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# On-Grade Insulated Panel Floor System

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## ABSTRACT

*The On-Grade Insulated Panel Floor System combines floor and foundation to reduce cost, maintain energy and structural performance in operation, and provide easy dismantling and recycling upon demolition of the structure. Our prototype combination floor and foundation system uses one-sided structural insulated panels (SIPs with one layer of sheathing attached to foam insulation) on a compacted gravel bed, and uses engineered lumber for the perimeter beam.*

*We built a 720 ft<sup>2</sup> test floor to determine constructability, construction time, cost, and performance of the panel floor system. The 20 foot by 36 foot site was graded, the footer perimeter trenches were dug, gravel was laid and compacted, and footer beams were laid. A polyethylene moisture barrier was placed over the gravel. The R-20 foam faced with Oriented Strand Board (OSB) panels fitted foam side down on top of the polyethylene; an additional layer of OSB sheathing was positioned over panels, staggering the joints.*

*Seven structural tests were conducted representing typical distributed, point, and dynamic loads. The tests showed that the floor meets standards for concrete slab levelness and flatness, and wood floor system deflection simulating an interior wall load (design load of 380 lb/ft) was 0.25 inches and the average was 0.05 inches. If built as a joist system, a floor with a span of 20 feet corresponds to a maximum allowable deflection of 0.67 inches. We determined that the floor could support bearing wall loads. Additional test floors are planned to examine temperature, moisture, and further structural performance.*

*After test, the floor was disassembled in eight hours by an inexperienced crew. We estimate an experienced crew and additional power tools could dismantle the floor in under four hours.*

*The estimated total cost for the on-grade panel floor requires less than a concrete slab floor and nearly 40% less than a crawl-space foundation. The on-grade panel floor requires less time to construct than either slab or crawl-space system.*

*This floor/foundation system replaces the typical concrete systems with materials having lower embodied energy and cost. The insulated floor/foundation should outperform a concrete floor in energy performance. The ease of dismantling the structure indicates potential in recycling and reuse at the end of its life cycle.*

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