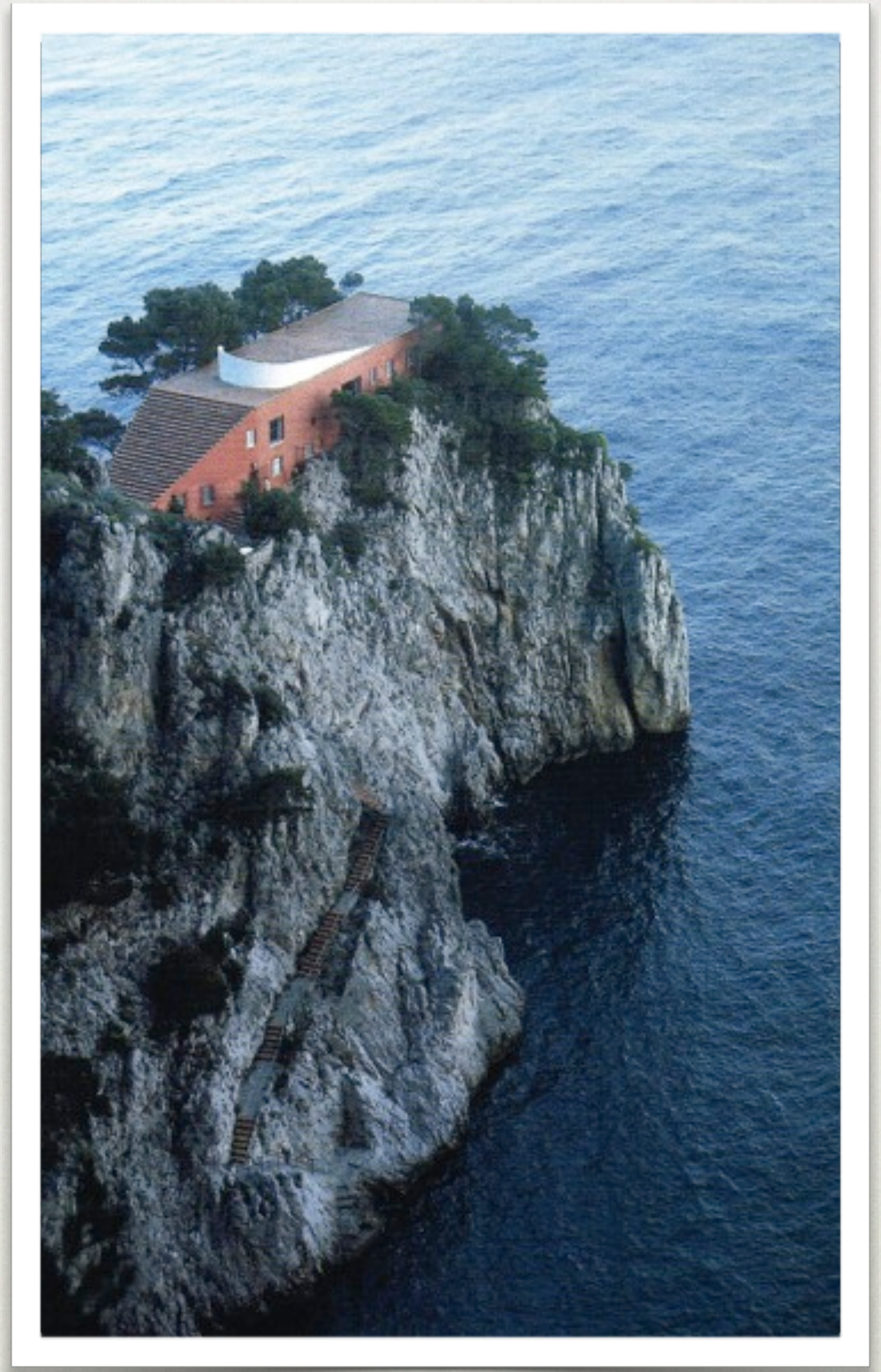
- Villa Marea - Finland 1938 Alvar Aalto

DREAM HOMES - AN EVOLUTION

EARLY MODERNISTS

- Frank Lloyd Wright - Usonian Houses
- Jacobs House 1 1936

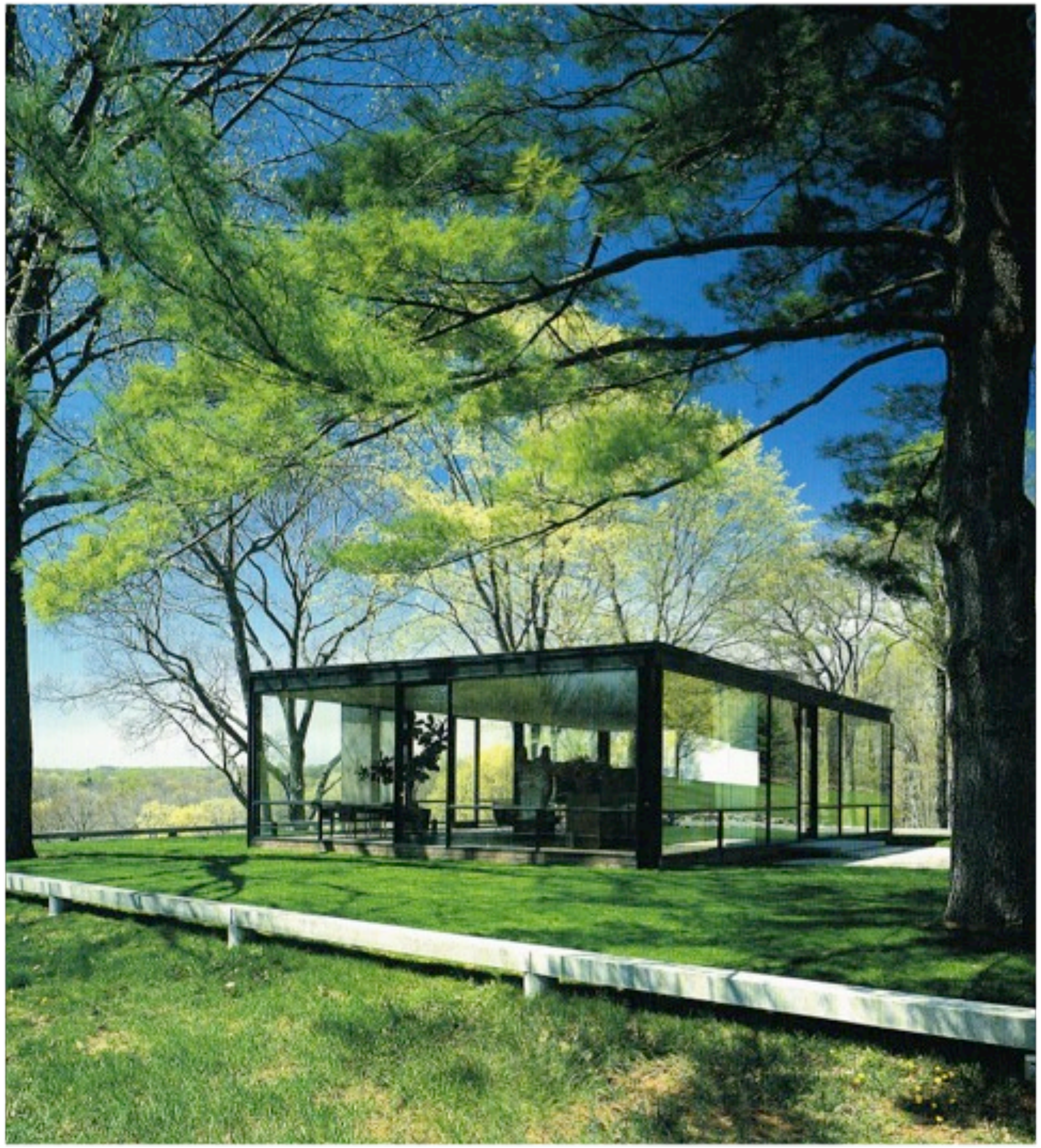
DREAM HOMES - AN EVOLUTION



EARLY MODERNISTS

- Casa Malaparte - Capri Italy 1938

DREAM HOMES - AN EVOLUTION



POST WAR

- Philip Johnson Glass House 1949
  New Canaan, Connecticut

DREAM HOMES - AN EVOLUTION

POST WAR

- FLW-1950 Carlson House Phoeniz
- FLW-1953 Bunker Hill Texas
- FLW-1953 H Price Jr. Home Oklahoma

DREAM HOMES - AN EVOLUTION

- FLW-Jacobs House 2 1944 Wisconsin
- FLW-Pearce House 1950 California
- FLW-Rayward House 1955 Connecticut

POST WAR

DREAM HOMES - AN EVOLUTION

- Fred Hollingsworth 1949 Neoteric House
- Sky Bungalow 1949 - show home for Capilano Highlands built at Hudsons Bay parking lot

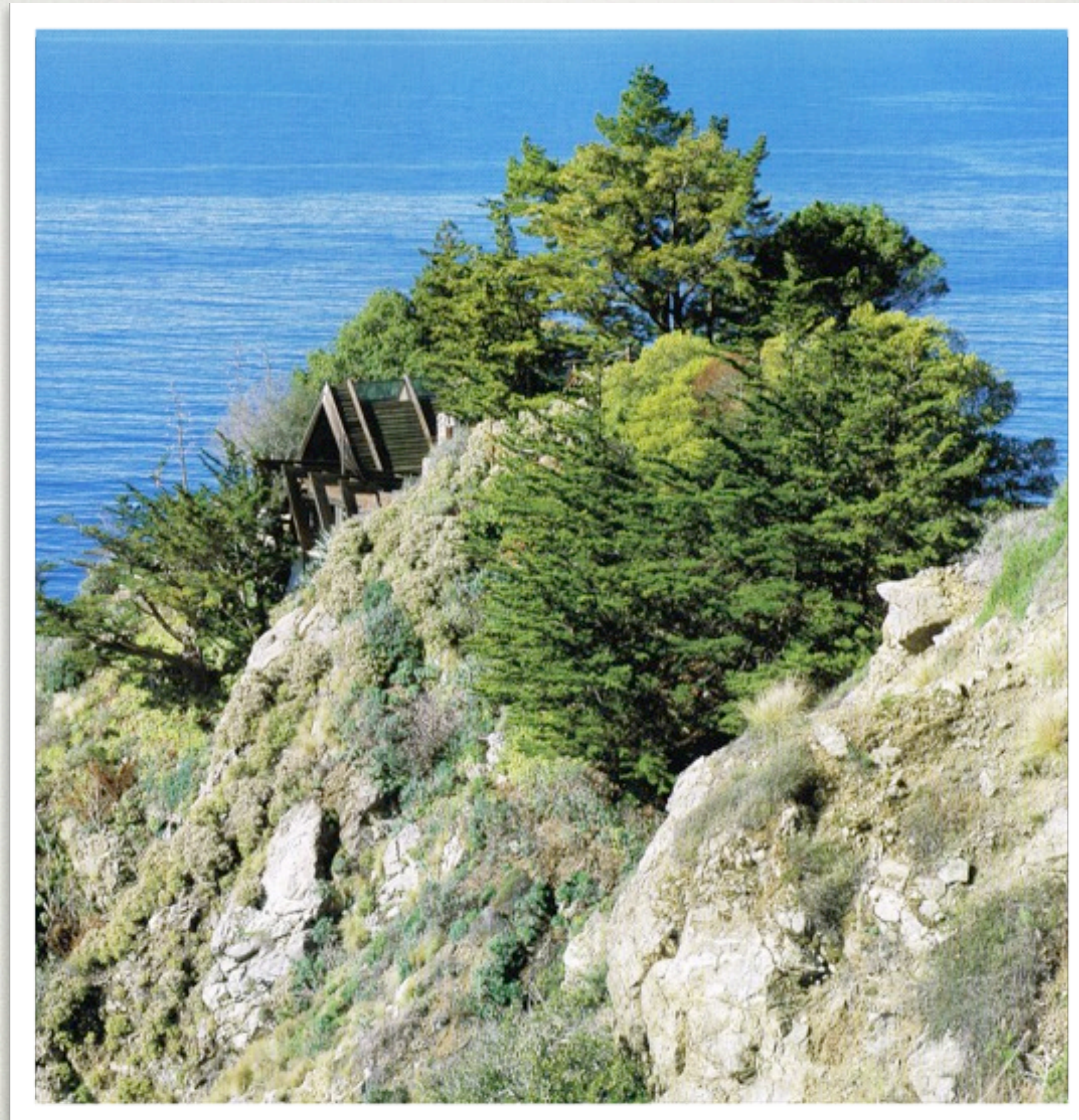
THEN TO NOW

DREAM HOMES - AN EVOLUTION

- Allyn Morris Eagle Rock - Calif. 1956
- Palmer & Krisel Twin Palms House 1957 Palm Springs first prototype for modernist tract house - whole neighbourhoods came into being with the work of P&K

THEN TO NOW

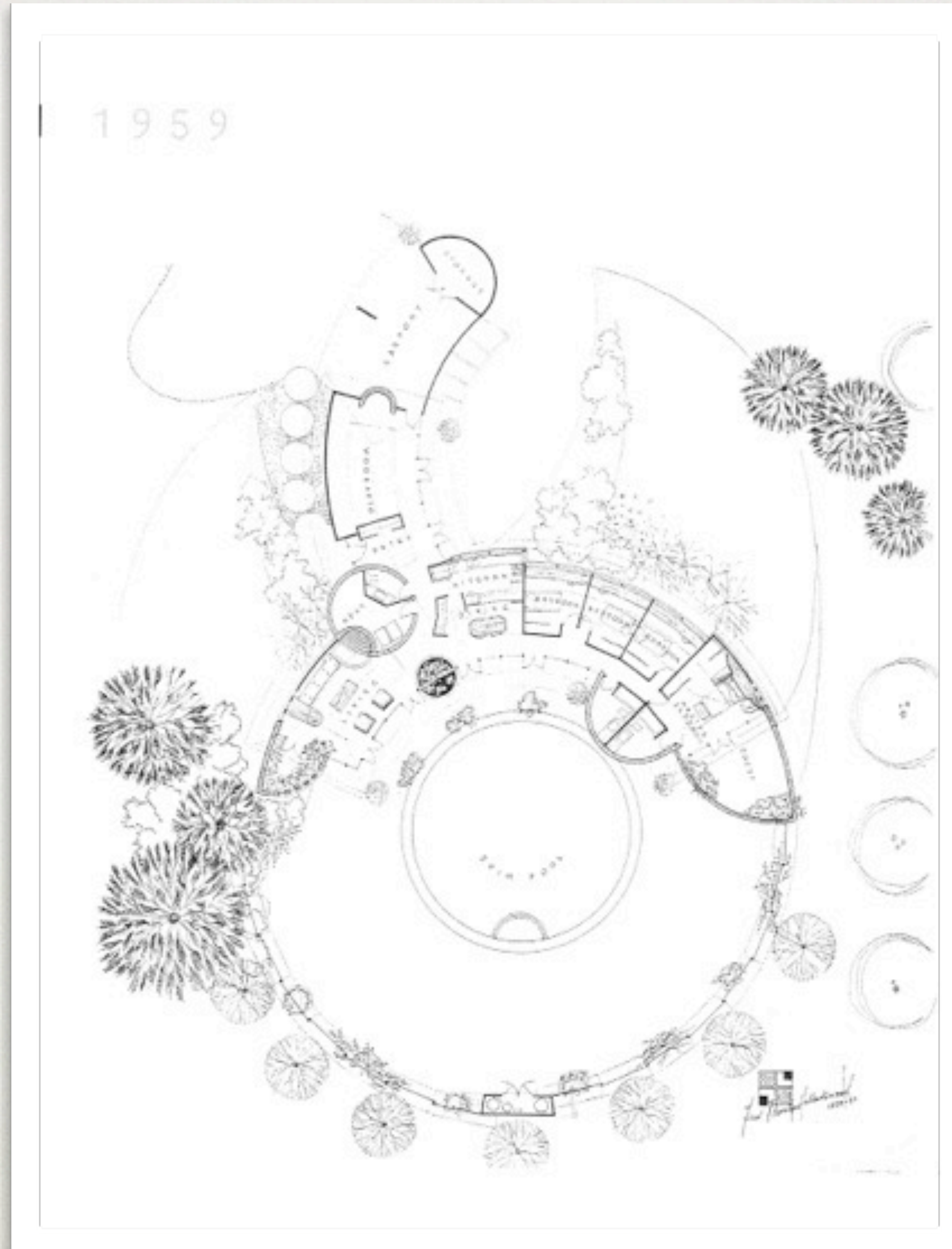
DREAM HOMES - AN EVOLUTION



THEN TO NOW

- Big Sur house 1957
- Mark Mills & Nathaniel Owings architects

DREAM HOMES - AN EVOLUTION



- Fred Hollingsworth 1959
- Trethewey House - Vancouver

THEN TO NOW

DREAM HOMES - AN EVOLUTION

1961 World Wildlife Fund est.
1962 Rachel Carson - Silent Spring

- August 1963 Look magazine
- lets not forget ever growing suburbia
- belief in boundless energy supplies

THEN TO NOW

DREAM HOMES - AN EVOLUTION

- Case Study House #26 1962 - LA
- Smith House - Arthur Erickson 1964 Vancouver
- Dawson House Laguna Beach 1965
- Smith House - Richard Meier 1967 Connecticut

THEN TO NOW

DREAM HOMES - AN EVOLUTION

1973 - oil crisis   1974 - E.F. Schumacher's Small is Beautiful

- Barber House Charles Moore 1975 uses passive & active solar systems
- Saskatchewan House 1977 - (.8ACH)

THEN TO NOW

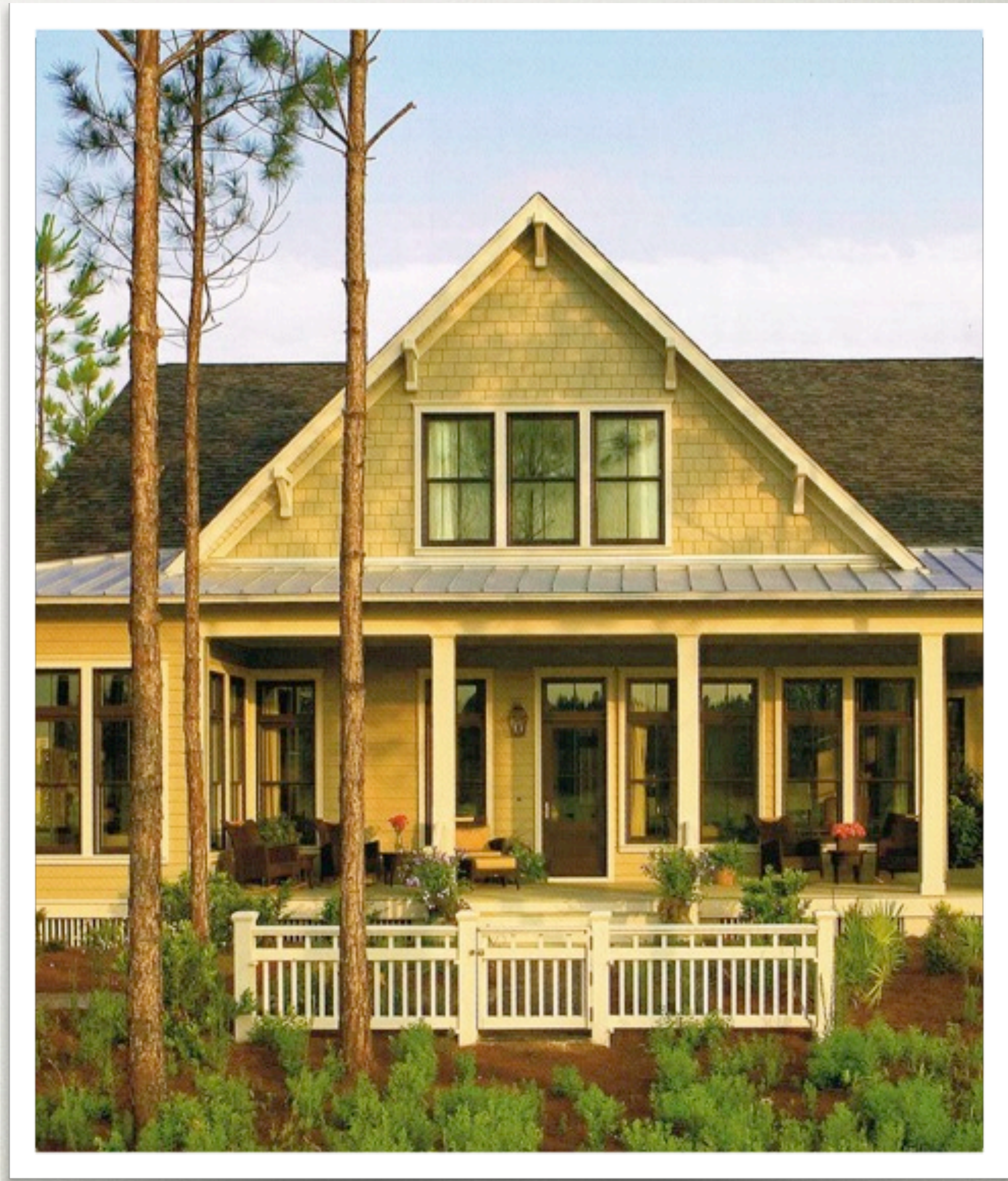
DREAM HOMES - AN EVOLUTION

THEN TO NOW

- NY residence Robert Stern 1984
- sometimes green...often not

DREAM HOMES - AN EVOLUTION

- 1977 U.S. Dept. of Energy established
- 1979 solar panels installed on roof of the White House
- 1986 solar panels removed from the roof of the White House
- 1987 Brundtland Commission releases "Our Common Future"
- 1993 Green Building Council established
- 1996 Passive House Institute established
- 2000 LEED introduced



THEN TO NOW

DREAM HOMES - AN EVOLUTION

THEN TO NOW

- examples and options abound
- the future is left to the imagination

SHADES OF GREEN

- SELF BUILT OFF-GRID
- ISLAND FAMILY COTTAGE
- RURAL ESTATE
- FAIRWINDS PASSIVE SOLAR
- OFF-GRID LUXURY COTTAGE

SHADES OF GREEN

- Built 1986 - 1981
- hand built with minimal site disturbance
- site milled lumber

SELF BUILT OFF-GRID

SHADES OF GREEN

- built 1986 - 1991
- hand milled with minimal site disturbance
- site milled lumber
- solar electric with micro-hydro 12 volt battery bank with 120 volt inverter - house wired for 12V and 120V

SELF BUILT OFF-GRID

SHADES OF GREEN

- built 1986 - 1991
- hand built with minimal site disturbance
- site milled lumber
- solar electric with micro-hydro 12 volt battery bank with 120 volt inverter - house wired for 12V and 120V
- solar hot water with thermosyphon from 2 wood stoves

SELF BUILT OFF-GRID

shades of green

- built 1986 - 1991
- hand built with minimal site disturbance
- site milled lumber
- solar electric with micro-hydro 12 volt battery bank with 120 volt inverter - house wired for 12V and 120V
- solar hot water with thermosyphon from 2 wood stoves
- structural post & beams with 2 x 6 walls - double glazed windows
- owner managed H2O system

SELF BUILT OFF-GRID

SHADES OF GREEN

- site rehabilitation
- site milled lumber
- passive solar plan
- PV panels, micro-hydro & 120 volt inverter power
- compact rooms & spaces - lots of natural light
- composting toilet
- wood heat with hot water thermosyphon

ISLAND FAMILY COTTAGE

SHADES OF GREEN

- careful siting without pretense siting to reduce scale and suggest organic evolution over time
- incorporated recycled heritage barn timbers
- semi-structural timbers set inside 2 x 8 walls for visual effect and minimal thermal bridging
- pond sourced geothermal radiant floor heat for home, guest cottage & shop/garage
- 3 rumford fireplaces
- traditional pigmented plaster interior wall finish
- high quality build in traditional style

RURAL ESTATE

SHADES OF GREEN

- progressive green home as spec house for developer
- challenging rocky site
- design retains natural rock outcrops, mossy pockets, & native vegetation
- modestly scaled rooms with 2 bedroom, studio, 2 baths, laundry, and sunroom
- construction intended to minimize site disturbance
- passive solar E-W siting with roof mounted solar thermal panels for whole house radiant heat & DHW
- 4000 gallon buffer tank

FAIRWINDS PASSIVE SOLAR

SHADES OF GREEN

- careful siting onto bedrock
- no heavy equipment on site and minimal site disturbance
- beach-combed cedar log posts integrated as key visual and structural elements

OFF-GRID LUXURY COTTAGE

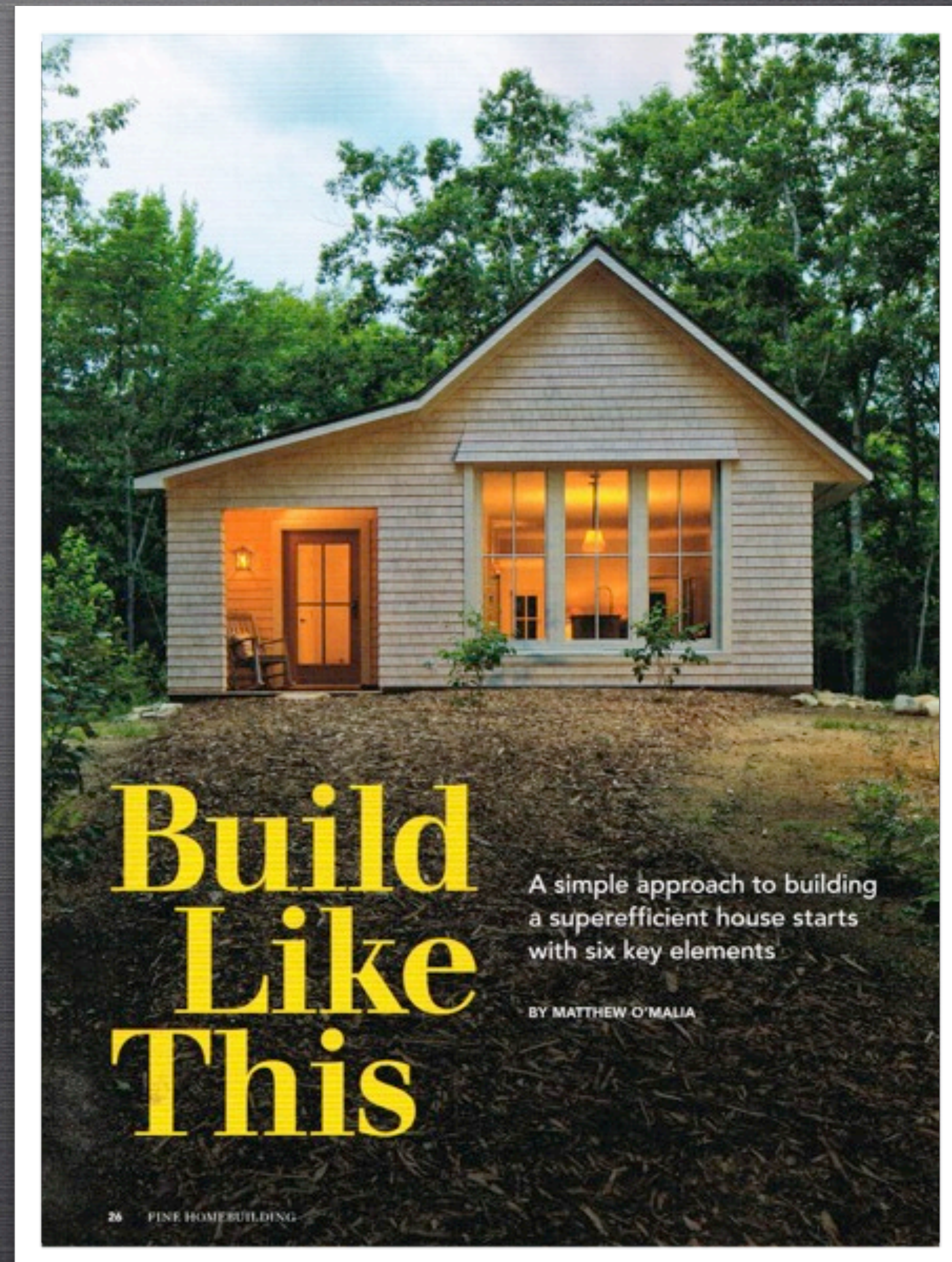
SHADES OF GREEN

- ✦careful siting onto bedrock
- ✦no heavy equipment on site and minimal site disturbance
- ✦beach-combed cedar log posts integrated as key visual and structural elements
- ✦PV with inverter for all house electrical needs
- ✦roof water catchment supplies water for year round
- ✦3 - 3000 gallon storage tanks
- ✦leach field for wastewater set in native forest leaving all large trees intact
- ✦high quality build with local craftsmen & materials

OFF-GRID LUXURY COTTAGE

GREEN STANDARDS

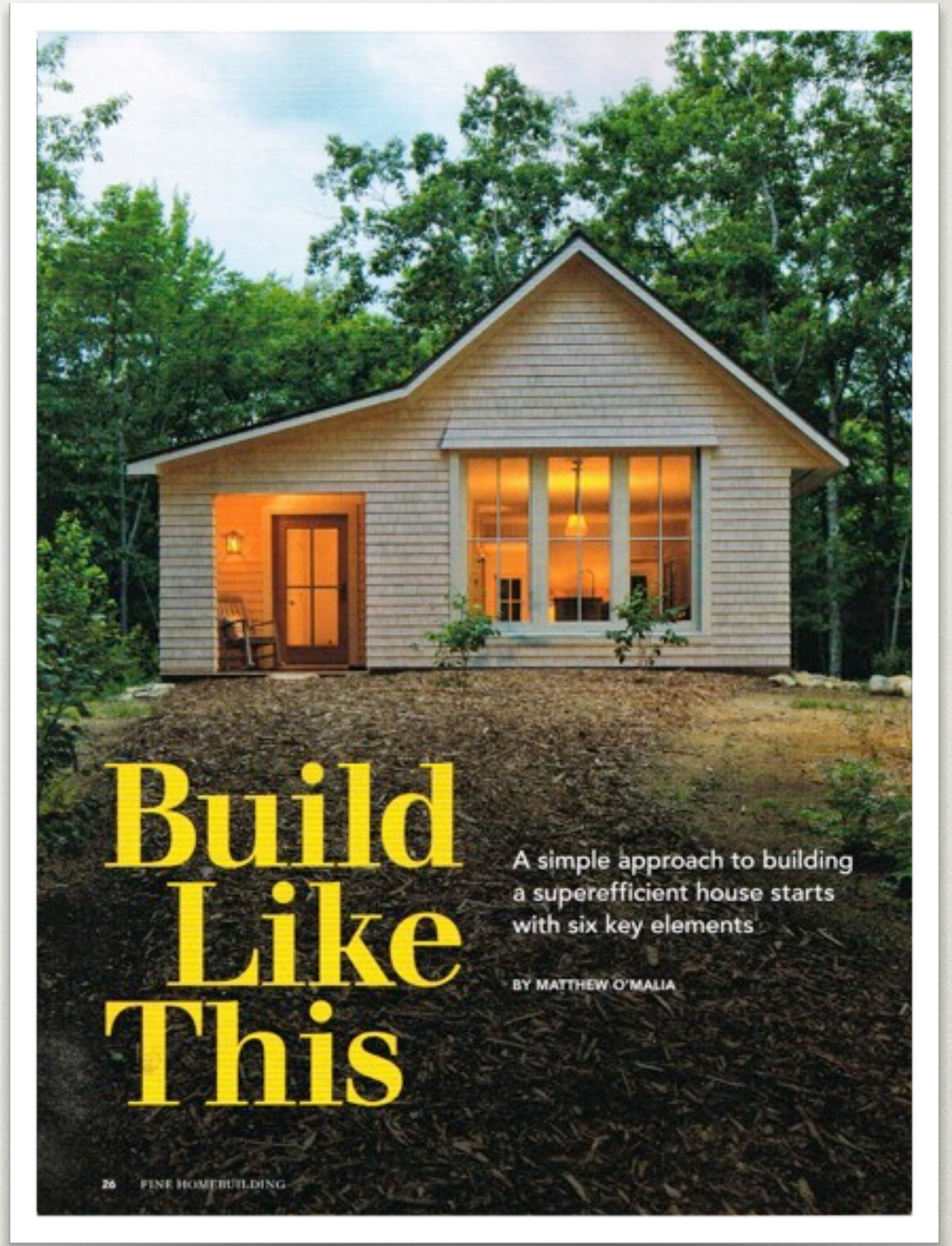
- THE PRINCIPLES
- THE CODE
- KEY CONCEPTS
- TECHNIQUES
- THE STANDARDS
- HOW TO CHOOSE



GREEN STANDARDS

- cover FHB - ES Homes 2013 identifies “six key” elements to include in a highly energy efficient green home - this focus could result in home built to Passive House & LEED

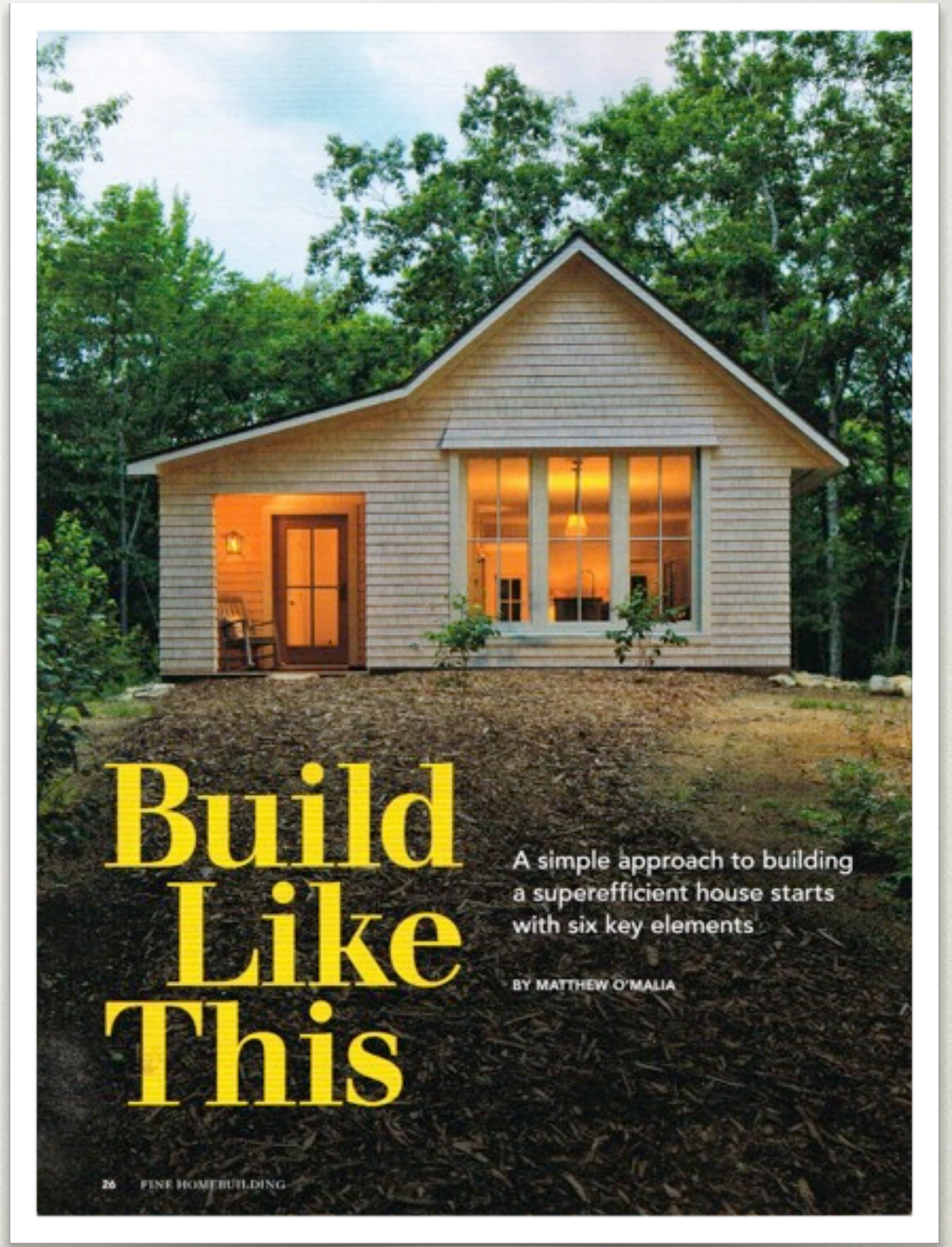
- Insulation
- Windows
- Air Seal
- Thermal Bridging
- Ventilation
- Thermal Mass



THE PRINCIPLES

GREEN STANDARDS

- Insulation, Windows, Air Sealing, Thermal Bridging, Ventilation, & Thermal Mass
- healthy house
- site for sun & passive solar
- size, fit, & flexibility - multi-generational + accessibility
- longevity & affordability



THE PRINCIPLES

GREEN STANDARDS

- 1st Cdn. Building Code 1941 - NBC
- 1st Cdn. code for homes adopted from the NBC in 1965 as the Residential Standards
- the emphasis of codes is safety and codes represent minimum standards
- areas in which codes are being revised include - structural/seismic,energy efficiency, airtightness whole house ventilation, insulation values, window performance
- the intent of the 2015AmericanIRCis to reduce energy use by 50% from 2006

Code Shock

Prepare to face the strictest building and energy codes in history

BY FERNANDO PAGÉS RUIZ

You know the drill: You apply for a construction permit, submitting a set of drawings detailing what you intend to build and how. After some back and forth with the plans examiner and after your plans appear to meet the legal building code, your jurisdiction issues a building permit. Inspectors come to your job site at specific stages of construction to verify that the workmanship and materials follow the approved plans and meet local building standards. You complete construction, your inspector judges the building to be in compliance, and then your local authorities issue a certificate of occupancy. Usually, everything runs smoothly; sometimes, though, it feels like a struggle.

How did we arrive at this system? Why do code standards seem to keep getting harder and more expensive to comply with? Who writes these codes anyway, and who represents your interests in the process?

It began with safety

Code historians—yes, there are such people—tell us that building codes date back to the earliest times we had written laws. American building codes derived from English common-law standards and then evolved in response to local conditions. More often than not, they were responses to local catastrophes, such as the Great Chicago Fire of 1871, the San Francisco earthquake of 1906, and Hurricane Andrew in 1992—all of which resulted in the development of ever more stringent construction standards, crafted to prevent a devastating loss of life and property from happening again. At the same time,

108 FINE HOMEBUILDING

THE CODE

GREEN STANDARDS

- Insulation R2.8 = U.35 (imp.)
- Windows U value, SHGC, + VT
- Air Seal = ACH@50pa
- Ventilation = HRV/ERV


Does Fiberglass Insulation Still Make Sense?

Maybe, but other types offer installation advantages that make them more reliable

BY SCOTT GIBSON

KEY CONCEPTS

GREEN STANDARDS

- INSULATION
- R value (common usage)
- U value (code/technical usage)
- BCBC = R10-slab/R20-wall/R40-roof
- PGH = R10-slab/R40-wall/R60-roof
- P-H = R35-slab/R40-wall/R60-roof
- P-H requires these values to be thermal bridge free
- BCBC - B.C. building code
- PGH - Pretty Good House
- P-H - Passive House Standard

buyer'sguide

HELPING READERS MAKE CHOICES

Insulation

Your choice of insulation goes far beyond what's on the shelf of the local home-improvement store. Here's what to consider.

BY MARTIN HOLLADAY

Most homes have several different types of insulation. For example, attic floors are often insulated with fiberglass batts or cellulose, while many basement walls are insulated with rigid-foam panels. For a variety of reasons, you probably don't want to insulate your basement walls with cellulose or your attic floor with rigid-foam panels.

If you're selecting insulation, you need to make sure that your chosen material is appropriate for its intended location, that it will perform well, that it won't be prohibitively difficult to install, and that it won't blow your budget.

The higher a material's R-value, the better it is at resisting heat flow. In most cases, insulation with a high R-value per inch is preferable to insulation with a low R-value per inch, and insulation that resists airflow is preferable to air-permeable insulation. To save money, however, many builders choose air-permeable products with a low R-value. As long as air leakage is addressed by installing a tight air barrier and as long as an adequate thickness of insulation is installed, even inexpensive insulation products can perform well.

Martin Holladay is a senior editor.

Batts

Blown in

Rigid foam

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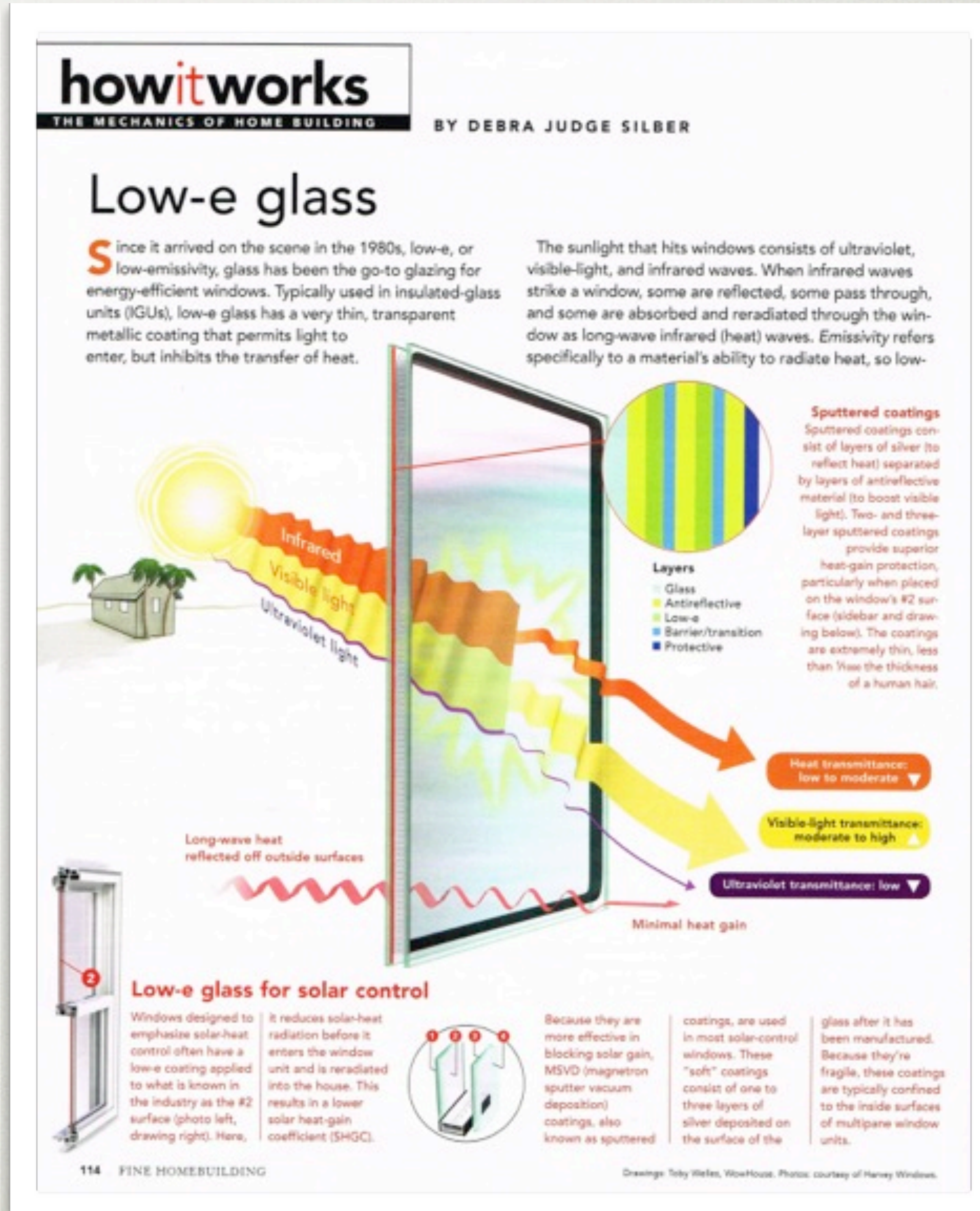
KEY CONCEPTS

GREEN STANDARDS

- WINDOWS
- insulate/reflect/admit/heat
- low SHGC reflects heat (.2-.4)
- high SHGC admits heat (.5-.7)
- typical home heat energy loss of windows is 30-60%
- typical home heat energy loss of walls is 20-40%
- VBC G bldg code = R2.8/U.35
- E STAR (zone A) = R3.1/U.32
- PGH window (zA) = R3.5/U.29
- P-House window = R7+/U.14



howitworks

THE MECHANICS OF HOME BUILDING

BY DEBRA JUDGE SILBER

Low-e glass

Since it arrived on the scene in the 1980s, low-e, or low-emissivity, glass has been the go-to glazing for energy-efficient windows. Typically used in insulated-glass units (IGUs), low-e glass has a very thin, transparent metallic coating that permits light to enter, but inhibits the transfer of heat.

The sunlight that hits windows consists of ultraviolet, visible-light, and infrared waves. When infrared waves strike a window, some are reflected, some pass through, and some are absorbed and reradiated through the window as long-wave infrared (heat) waves. *Emissivity* refers specifically to a material's ability to radiate heat, so low-

Sputtered coatings

Sputtered coatings consist of layers of silver (to reflect heat) separated by layers of antireflective material (to boost visible light). Two- and three-layer sputtered coatings provide superior heat-gain protection, particularly when placed on the window's #2 surface (sidebar and drawing below). The coatings are extremely thin, less than 1/100 the thickness of a human hair.

Low-e glass for solar control

Windows designed to emphasize solar-heat control often have a low-e coating applied to what is known in the industry as the #2 surface (photo left, drawing right). Here, it reduces solar-heat radiation before it enters the window unit and is reradiated into the house. This results in a lower solar heat-gain coefficient (SHGC).

Because they are more effective in blocking solar gain, MSVD (magnetron sputter vacuum deposition) coatings, also known as sputtered coatings, are used in most solar-control windows. These "soft" coatings consist of one to three layers of silver deposited on the surface of the glass after it has been manufactured. Because they're fragile, these coatings are typically confined to the inside surfaces of multipane window units.

114 FINE HOMEBUILDING

Drawings: Toby Welles, WowHouse. Photos: courtesy of Harvey Windows.

KEY CONCEPTS

GREEN STANDARDS

- Air Seal
- FineHomebuilding article - Nov 2012 by John Straube
- air sealing has become a critical concern for all high performance green building standards

KEY CONCEPTS

GREEN STANDARDS

- AIR SEAL
- ACH@50pa (with blower door test)
- air changers per hour @ 50 pa
- typical code home = 3 - 7 ACH@50pa
- BCBC (2015) 2.5ACH - max
- VBC (2012) 3.5ACH - max
- E STAR (2012) 2.5ACH - max
- R2000 (2012) 1.5ACH - max
- LEED (2012) 3.5ACH - max
- P-HOUSE .6 - max
- .6ACH (9'/1200sf home) = 108cfm (approx. equal to 2 bathroom fans)
- 4ACH (9'/1200sf home) = 720cfm

How tight is tight?

Blower-door test results are expressed in cubic feet per minute (cfm). When measuring air leakage, this value is combined with an industry-adopted standard of 50 pascals (a pascal is a measure of pressure) as a pressure rating and is abbreviated as cfm50.

Blower-door test results also can be expressed in air changes per hour (ACH), the measurement used in code language. Air changes per hour are determined by dividing cfm by the volume, then multiplying that sum by 60 minutes: ACH = (cfm/volume) x 60.

It's instructive to note that although code specifies a minimum of 7 ACH, a tight, energy-efficient 2000-sq.-ft. house should have a result closer to 2 ACH. For my house, I wanted to be under 0.8 ACH at cfm50 and to find out how low we could go. While blower-door tests are often performed at the end of each stage of air-sealing, our procedure was a bit different. The end result was instructive, as the results above indicate.

Our goal for the first test was to get as close to zero as possible. I was disappointed at first because I thought we would start around 400 cfm.

We knew there would be leakage, but didn't know how much. We never exceeded our expectations, but in the end, we were not disappointed either. For such a tight house, we had to set goals that were going to be tough to achieve at all levels.

ENERGY-SMART HOMES 2012 69

KEY CONCEPTS

GREEN STANDARDS

- VENTILATION

- well insulated & super tight homes need an HRV or ERV

- HRV's heat recov. ventilators exchange fresh outside air with stale indoor air and at the same time warm the incoming cool outdoor air with the latent heat of the warmer exhaust air

- conventional fan forced vents and venting appliances such as wood stoves, fireplaces and range hoods are usually a poor choice for super insulated green homes - unless carefully integrated

Efficient Houses Need Fresh Air

BY MAX H. SHERMAN

I hear it all the time: "Houses are too tight." "Houses didn't used to make people sick." These assertions seem well founded: The most serious chronic illness of American children is asthma, and the Environmental Protection Agency lists poor indoor-air quality among its top five environmental threats. Are tight houses poisoning us?

There's no disputing the cause-and-effect relationship between tight houses and indoor-air pollution. In theory, the solution is simple: If you build tight, you must ventilate right. In practice, though, ventilating right is complicated and controversial. In 2003, I chaired an American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) committee that passed the country's first residential ven tion standard. It gives builders and designers guidelines for provi good indoor air while keeping utility costs low (sidebar p. 87).

Houses require ventilation

Before I go farther, let me define *ventilation*. The word *vent* comes from the Latin *ventilare*, and it means to expose to the w Although this might sound like some creep in a raincoat, the story is more complex. *Ventilation* is used many ways when des ing how a house works: There's crawlspace ventilation (often ventilated siding assemblies (good), and roof ventilation (someti

Indoor air pollutants

Air pollution typically makes us think of smokestacks and exhaust pipes, but indoor air is usually dirtier than outdoor air. Listed at right are some of the common pollution sources that argue for good whole-house ventilation.

Moisture
Moisture is not a contaminant in the usual sense because water vapor itself is not an air-quality issue. But if the humidity is too high (as can happen easily in a tight house in a cold climate), it can lead to condensation, which can cause problematic mold and fungi to grow.

Consumer products
Toxic chemicals (such as pesticides, paint supplies, and cleaning suppli that are stored around the house can cause health problems. These items aren't limited to the garage and the cleaning-supply cabinet; many consumer products such as cosmetics and "air fresheners" also can cause indoor-air pollution.

82 FINE HOMEBUILDING

KEY CONCEPTS

GREEN STANDARDS

- domestic hot water
- home heat systems
- insulation
- windows
- wall & roof systems
- solar systems
- grid inter-tie/net zero

TECHNIQUES

GREEN STANDARDS

- B.C. Building Code
- Built Green
- Energy Star
- R-2000
- LEED for Homes
- Passive House
- Living Building Challenge

THE STANDARDS

GREEN STANDARDS

- Begins With the Owner
- What Are The Priorities
- Great Resources Out There
- Finehomebuilding
- Home Power Magazine
- greenbuildingadvisor.com
- Many Great Books

SPECIAL REPORT

What Does Green Really Mean?

Rising energy costs, climate change, and a new social conscience are complicating the way we build

BY SCOTT GIBSON

David Gottfried is putting his money where his mouth is. The Berkeley, Calif., building consultant and founder of the U.S. Green Building Council (www.usgbc.org) is downsizing, swapping his 2600-sq.-ft. house for one half its size. His two children will share a single bedroom with bunk beds.

Gottfried is leaving behind a home office, playground equipment in the yard, and a guest room. He doesn't view it as much of a sacrifice. Instead, it's completely logical for someone who has been beating the drum for smaller, more energy-efficient houses that waste fewer resources and keep their owners healthy and comfortable.

That, basically, is what the green-building movement is about. And in an industry that is painfully slow to change, green building seems to be gaining momentum with surprising speed. By the end of 2007, the National Association of Home Builders (NAHB) expects that more than half its members will be calling themselves green builders.

A combination of public and private initiatives is part of the reason. "And beyond all that," Gottfried says, "there's the market.

"Consumers are starting to get interested, and the bigger picture encompasses climate change, overburdened landfills, increasing energy costs, water scarcity, and diminishing air quality. Connect all those dots, and you can see a huge potential, not just in the U.S. but globally."

Just what is "green" building?

Dozens of local and regional programs acro the country set minimum standards for wi ning a green label. NAHB has a set of volu tary guidelines, and the U.S. Green Buildin Council now has a residential version of i successful LEED (Leadership in Energy an Environmental Design) program, which ce tifies green commercial buildings.

On the other hand, some states have no fo mal green-building initiatives, while othe have allowed their green-building organiza tions to lapse. Given this patchwork of some

FIVE HOUSES PROVIDE A GREEN SNAPSHOT

To illustrate the range of green-building practices around the country, we have included case studies from various regions. Each house has its own unique design features and shows some of the diverse strategies being used by architects and builders who are going green.

104 FINE HOMEBUILDING

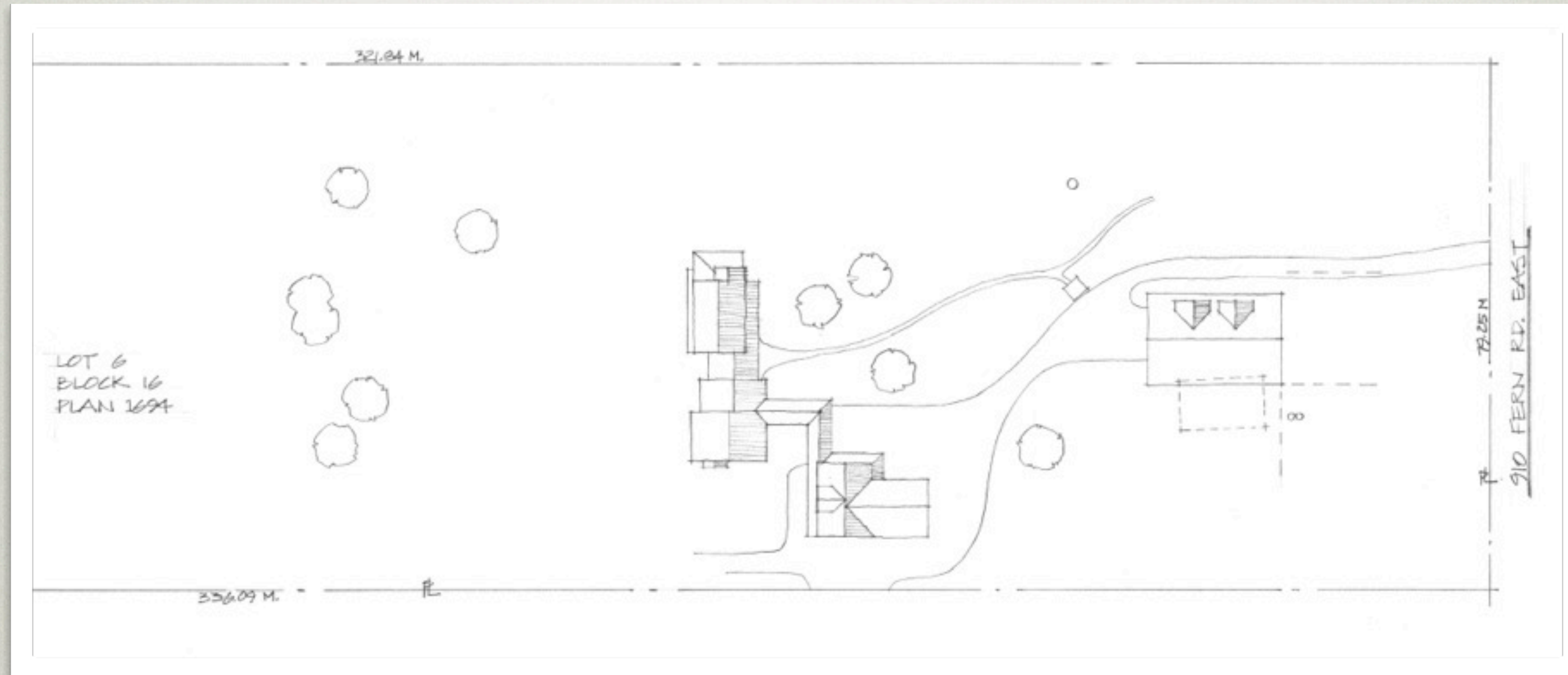
HOW TO CHOOSE

QUALICUM BEACH PASSIVE SOLAR

- PASSIVE SOLAR ON A BUDGET
- MULTI-GENERATIONAL HOME CREATES TWO DWELLINGS IN ONE
- EACH DWELLING = VENMAR HRV
- USE OF SITE MILLED LUMBER
- SUPER INSULATED DOUBLE STUD WALL CONSTRUCTION
- SPEEDY CONSTRUCTION OF FACTORY SUPPLIED WALLS & ROOF
- MAIN HOUSE-1742 SF/1350 HEATED

PROJECT OVERVIEW

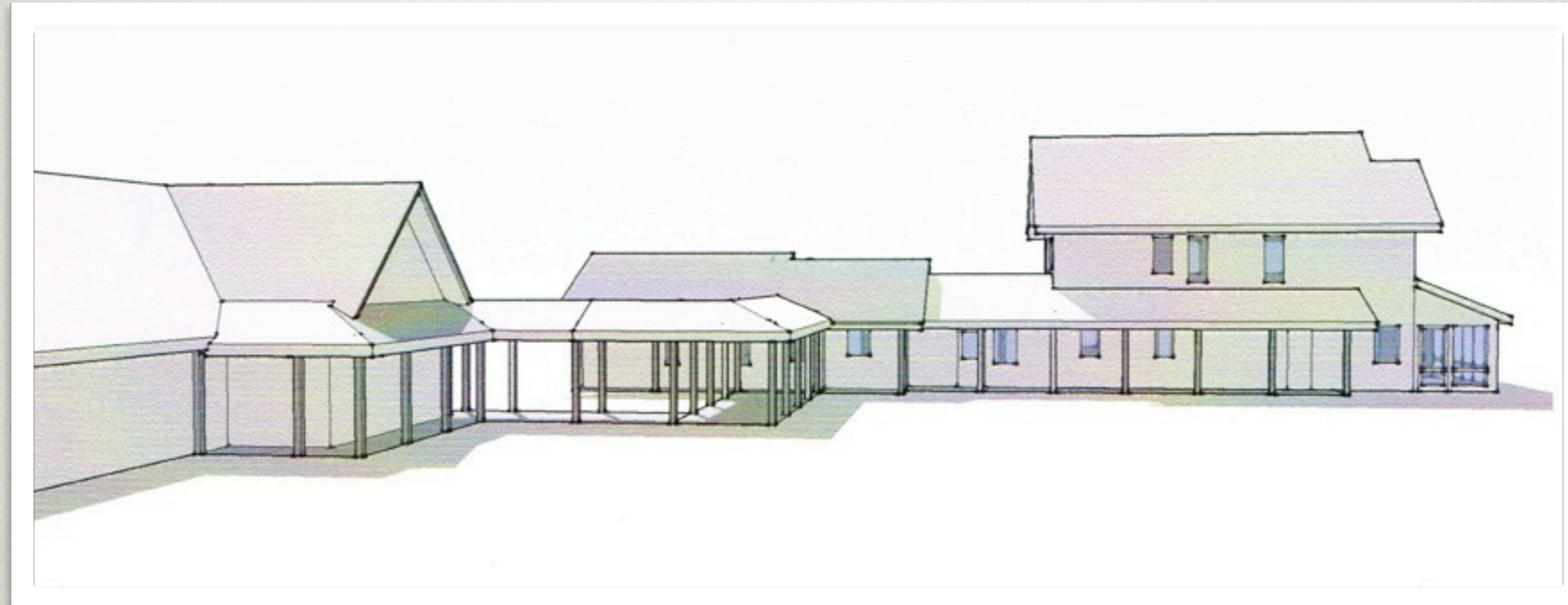
QUALICUM BEACH PASSIVE SOLAR



DESIGN & PLANNING

- early site plan with garage/shop & barn
- long facade of dwellings S-facing for solar gain
- explored options for breezeway & shop

QUALICUM BEACH PASSIVE SOLAR

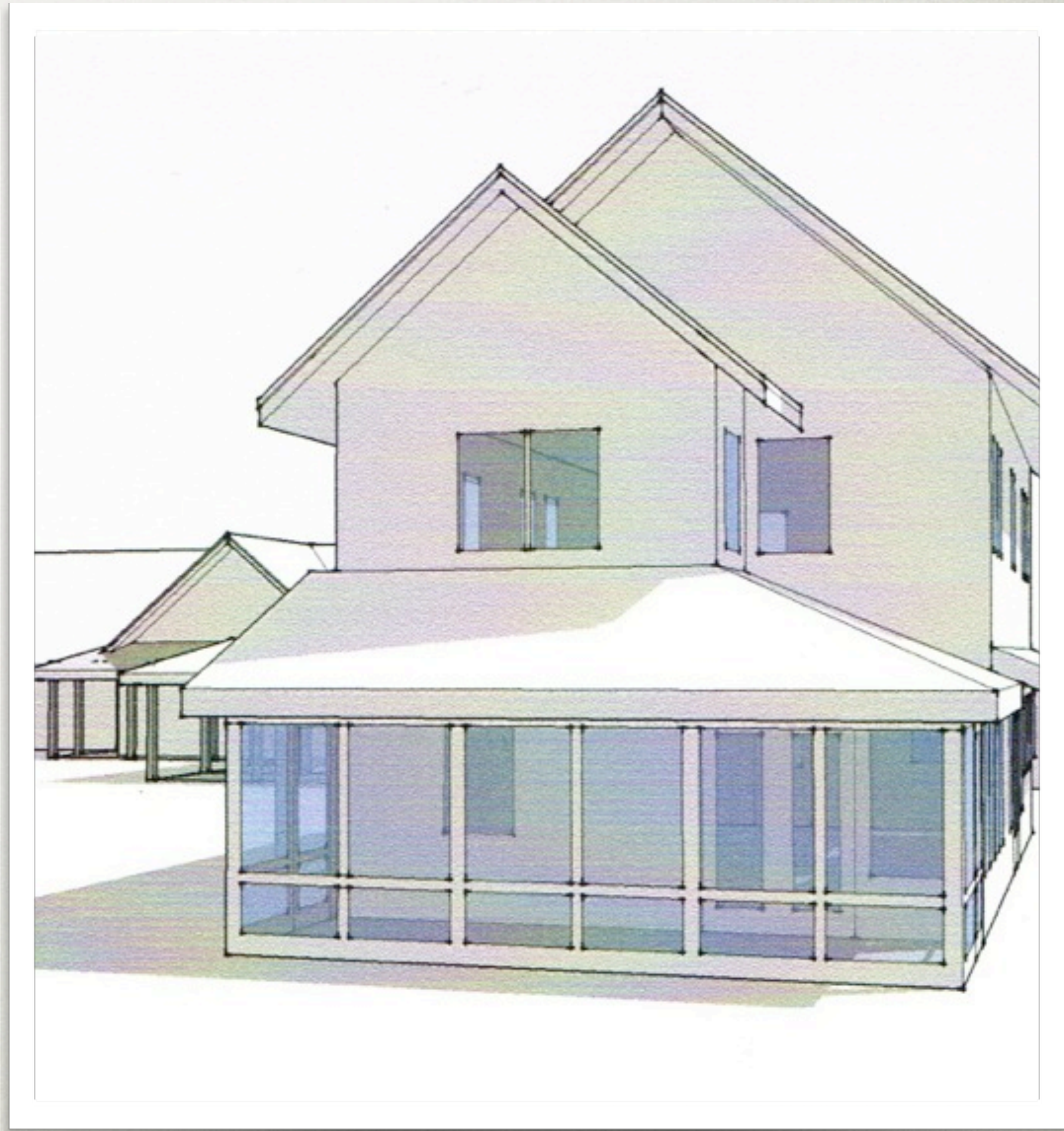


DESIGN & PLANNING

- early decisions - slab on grade & superinsulate
- juggled early floor plan options - no south bays
- airtight hi-efficiency wood stoves chosen over outdoor single wood-fired boiler for both homes

QUALICUM BEACH PASSIVE SOLAR

- DECISIONS
- dble stud wall - 2 rows 2x4 studs with 2x10 plates & rigid foam wrap
- exterior air barrier at walls & interior at ceilings - secondary interior air barrier at walls - walls are vapour permeable in both directions
- flat ceilings & raised heel truss roof
- exterior attic access hatches & minimal ceiling penetrations
- 4 inch under-slab rigid insuation
- seperate HRVs for both homes
- each home is thermally separate
- fir floors over concrete slab



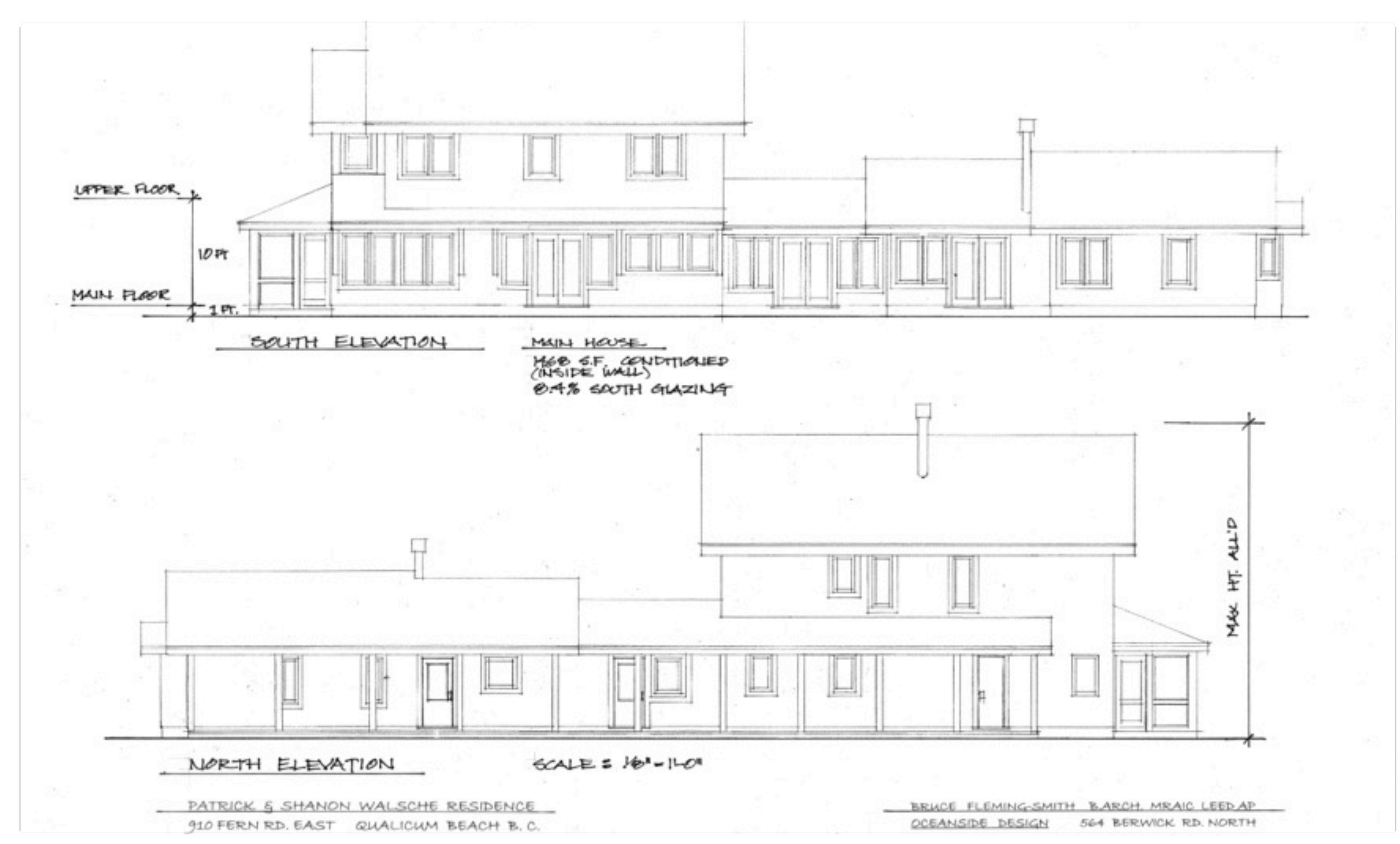
DESIGN & PLANNING

QUALICUM BEACH PASSIVE SOLAR

- R20 under-slab
- R10 outside foundation/slab
- R43 walls (w min T-breaks)
- R62 roofs
- extensive window research & pricing narrows field to Gienow vinyl framed with high SHGC - clients make final call on double vs triple glazed
- high performance french doors recommended but budget ruled
- 3D modeling for massing & seasonal sun penetration studies

DESIGN & PLANNING

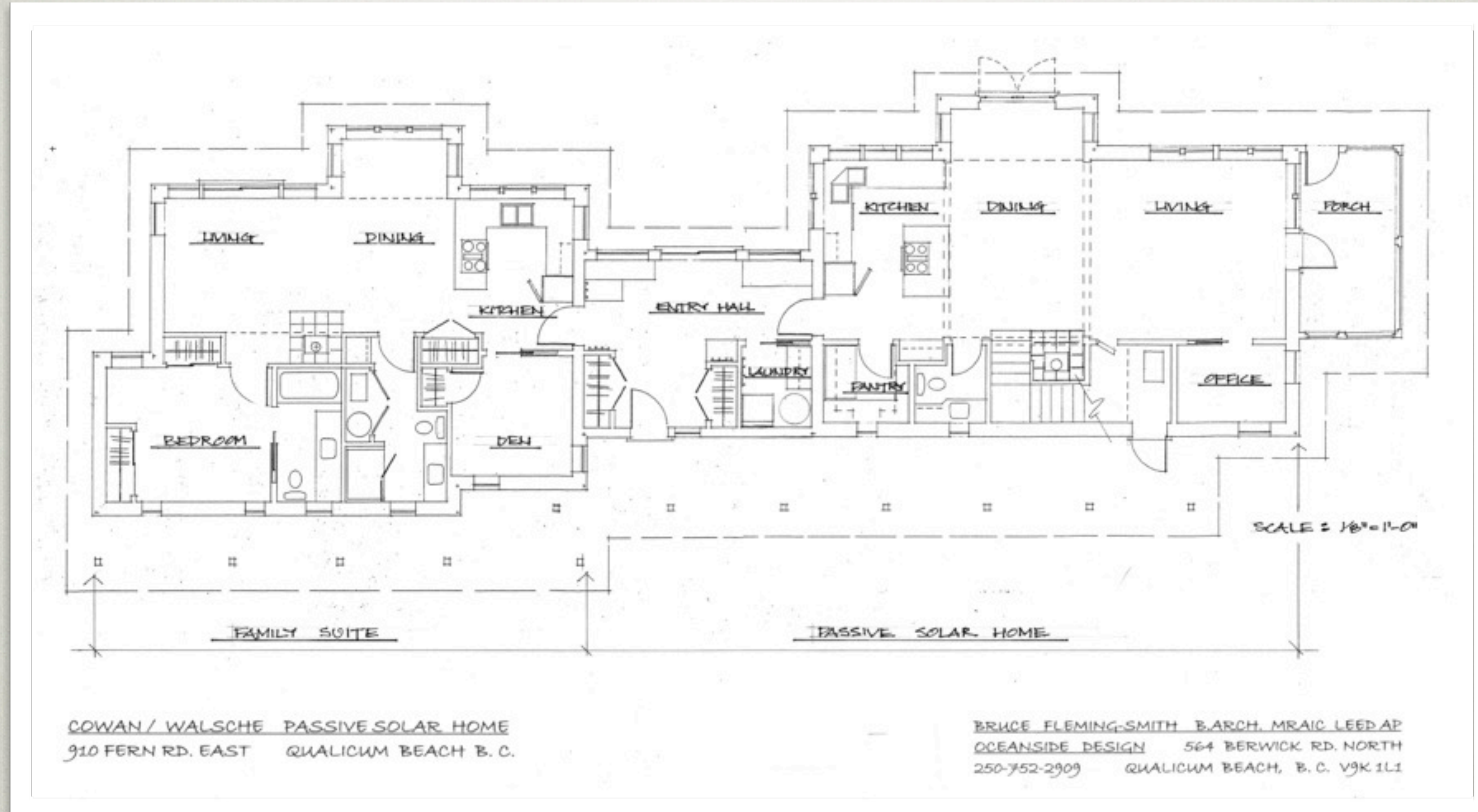
QUALICUM BEACH PASSIVE SOLAR



DESIGN & PLANNING

- 8.5% south glazing minimal north glazing
- south facing bays not yet added
- some north facing windows later deleted

QUALICUM BEACH PASSIVE SOLAR



DESIGN & PLANNING

- final floor plan - porch at W deleted - garden facing french or slider doors at Family Suite not yet finalized
- 12 inch thick exterior walls

QUALICUM BEACH PASSIVE SOLAR

DESIGN & PLANNING

- final drawing set includes 12 page detail drawing binder
- extensive "air barrier notes" target final building airtightness of 1ACH@50

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- a raw site - site milled lumber - a new pond
- enthusiastic owners
- 4 inches XPS foam beneath slab = R20

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- Pacific Homes supplied pre-fab walls, floor & roof
- Brad & Girard of PenBay Construction do the work
- sample of Pacific Homes layout/ fabrication sheets
- short work is made of tall walls

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- double stud walls all go in smoothly
- better project management would insure no conflicts between studs, anchors & seismic details

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- main house & family suite are thermally separate
- air barrier covers main house wall prior to roof truss
- careful installation of air barrier a must here

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- 2 inch EPS foam outside foundation
- protective metal cover with peel&stick for air & water barrier - followed by cover flashing

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- air barrier & foam block out at windows
- Gienow windows U.29/R3.4 - SHGC .58

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- Roxul Comfortboard IS goes over air barrier
- 2” of Roxul IS = R8 - lets wall breath
- XPS also used - minimal thermal breaks at walls

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- project included significant seismic reinforcement
- shear walls & holdowns at raised heel truss
- 1x4 rainscreen furring for solid backing for siding
- site milled wood for all trims & timber work

FERN ROAD PASSIVE SOLAR

- poly vapour/air barrier taped at ceiling
- TLC Insulation installs fibre mesh before dense pack cellulose is blown in - R3.8 per inch = R35
- poly over slab/2 layers ply/Aqua-bar paper/fir floor

CONSTRUCTION

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- interior finishing progressing
- attic access hatch important important for P-H
- PenBay's commitment to the job was excellent!

FERN ROAD PASSIVE SOLAR

CONSTRUCTION

- CertainTeed fibre cement siding for longevity
- metal roof with concealed fasteners
- main house & family suite are both “solar ready”

QUALICUM BEACH PASSIVE SOLAR

- TIGHT BUDGETS CHALLENGE
- CONTRACT MANAGEMENT IS ESSENTIAL WITH HIGH PERFORMANCE BUILDING
- ENERGY MODELING CAN MAKE A DIFFERENCE
- GET THE TEAM TOGETHER EARLY
- TRADES & SUBCONTRACTORS MUST KNOW THE PRIORITIES
- GET CLEAR ON KEY CODE ISSUES
- A SPECIALIZED HVAC PRO WHO UNDERSTANDS P-HOUSE IS KEY
- HIGH PERFORMANCE WINDOWS ARE CRITICAL

LESSONS LEARNED & QUESTIONS TO ASK

Thank you for your interest

Bruce Fleming-Smith
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www.agreenhearth.ca