ICF Walls - Wood Fiber Composite Forms: 2005

Cement-bonded recycled wood chip forms that hold concrete in place during curing and remain to provide thermal and sound insulation.

Summary

Concrete walls can be constructed of cement-bonded recycled wood chip stay in-place Insulated Concrete Forms (ICFs), that hold concrete in place during curing and remain in place to provide thermal and sound insulation. The blocks are lightweight and are available with mineral fiber insulation to provide an energy-efficient, fire and termite resistant, and durable structural wall system. The system is inherently moisture regulating, capable of absorbing high levels of moisture in the air without damage. The wall form however, does not support fungal or mold growth. The material is capable of being installed both above and below grade and is available in various widths and insulation thicknesses.

Cement/Wood fiber blocks are similar to subsequently developed ICF systems comprised of foam insulation with metal or plastic joiner ties. Cement wood fiber blocks are intended to be dry-stacked and are designed with horizontal and vertical cells that are filled with concrete to form the structural portion of the wall. Vertical and horizontal interlocking channels simplify alignment.

The wood fiber used in the manufacture of the block may be partially or fully comprised of post-industrial softwood which is then mineralized with cement. The basic material heat resistance is approximately 1.75 per inch thickness. The product R-values range from about R-8 for an 8 inch block with no additional insulation to R-20 for a 12 inch block with a 3 inch mineral wool insert. No bridging occurs since the solid portions of the material at the ribs have an insulative value of about R-14.

The hygroscopic properties of the material allows it to readily take up excess moisture in the air and store it without being absorbed and without damage to the material. On the interior, this property helps to balance changes in the relative humidity of the indoor environment. On the exterior, the material can act as a drainage plane if subjected to liquid water as is possible in a basement. An air barrier may be required for some finishes.

The thermal mass benefits of the concrete are enhanced with cement wood fiber blocks since at least two-thirds of the insulation is on the exterior of the mass. This proximity of the mass to the indoor environment serves to stabilize the indoor air temperature and to take advantage of direct solar gains in heating periods.

PATH Attributes

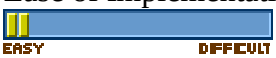
These forms are competitive with their foam counterparts. However, due to their greater versatility, they may be a more cost effective option than both foam form and wood frame homes.

Wood fiber ICFs provide good insulation without the need for additional layers to be added. The form allows little infiltration, can absorb moisture to help balance humidity, and can act as a thermal mass. This all can help save on enrgy costs.

In addition to helping conserve energy, these forms do not give off any toxic runoff or airborne pollutants.

Wood fiber ICFs are not susceptible to rot and infestation, and thus can last for many years while providing a strong, durable structure. In addition, some finishes can be applied directly to the wall.

Ease of Implementation



Appropriate concrete placement equipment (such as a pump truck) may not be available in some locations distant from metropolitan areas. Cement wood fiber blocks change the construction sequence, which initially requires a greater amount of coordination between the trades.
Methods for attaching interfacing materials are different from traditional building materials and may be met with resistance by trade contractors. For example, utilities must be routed behind or within the wall surface by cutting grooves in the block.
There are at least two North American manufacturers of cement wood fiber block - some distribute directly to concrete contractors or builders.

Initial Cost

Cement wood fiber block costs range from about $2.00 per square foot for an uninsulated block (R-8) to about $4.00 per square foot for a 12" block with 3" of insulation (R-20), in addition to installation labor, reinforcement, bracing, and concrete.
Cement wood fiber homes cost about the same as foam ICF wall systems. However, they may be more cost-competitive when considering the interior and exterior finishes applied directly to the wall surface.

Operational Cost

Not Applicable

U.S.Code Acceptance
As with ICFs with flat wall configurations, concrete wood fiber wall systems must meet standard prescriptive structural design requirements for cast-in-place concrete walls in the building codes. Since the block has no plastic foam insulation on the interior surface, no special attention is required to meet fire resistance provisions. Currently, manufacturers of post and beam and grid systems provide design and engineering assistance to help builders obtain local code approvals. Grid ICFs are expected to be in the "International Residential Code" by the end of 1998.

Field Evaluations
Not Applicable

Installation
Cement wood fiber blocks are commonly installed on standard spread footings or on-grade concrete slabs. Layout lines may be used and the cement wood fiber blocks are stacked or set in place in an interlocking fashion. Steel rebar is placed where required in the hollow cores. Concrete is poured, typically with a concrete pump. Blowouts and floating are uncommon due to the interlocking feature and the material weight. The ribs are designed to withstand the cement pressure during the pour. Bracing may be required in specific instances where the block has been cut.
The material may be cut using a carbide tip circular saw. Chases for electrical or plumbing materials may be cut with a router or placed within the block prior to the pour. After curing, standard construction materials are used to complete the roof, floors, and interior walls.
Interior finishes may be applied directly to the surface of the cement wood fiber blocks. Gypsum board may be attached using a coarse thread screw. Exterior finishes such as stucco may be applied directly to the surface of the block without use of building paper or wire mesh. Other rigid finishes require attachment support through to the concrete, which may be accomplished through use of furring strips attached with anchor bolts prior to the pour.

Warranty
Not Applicable

Benefits/Costs
Cement wood fiber blocks allow trade contractors to construct concrete walls without a significant investment in reusable forms. They are inert with no VOC’s or off-gassing, they do not support fungal or mold growth and are termite and rot resistant. The block will not burn nor release toxic fumes in the event of a fire. Should the cement wood fiber block become wet, no damage will result. The block is capable of storing high levels of moisture thereby dampening large swings in interior humidity levels. Thermal performance is slightly enhanced in most climates due to the proximity of the mass (concrete) to the interior air.

The insulating quality of the block forms allow for cold weather concrete pours to as low as 5° F with only top form insulation added. In addition, high-slump concrete mixtures may be used since the concrete wood fiber block material facilitates the removal of water. With high-slump mixtures, the use of vibrators may be unnecessary

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Please visit Path's website at www.toolbase.org for additional and up to date information about this subject.