Building America Case Study
Technology Solutions for New and Existing Homes

Interior Foundation Insulation Upgrade—Minneapolis Residence

Minneapolis, MN

PROJECT INFORMATION

Private residence, basement renovation

Minneapolis, MN

Builder: Otogawa-Anschel Design + Build

Designer: Otogawa-Anschel Design + Build

Building Component: Envelope: Foundation Wall

Application: Single family home, retrofit (also suitable for multi-family)

Project year: 2006

Climate Zone 6A (applicable to most climate zones. Termite risk must be assessed)

PERFORMANCE DATA

Cost of Energy-Efficiency Measure (including labor):

Walls—dimple mat and SPF

Slab—demo existing, excavate, new granular fill, perimeter draintile, sump, insulation, slab: $28,406 (2006 cost)

In-floor hydronic heating system: $12,000

Projected 2013 cost: $50,000

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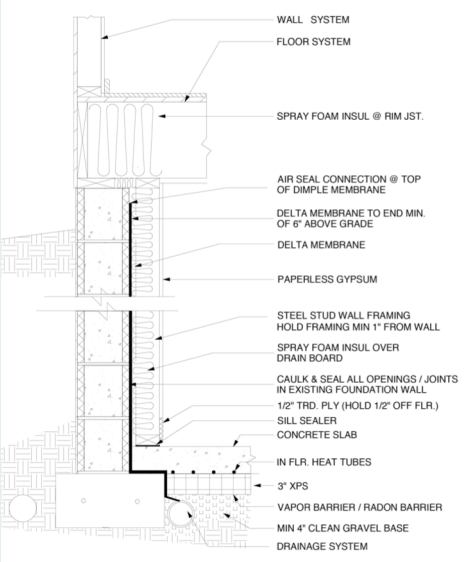
With the pending arrival of a beautiful baby girl, the homeowners of this 1928 Minneapolis Tudor wanted a basement that was conducive to a young child, and would provide a place for family to gather. The original basement was typical; cold, lacking natural light with tiny, uncomfortably confined rooms and that "unique" basement smell. The goal was to reverse all of the ill effects of a rarely appreciated space while increasing the performance of the older home.

The existing foundation was made of poured concrete, and there was evidence of vapor diffusion and limited bulk water intrusion. It was assumed that no waterproofing was installed on the exterior. The designers chose to install an interior upgrade. The wall upgrade included a dimple mat attached to the foundation wall, draining to a new perimeter draintile and sump system. The dimple mat, in turn, was covered in high-density spray polyurethane foam (SPF), which extends from the floor to the top of the rim joist. To facilitate installation of thermal and moisture management systems, the existing slab was demolished, and the subgrade was excavated approximately sixteen inches. Then new granular fill, three inches of extruded polystyrene, a vapor retarder, and a new slab with a hydronic heating system were installed. Ceiling height was increased by six inches.

Interior insulation upgrades can be at risk for moisture issues; this project employed a number of strategies to ensure success:

- Dimple mat conveys inbound moisture to new interior draintile and extends up the wall past the exterior grade
- SPF insulation is airtight, ensuring indoor air does not contact foundation wall surfaces.
- Slab demolition enabled the installation of complete moisture and thermal management systems under the floor.
- Paperless gypsum board and steel framing reduce mold risk.

"Finishing basements is a moisture first, insulation second proposition."
Michael Anschel, Otogawa Anschel Design + Build



Wall section showing the insulation and moisture-management components of the system

Before and after images of the stairwell area

Photo showing finished basement space. Extensive moisture management and insulating efforts result in a warm, dry living space.

Lessons Learned

- Homeowners' motivation for a basement finish is never to make the house more efficient. At the same time, when they go down below the ground they have the sense that they should be putting some level of insulation in but are unsure of how much. Their number one concern is that it stay dry.
- For a client who wants carpeting in their basement, it is important to install a moisture control system in the slab. Removing the slab, Excavating, installing gravel, insulation, and cross braided poly under a new reinforced slab is the best system.
- in floor heat in a basement can become a big energy sink if not done properly. This is when the value of insulation and thermal breaks is noticeable.

Looking Ahead

Most foundation insulation upgrades are made on the interior side because of the relative ease of access to the interior surface. However many of these upgrades are risky from a moisture management standpoint, employing air-permeable insulation materials, moisture-susceptible framing, and interior vapor retarders that essentially ensure moisture-related failure. This project highlights a robust approach that must be employed more widely. Contractors need to be educated about the relevant building science issues in below-grade spaces, so they can educate their clients about why spending more money on the front end will avoid many problems in the final project.

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