A MV DIY ZNE DER by a GEEK, Part 1

Marc Rosenbaum, P.E. South Mountain Company West Tisbury, MA

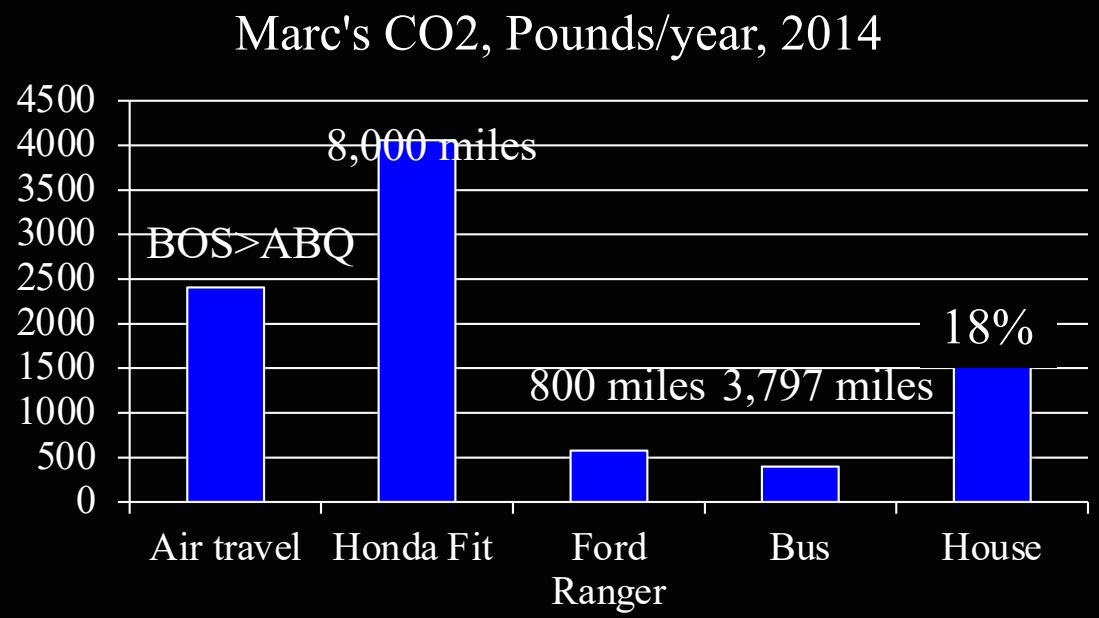
Objective

My intention is to share objectives, strategies, successes, and, let's just call them, *choices I wouldn't make again*

- Objectives
- Design
- Enclosure
- Systems
- Data
- Cost

Our Objectives

- Clients were a middle aged couple (60, 54) who were hoping to stay in this house until we can't..
- Find an existing house not "fixed up", good solar access and orientation, solid utilities and foundation, usable lot, N end of WT, close enough to town to maintain a bicycle lifestyle

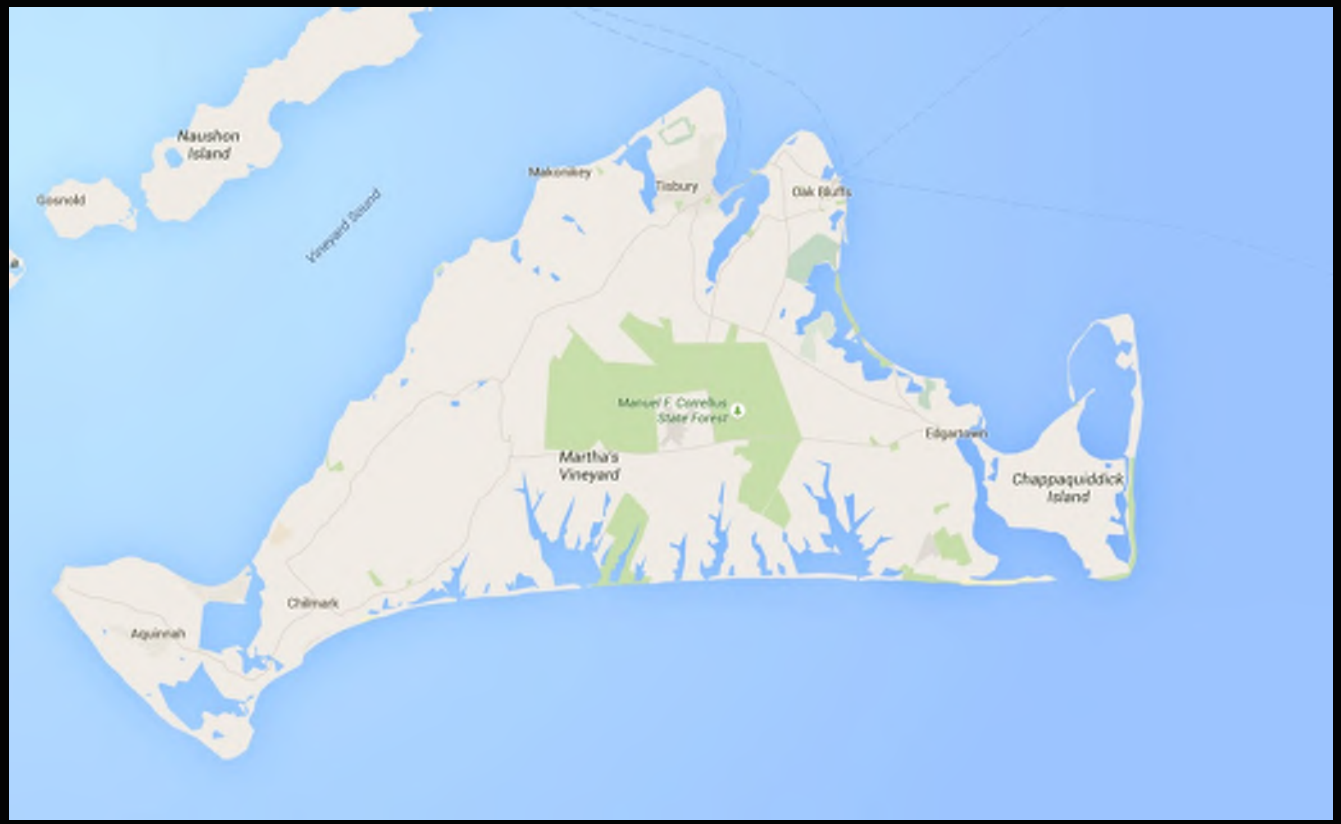


A Useful Bicycle

Cargo capacity
Generator lighting
Fenders
Studded tires

What We Started With

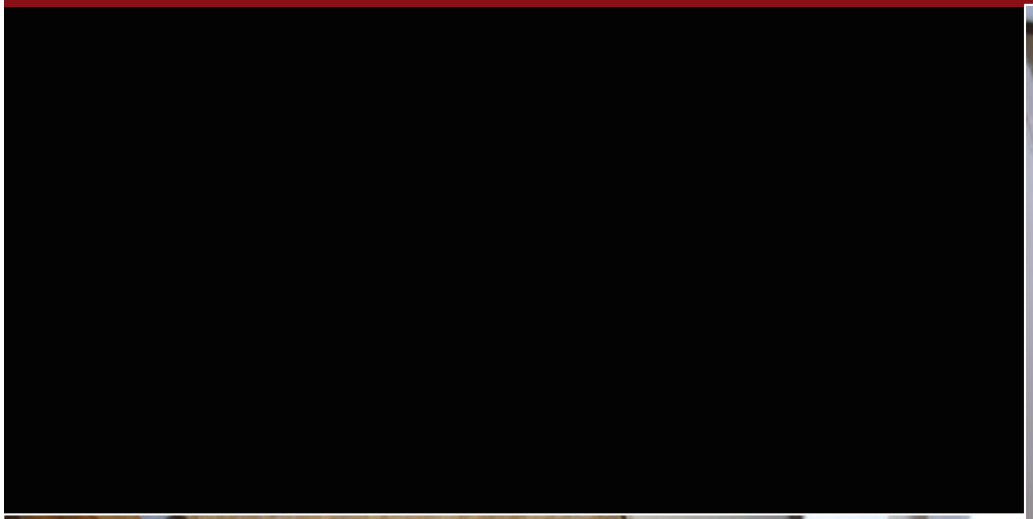
1,142 sf, 1 BR, 1 story, dry basement, 4 BR septic, good well, 200A and 100A underground services, 1-1/2A of sand plain, two funky outbuildings (converted truck bodies) in the middle of Martha's Vineyard



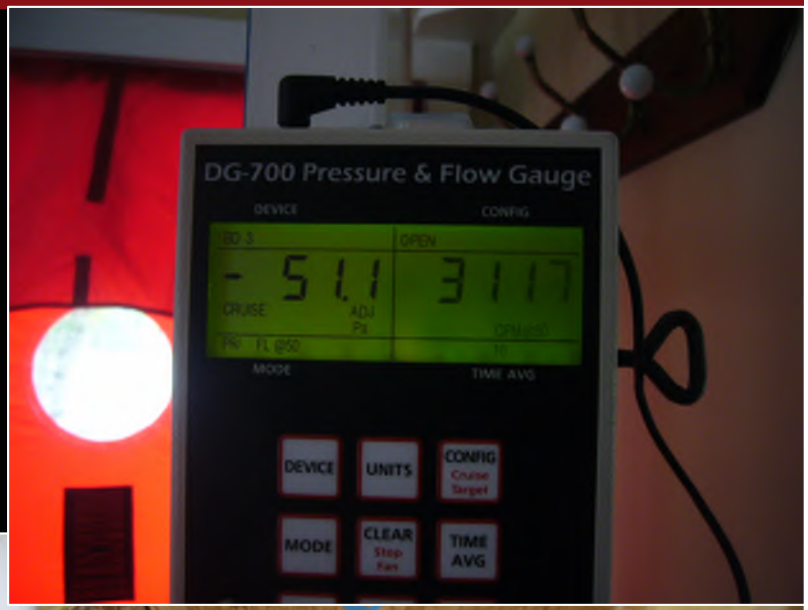
Existing Conditions

Moved From Edgartown

Structure?



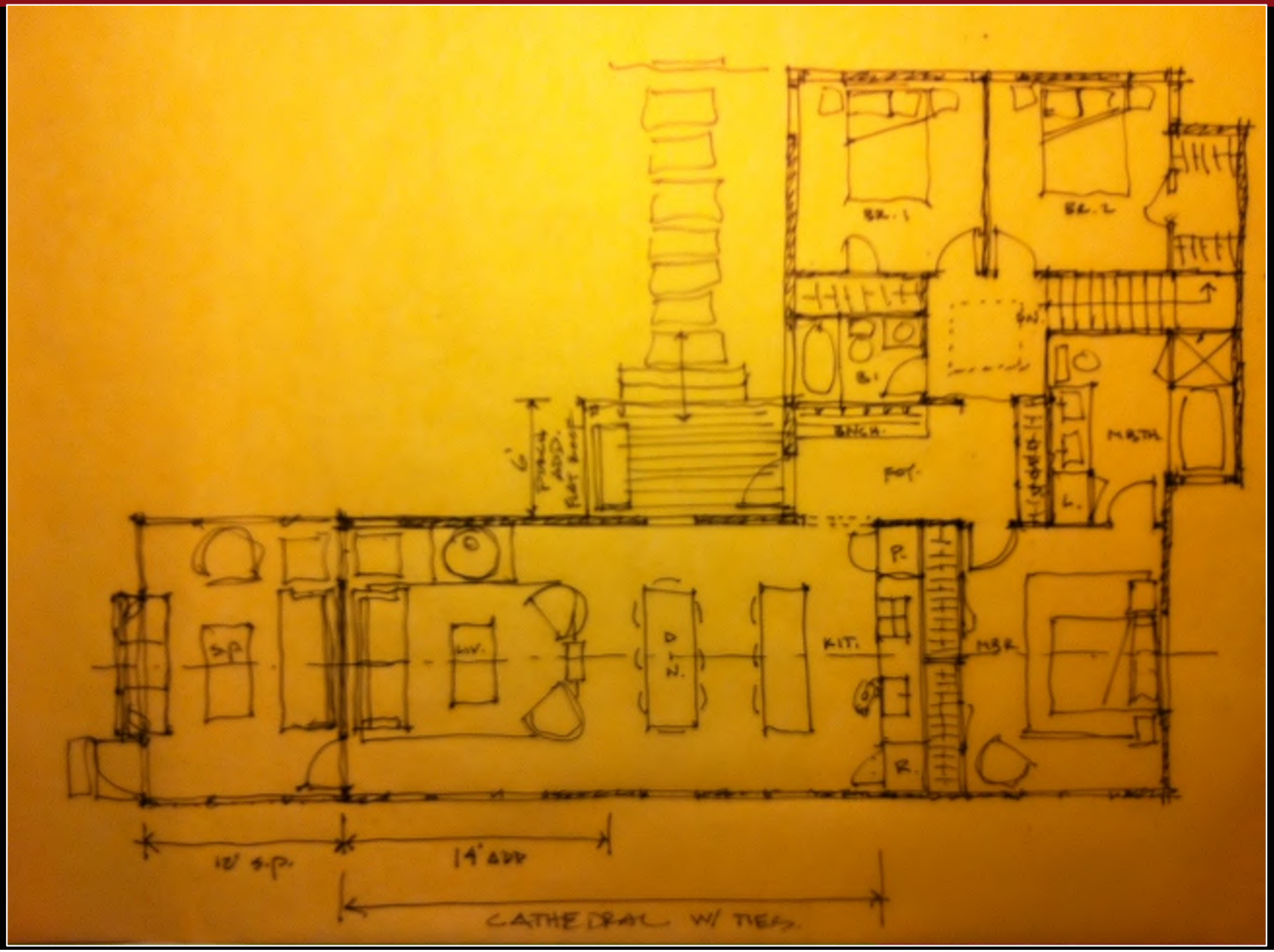
Energy Efficient?



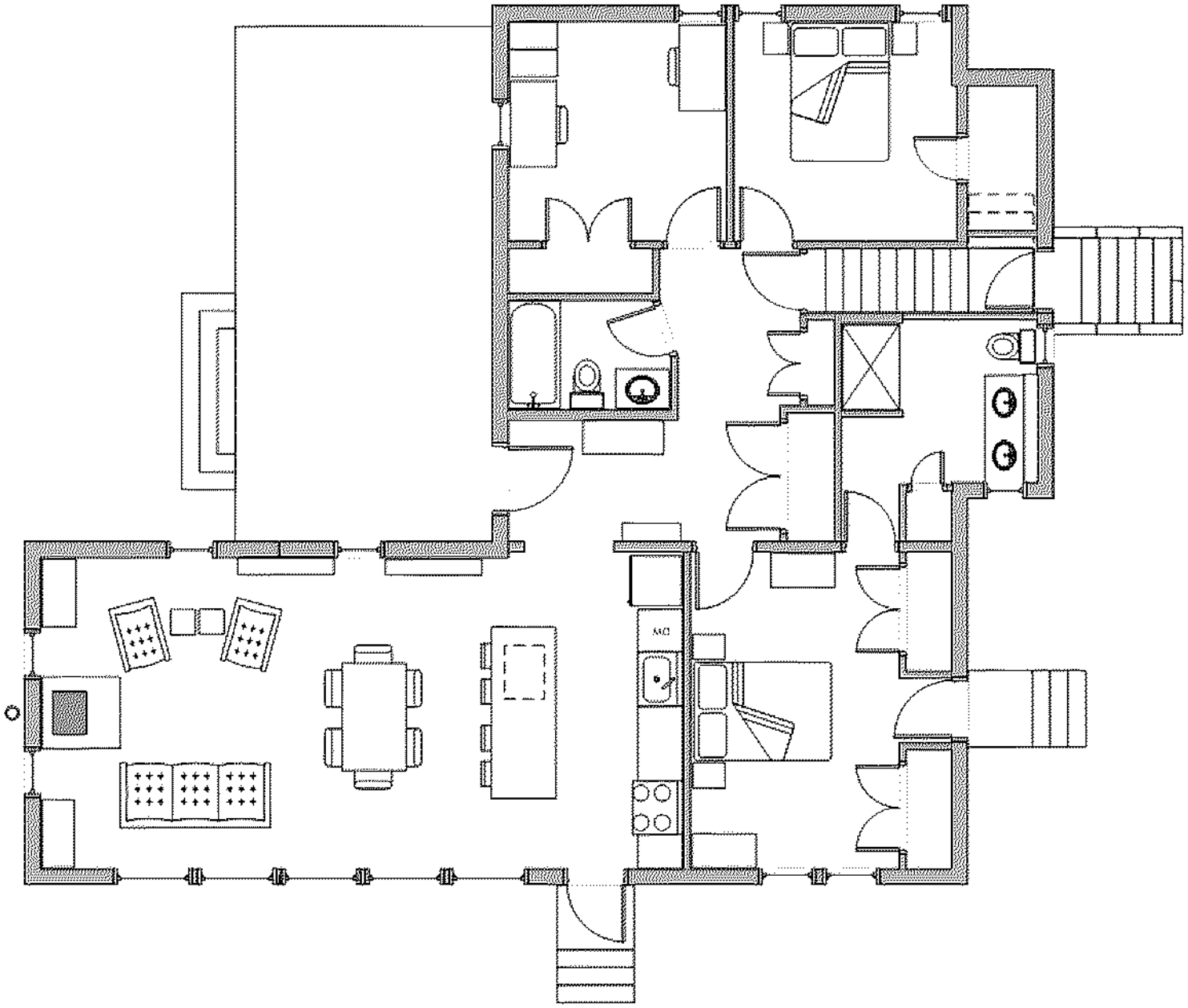
Design Criteria

- 3 BR, 2 baths
- Add S light, plus light on two sides
- Maintain high ceilings
- Southwestern feel
- Minimize added sf

Matt Coffey's Design



As-Built Design



Additional Goals

- Minimize materials going to the landfill
- Use salvaged materials where possible
- Durability
- Zero net energy
- Resilience

Dramatis Personae

- Ben Brungraber, structural engineer
- Pete Romaniello, lighting designer
- Richard Johnson, landscape architect
- Pascal Albanese, Island Home Construction, builder
- Matt Viaggio and Ned Reynolds, insulators
- Sean Welch, electrician
- Phil Forest, SMC, PV installer
- Brice Delhougne, SMC, HVAC assistance
- Jason Gale and employees, plaster
- Bill Russell and employees, hardwood flooring
- Barney Zeitz and Michael Caughwell, custom metalwork
- Numerous carpenters
- Jill and me, everything else and bill paying
- The #@&%! plumber shall remain nameless

Southwest View

Southeast View

West Addition

Interior Views

Interior Views

Interior Views

Interior Views

Interior Views

Enclosure

- Started with an annual energy model
- Goal was to keep roof and roof trim, and much of the wall shingles
- Floor plan and RO changes plus structural upgrades plus mice in the walls meant interior gut
- Both of these led to interior DER strategy, which is harder
- 12’x16’ addition on piers

Where's The Air Barrier?

- My original intention was to build inwards with two 1-1/2 inch layers of foil-faced polyisocyanurate foam over cavity fill in the existing 2x6 studs and 2x10 rafters
- Taping the foam would be the AB
- Got cold feet about this as the project progressed
- Compromise was a layered approach of first 3 inches of closed cell spray foam (CCSF), then the balance of open cell spray foam (OCSF)
- Used 1-1/2 inch polyiso blocks over the existing framing then 2x4 flatwise strapping – 8-1/2 inch wall cavity, 12-1/4 inch roof cavity – with thermal bridging about R-32 / R-44
- Don't try this at home…
- AB was caulked wood to wood joints, and the CCSF

Foam + Strapping

Foam + Strapping

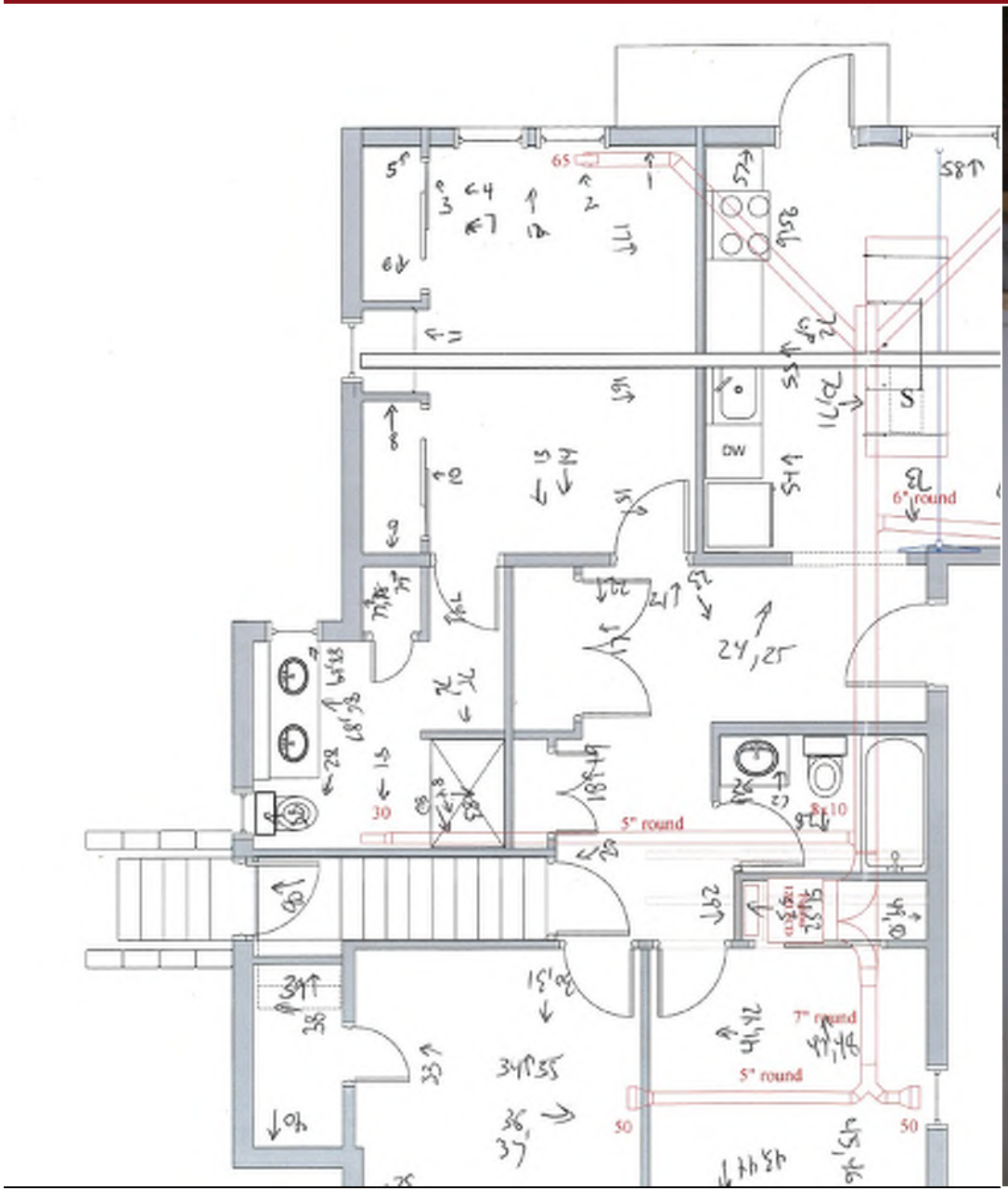
Foam + Strapping

Foam + Strapping

3 Inches Water-blown CCSF

3 Inches Water-blown CCSF

Roughing Photos



OCSF

OCSF

Addition Floor

Addition Floor

Addition Floor

Cellulose Dense-packed From Basement

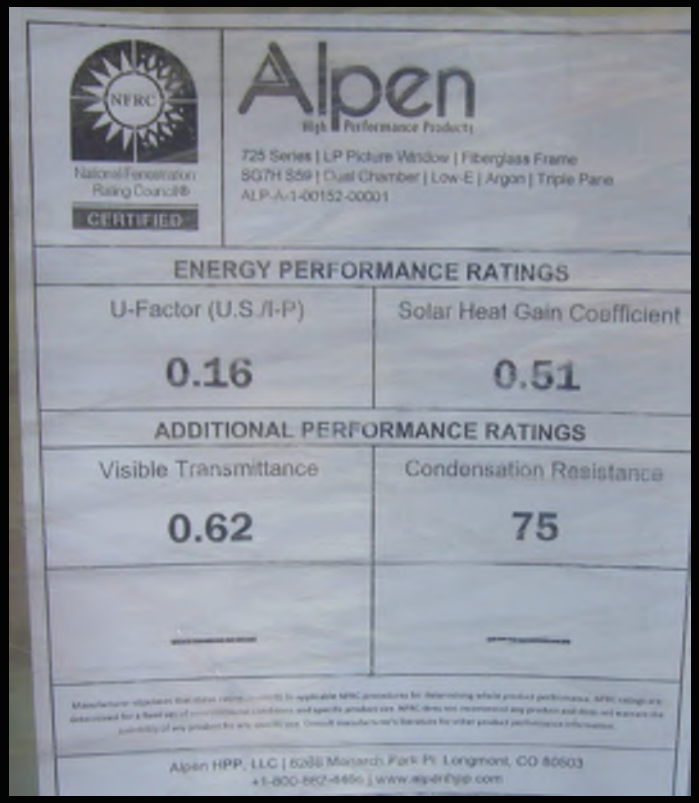
Prep For Wall + Slab Foam

Basement

2” Polyiso, 1”Thermax, 3” CCSF

Windows

- Choose high SHGC over low U value
- Triple glazed, two Cardinal 180 low-e layers (3,5), argon fill
- Fixed south glazing – low iron outer lite, krypton fill
- Insulated fiberglass sash and frame
- Warm edge spacer



Windows

Exterior Doors

- Fiberglass skins, foam insulation
- Hardly any insulated triple glazed doors – big $
- Four doors, one full lite, two half lite, one solid – 7% of total design heat loss
- Plan is to change out the glazing to triple

Durisol forms

Skylight

- Wasco, PVC frame E series
- Triple glazed, two Cardinal 180 low-e layers (3,5), argon fill

Air Tightness

Conditions	CFM50
Existing	3,117
After CCSF and caulking wood joints	419
After OCSF	351
After Drywall	338
After Plaster	331
After Floor Cellulose	281
After Rim CCSF	171
After Tweaking Doors, etc.	136
After Woodstove and chimney	141

HRV louvers taped off for all tests
Blast gates closed