

Super Insulated Construction

Why We Do What We Do

It's safe to say that most people would like their homes to be:

- Safe and healthy to live in
- Durable
- Comfortable
- Energy efficient
- Resilient in the event of a disruptive event.

The best way to achieve these outcomes is superinsulation, a term coined by Wayne Schick in 1976 when the University of Illinois designed and built the Lo-Cal House. Since then, we have gained forty years of experience with this construction method and the ability to dramatically improve on conventional construction.

The components of superinsulation are airtight construction (with heat recovery ventilation), high levels of insulation (roughly doubling code requirements), and triple glazed high performance windows. At South Mountain, we've used multiple approaches. Our current typical approach is to use:

- Basement: four inches of rigid foam beneath the slab and three inches of rigid foam on the walls
- Walls: 2x6 studs with either cellulose or open cell foam cavity insulation plus three to four inches of rigid foam on the exterior
- Roofs: 2x10 rafters with either cellulose or open cell foam cavity insulation, plus three to four inches of rigid foam on top.

Building this way, we can reduce the heating load of the house enough that we can use electrically powered high-efficiency heat pumps for heating, cooling, and hot water rather than fossil fuels. Heat pump operating costs are less than half of fuel oil or propane. Using heat pumps also allows the house to be powered by renewable solar electricity, and the possibility of attaining net zero energy use or becoming a net energy producer, which many of our houses are.

But there is a significant collection of other benefits to building this way, including:

- The basement space is encapsulated by insulation, cutting off ground moisture and raising the surface temperatures above the dew point of the air, thereby creating a mold-free environment, and reducing or eliminating the need for dehumidification
- The framing components are inside the exterior insulation, keeping them warmer, which means lower wood moisture content and less vulnerability to decay
- High levels of roof insulation and airtight construction eliminate ice dams
- Air leakage, the most common cause of frozen pipes, is greatly reduced
- The superinsulated, airtight building enclosure combined with triple glazed windows provides high and more even interior surface temperatures, and therefore a draft-free interior and a more comfortable environment to occupy
- Triple glazed low-e windows eliminate interior condensation in winter
- In the event of a winter power failure, the house loses heat slowly and maintains livable conditions far longer than conventional houses, and is very unlikely to freeze
- Moisture laden air is kept out of walls and roofs, preventing decay and mold

- Noise transfer from outdoors is substantially reduced
- Pollutants from outdoors stay there, and the ventilation system ensures fresh air.

That's a serious list of benefits, all resulting from the well-informed practice of good building science. They are non-energy-related, and in many cases may be more valuable than the energy savings. Most people want to think their home is energy-efficient, but don't have a sense of what constitutes success. They have a much better grasp on whether their home is comfortable, easy to maintain, and healthy to live in. In essence, the low (or non-existent) energy bills are an extra way our clients benefit from building a healthy, durable, resilient, and comfortable house.