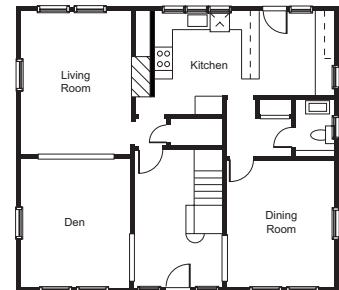


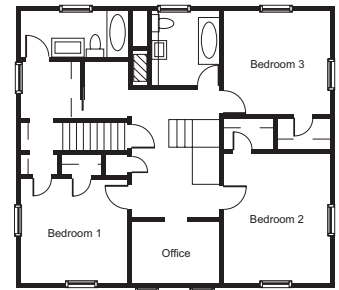
Case Study

Concord Four Square Retrofit

Concord, Massachusetts

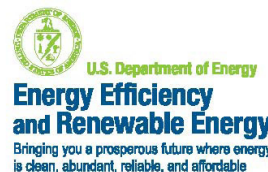


First Floor



Second Floor

Homes built prior to 1980 make up 80% of the housing stock in the United States, and are responsible for a majority of the residential energy use in the country. The Architecture 2030 goals call for a 50% reduction in home energy use by 2010. The objective of this project was to show that this energy goal could be met today in existing housing. The house was built in 1916 and is typical of the Sears kit homes available at that time. All systems were in need of updating, including plumbing, electrical and heating. Using systems engineering techniques, the enclosure and mechanical systems were analyzed to determine the most cost effective ways to meet this goal. Care was taken to provide proper water management details as the additional insulation was added.



PROJECT PROFILE

Project Team:

Building Science Corporation

Address:

West Concord, Massachusetts

3,600 ft² two-story, 4 bedrooms, 3 1/2 bath single family home

To be completed October 2008

Cost of renovation: \$100/ft²

Annual utility costs:

Gas before: \$2,400/year

Gas after: \$858/year

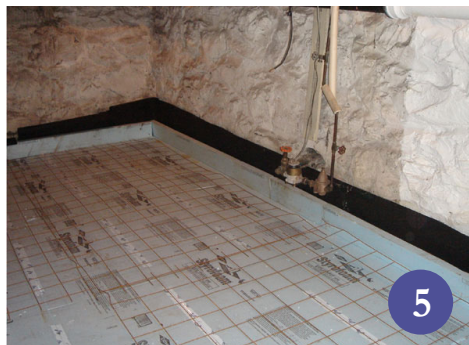
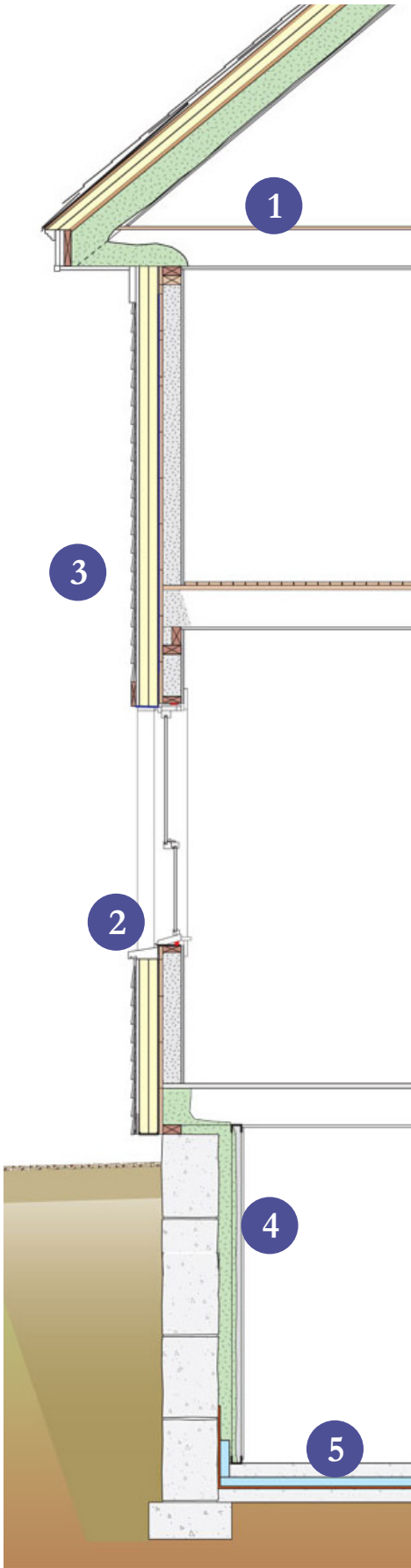
Electric before: \$960/year

Electric after: \$471/year

Total annual utility savings:

\$2,031/year

bsc Building Science Corporation
30 Forest Street
Somerville, MA 02143
www.buildingscience.com



BUILDING ENCLOSURE

Roof: Unvented

1 Attic Insulation: R-60 with 4" rigid foam on the exterior and 5" high density sprayed polyurethane foam to the underside of the roof sheathing

Roof insulation: Two layers of 2" polyisocyanurate rigid insulation

Air Sealing: Airtight drywall approach; low expanding foam sealant around windows, sealants and adhesives used between framing components

2 Window Specifications: Double-glazed, Low-E, argon-filled: U=0.33, SHGC=0.33.

3 Wall Insulation: R-41 with blown cellulose cavity insulation and 4" of rigid foam on the exterior

Foundation: Conditioned basement

4 Foundation Wall Insulation: R-20 walls with 4" high density sprayed polyurethane foam

5 Slab Insulation: R-10; 2" XPS insulating sheathing under the slab

Drainage Plane: Taped foil-faced polyisocyanurate

Radon Protection: Passive system installed

Infiltration: 2.5 in² leakage area per 100 ft² envelope

MECHANICAL DESIGN

1 Heating: 92% AFUE sealed combustion gas boiler in conditioned space

1 3 Cooling: 13 SEER split system in conditioned space

2 3 Ventilation: Supply-only system with outside air to return; run at low speed with an ECM motor

Filter: MERV 13

Return Pathways: Transfer grilles at bedrooms

Ducts: Sheet metal trunk and flex runouts in conditioned space

DHW: 0.8 EF side-arm storage tank

Appliances: ENERGY STAR dishwasher, refrigerator, range, clothes washer, clothes dryer

Lighting: Energy Star CFLs

Site Generated Power: 4.9 kW PV system **4**

ADDITIONAL FEATURES

- Large overhangs with crown molding to accommodate additional exterior foam **5**
- Front porch
- Maintenance-free fiber cement siding and trim
- Very high efficiency faucets, showerheads and toilets
- Plan minimizes water run-off from the site

