



## FACT SHEET

### HOUSE: BASEMENT

#### Description

While basements are common in cold-climate construction, the decision to include a basement affects a variety of health, construction, and cost-related issues. Basements provide a range of useful functions, including additional storage, laundry and mechanical equipment space, refuge space from tornados, and potential living space (given proper construction). However, not all basements are created equally. If a basement is to be considered “livable” (which means that the quality of the space is acceptable for human occupation), then it is essential to address issues of indoor air quality, moisture and soil gas control, ventilation, daylighting, and egress. The following comparative analysis identifies the relative economic, energy, and environmental implications of no basement, garden basement, and full basement options. Further information on foundation systems can be found at Assemblies: Foundation.

#### Recommendations

Whether to build a basement or other foundation type is a complex decision. A house with a basement costs more than slab-on-grade or crawl space foundations, but it can provide additional living space making the overall cost per square foot less. Basements that are not designed to livable standards (with proper daylight, egress, moisture protection, insulation and ventilation) are a great concern because they are often occupied in any case and may have significant health risks. For this reason, if a garden basement or a full basement is constructed, it should be built to “livable basement” standards. When the site and program permit, a garden basement should be considered because of its lower cost and greater opportunity for windows. While slab-on-grade and crawl space foundations may appear to cost more per square foot than a basement option, there are definite tradeoffs. The quality and usability of basement space may not be equivalent to above grade space. If a no basement foundation option is selected, consideration should be given to the overall house design to provide adequate storage. Life safety issues related to severe weather must also be addressed through design and construction.

## Basement Alternatives

alternatives	cost/sf-habitable	energy cost/sf-habitable	material/sf-habitable	IAQ
slab (864 s.f.)	\$95.97	\$1.44	concrete (C.Y.) 0.02 steel <sub>mesh</sub> (s.f.) 1.10 insulation A (s.f.) 1.00	better
crawlspace (864 s.f.)	\$97.29	\$1.44	concrete (C.Y.) 0.02 steel <sub>rebar</sub> (lbs.) 0.76 insulation A (s.f.) 0.56 lumber (bf) 0.11 subfloor (s.f.) 1.00	good
garden basement (1728 s.f.)	\$56.54	\$1.06	concrete (C.Y.) 0.02 steel <sub>rebar</sub> (lbs.) 0.93 steel <sub>mesh</sub> (s.f.) 0.55 insulation A (s.f.) 0.78 lumber (b.f.) 0.01 sheathing (s.f.) 0.28 sheetrock (s.f.) 0.28 insulation B (s.f.) 0.24	typical
unfinished basement (864 s.f.)	\$109.33	\$1.72	concrete (C.Y.) 0.05 steel <sub>rebar</sub> (lbs.) 2.23 steel <sub>mesh</sub> (s.f.) 1.10 insulation A (s.f.) 2.11	typical
finished basement (1728 s.f.)	65.82	\$1.08	concrete (C.Y.) 0.02 steel <sub>rebar</sub> (lbs) 1.11 steel <sub>mesh</sub> (s.f.) 0.55 insulation A (s.f.) 1.06 lumber (b.f.) 0.01 sheetrock (s.f.) 0.56	typical

## Criteria Summaries

**Cost:** The cost per square foot of a “livable basement” in either a garden basement or full basement configuration is typically less than above grade construction, but greater than a slab-on-grade, or unfinished basement. This additional expense may be acceptable if the basement space can be inhabited because the total cost per square foot of habitable space decreases sharply when the basement is included. Cost per square foot of habitable space decreases by 30% for whole house calculations when comparing the finished basement to a slab-on-grade.

**Energy:** Less energy is required to condition below-grade space as compared to above-grade. Whole house energy consumption is reduced by 15% per square foot for a finished inhabited basement (either full or garden) when compared to slab-on-grade. Whole house energy consumption is reduced by 25% per square foot for a finished inhabited basement (either full or garden) when compared to unfinished uninhabited basement.

alternatives	whole house cost	percent of budget	cost/sf-habitable	energy cost/sf-habitable
slab (864 s.f.)	\$82,920.00	12.4	\$95.97	\$1.44
crawlspace (864 s.f.)	\$84,060.00	14.7	\$97.29	\$1.44
garden basement (1728 s.f.)	\$97,697.84	21.7	\$56.54	\$1.06
unfinished basement (864 s.f.)	\$94,460.00	20.2	\$109.33	\$1.72
finished basement (1728 s.f.)	\$105,310.00	28.4	\$65.82	\$1.08

**Materials:** A basement, garden or full, is inherently more resource consumptive than a slab or crawl space due to the increase in materials. Depending upon the site conditions, a basement may involve greater environmental impact at the site scale for excavation and site preparation. Garden basements may have less impact than a conventional depth basement. A basement constructed not solely as a structural foundation system with incidental uses, but as habitable space is less resource consumptive when materials per habitable square foot is considered. A garden basement, which requires less concrete and steel may be less resource consumptive than a standard basement depending on what construction system is used for the above grade walls. (see Assemblies: Wall)

**IAQ:** Wet and damp basements can cause an increase in mold and mildew within the house. This in turn can lead to a decrease in indoor air quality. In addition, basements in general and habitable basements in particular can have high levels of radon gas, a known carcinogen. Steps must be taken to prevent moisture and radon gas problems. Improperly constructed crawl spaces can also have negative impacts on IAQ.