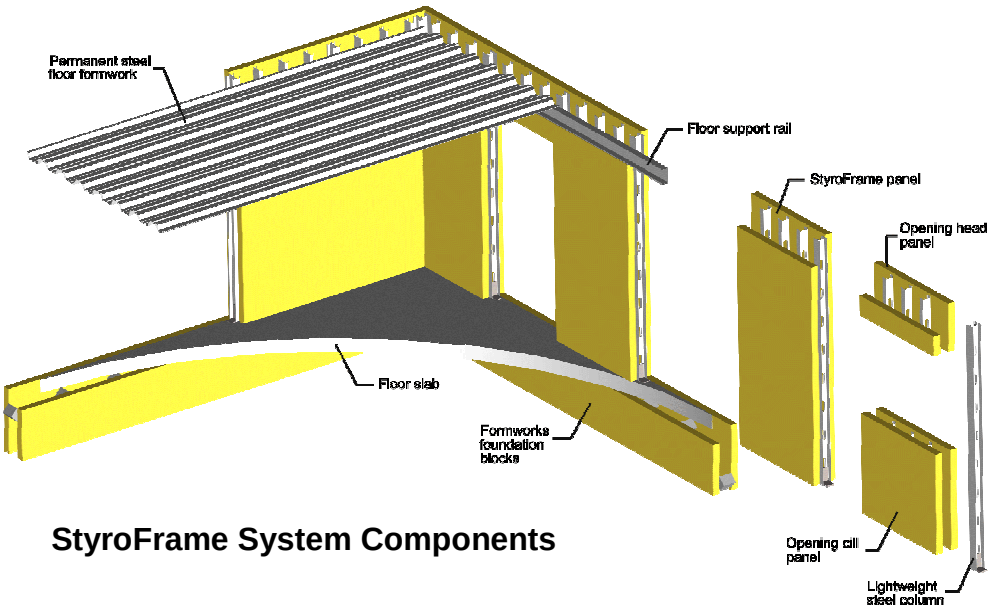
StyroFrame Construction System

A Modern Method of Construction by Formworks UK Ltd.

Smart 2001
Award winning product

Hybrid Permanent Insulating Formwork

for high specification sustainable buildings



StyroFrame System Components

Buildings constructed using Styroframe are:

Warm and economical

- **Super-insulated** - much better than current building standards, with a U-value of 0.1 W/m^{2}K if required
- **Airtight** - the construction method ensures air tightness, providing enhanced comfort levels and energy efficiency. A whole house ventilation system provides clean, filtered and pre-warmed air.
- **Concrete construction provides thermal mass.** Improved comfort levels and small temperature fluctuations.

Quiet and strong

- **High mass** ensures good acoustic performance.
- **Strength** - The composite structure is resistant to extreme climate and physical damage.
- **Built quickly** resulting in less disturbance on and around the site.
- **No waste.** Off-site manufacture ensures no on-site waste.

Cost effective

- **Speed of construction** - Quickly erected using semi-skilled labour. Addresses skill shortage.
- **Off-site production** - Pre-fabrication cuts construction time, cost and waste.
- **Low running costs** - Future benefits as fuel costs increase.
- **Future proof** - meets proposed increased standards.

Eco friendly

- **A+ Green Guide Rating for installed StyroFrame external wall panels with concrete fill.**
- **Super-insulation** ensures low energy use therefore reduced CO_2 emissions
- **The most efficient use is made of all components** - They fulfil more than one function.
- **No waste.** Off-site manufacture ensures no on-site waste.

StyroFrame is a Modern Method of Construction that provides the advantages of off-site construction without the logistical problems often associated with the transport and placing of heavy units.

Insulation panels enclose steel columns which support the floor forms, creating a stable self -supporting structure ready for placement of the concrete core. The lightweight panels are manufactured to suit the handling requirements of the site. They are prefabricated and sent to site for assembly. Standard panels can be manhandled or full pre-finished elevations machine placed.

The walls and floor are poured together, creating a strong airtight shell, saving time and cost. The heavy element, concrete is sourced locally and quickly placed using minimum labour. Foundation blocks provide an economic insulated foundation wall and the slab is cast together with the rising wall in one operation.

StyroFrame can be manufactured and supplied to a range of specifications depending on performance and finishes required, this includes PassivHaus, the worlds leading standard for energy efficient construction for dwellings (see later in this brochure and www.passivhaus.org.uk).

Popular finishes include through colour, maintenance free render, brick slips or timber cladding.

Increased insulation and passive use of solar energy provides a more economical, durable and efficient option than many of the add-on solutions currently being employed such as photovoltaic cells or wind power. Insulation is widely accepted as one of the most efficient ways of reducing energy consumption and is cost effective, especially when incorporated as part of the building system and the payback period is short.

Certification

Agrément Certification in South Africa, Certificate No. 2009/363

Premier Guarantee System Approval simplifies the process for issue of the Premier Guarantee 10 year warranty.

Mortgages

Details of mortgage providers who accept the warranties listed below are available at www.cml.org.uk/handbook/

Warranties for building defects insurance are offered by many providers, this is not the exclusive domain of NHBC; some are listed below:

Premier Guarantee offer warranties for new homes, social housing, self-build and commercial projects.

LABC Hallmark offer warranties for new homes, social housing, self-build and commercial projects.

Building Life Plans offer warranties for residential, social housing and commercial projects.

The construction sequence

StyroFrame Passive

We recommend building to PassivHaus standards - Save energy and money - typically 90% compared to existing housing.

The term 'PassivHaus' refers to a specific construction standard for residential buildings which use very little energy and have excellent comfort conditions and in both winter and summer.

PassivHaus dwellings have:

Compact form, orientation and good insulation.

The shell of a PassivHaus is insulated to achieve a U-value better than 0.15 W/m^{2}K; typical UK houses are constructed to 0.25 - 0.35 W/m^{2}K.
The orientation of the building is designed to take advantage of passive solar gains whilst reducing overheating so providing light, airy houses.
The total energy demand for space heating and cooling is less than 15 kWh/m^2/yr treated floor area, a typical UK house uses 55 kWh/m^2/yr, older houses use much more.
The total primary energy use for all appliances, domestic hot water and space heating and cooling is less than 120 kWh/m^2/yr.

Energy efficient windows and doors are installed.

Energy efficient ventilation and clean air. A whole house ventilation system with highly efficient heat recovery filters the air to ensure excellent indoor air quality and provides energy savings.

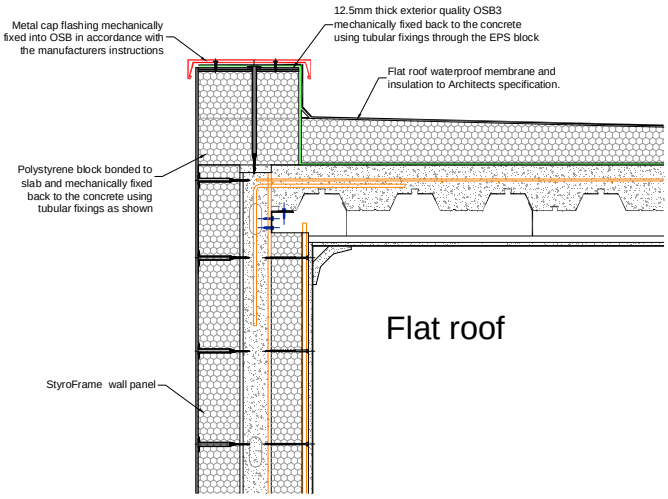
No Boiler - A PassivHaus does not need a traditional heating system or air conditioning. The small heating demand can be provided by using a small heater within the ventilation system (although there are a variety of alternative solutions.

Energy saving household appliances provide energy savings and reduce costs.

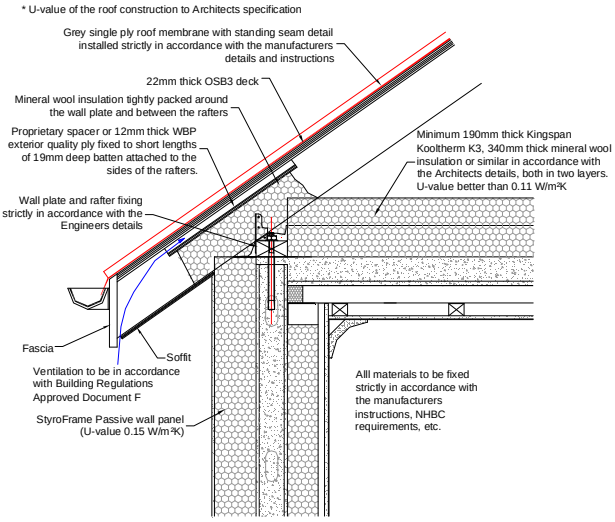
For further information see www.passivhaus.org.uk

Formworks UK can assist in the design and realisation of your PassivHaus project.

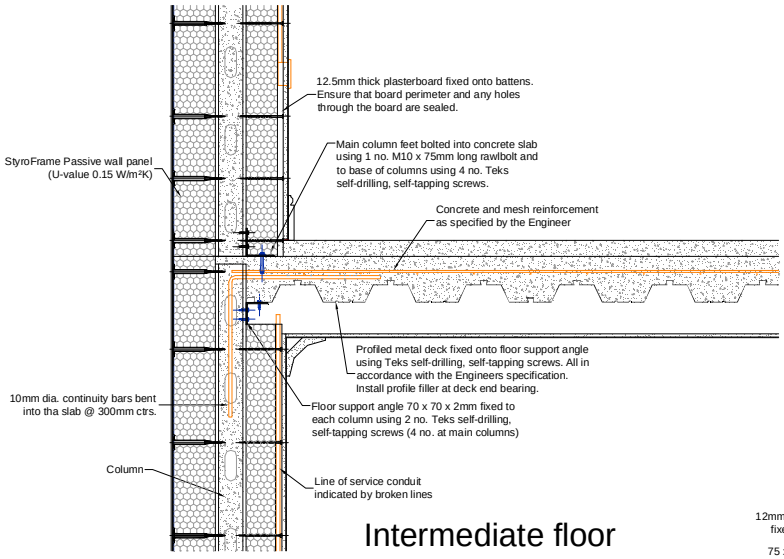
Typical Passive details



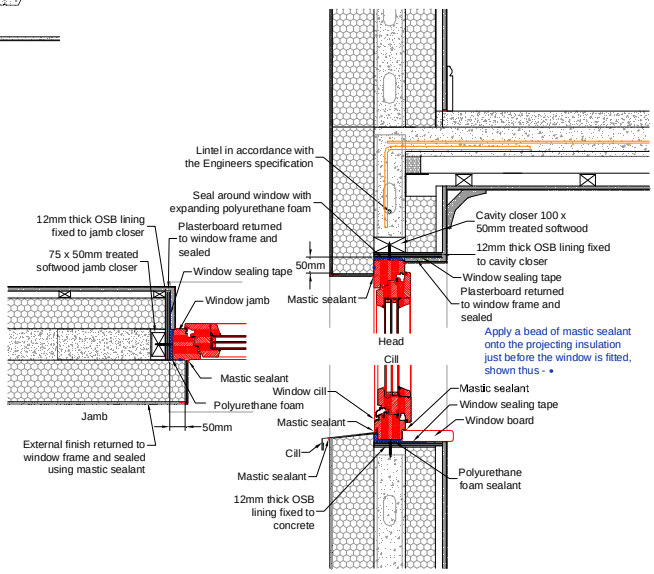
Flat roof



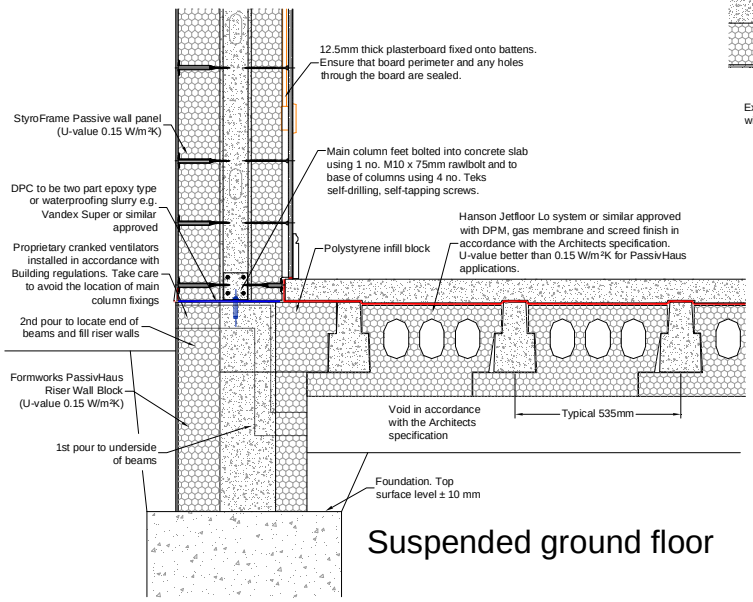
Pitched roof



Intermediate floor



Typical opening



Suspended ground floor

The Strength of ICF Construction

Blast Resistant Walls

The ability of ICF construction to withstand tremendous impacts has not gone unnoticed by the U.S. Military. In 2003, they conducted a series of blast tests at the Quantico Marine Base outside of Washington D.C. Six 10'x10' ICF "reaction boxes" were tested at distances ranging from 40 feet to 6 feet, using 50 pounds of military-grade TNT on each blast. The boxes had a nominal 6" concrete core, and were filled with regular 4,000 psi concrete. Horizontal and vertical rebar was placed every 16 inches.

At an earlier demonstration, timber frame walls were completely obliterated 35 ft. from the explosion. ICF walls survived explosions as close as 6 ft. Results showed that the EPS foam absorbed and reduced the force of every blast, regardless of the distance.

On the closest blast, the 50-pound charge of TNT created a ball of fire approximately 200 feet wide and 100 feet tall, generating forces 10 times the weight of the box. The blast did melt away the foam and create several small cracks—less than 2 mm in width—on the front face of the ICF wall, but there was no deflection, spalling, or structural damage to the concrete itself. A video of the tests can be seen by following the link on the ICF Magazine website http://www.icfmag.com/back_issues/aug-sept_06.html#11

ICF after the Hurricane/Tornado

In 2005 Hurricane Katrina made history as the most devastating storm in U.S history. Pushed by 150-mph winds, a tidal surge estimated at 22 feet high swept through Alabama and Mississippi, wiping entire towns off the map. All that is left of one neighbourhood is row after row of concrete slabs - and one ICF home. It stands as a prime example of the durability of ICF construction.

Devastation caused by Hurricane Ivan in 2004.

Every year there are more than 1,000 tornados in the United States causing millions of dollars in damage.

Flying debris is a major problem during hurricanes and tornadoes and studies have therefore been carried out at Texas Tech University simulated flying debris by shooting 50 x 100mm wood studs, traveling at nearly 100 mph, at wall assemblies. A video of the tests can be seen by following the link on the ICF Magazine website http://www.icfmag.com/back_issues/aug-sept_06.html#11

The missiles easily penetrated the wood and steel-stud walls, even at speeds of 50 mph. At 70 mph, they penetrated brick veneer finish. But nothing penetrated the ICF walls. Even wall segments constructed with waffle-grid block, hit in the middle of the thinnest panel, experienced no cracking.

The report concludes, "The strength and durability of concrete walls offer unmatched resistance to the devastation of major storms. Concrete homes are less likely to suffer major damage from debris than conventionally framed houses.

Concrete and the environment

A+ Green Guide Rating for installed StyroFrame external wall panels with concrete fill.

Concrete is one of the most versatile, durable and cost-effective building materials known to man. It is also environmentally sustainable, with green credentials that outperform both steel and timber. Concrete is the second most consumed substance on Earth after water. **90% of materials used in concrete can be from recycled sources including aggregate and the use of Ground Granulated Blastfurnace Slag (GGBS), a by-product from blast furnaces or fly ash from power stations as a replacement for cement in concrete. This significantly reduces the overall greenhouse gas emissions associated with the production of concrete. GGBS can replace up to 70% of cement in a concrete mix and reduce carbon dioxide emissions per tonne of concrete by up to 70%.**

Embodied energy. The Concrete Centre has published the latest information which should be used for comparing concrete with different materials on an embodied energy basis. Its report entitled 'Sustainable Concrete: The Environmental, Social and Economic Sustainability Credentials of Concrete' confirms that structural concrete has an embodied CO_2 (ECO_2) rating per kilogramme per tonne (KG/T) of 153 ECO_2KG/T compared with 1932 ECO_2KG/T for structural steel and 449 ECO_2KG/T for hardwood timber. Copies of 'Sustainable Concrete: The Environmental, Social and Economic Sustainability Credentials of Concrete' may be downloaded from the Concrete Centre Publications Library www.concretecentre.com and further information is available from www.sustainableconcrete.org.uk.

Concrete is a small net contributor to greenhouse gases responsible for 2.6% of UK CO_2 emissions in 2002. This compares with 33% of total CO_2 emissions from transport and 47% from buildings in use. This is before taking into account benefits provided by the use of GGBS, fly ash or other recycled material.

Concrete can be re-cycled. Construction and demolition waste is the UK's largest single source of recycled material, representing 72% of all recycled and secondary materials used in construction in 2001. Of this approximately 10% is used directly in the manufacture of new concrete. The rest is used in low-grade applications such as sub-base and fills, with some diverted into high quality uses such as asphalt. This down-cycling preserves our reserves of primary aggregate for applications where the quality of aggregate is important for durability and performance.

Through concrete's excellent thermal mass energy consumption in commercial and residential buildings can be reduced by up to 50% - a key component in the UK's effort to reduce its greenhouse gas emissions. Thermal mass is the ability of a material to absorb heat. A lot of heat energy is required to change the temperature of a high-density material like concrete. High thermal mass materials act as thermal sponges, absorbing heat during the summer and so cooling the building, and storing heat from the sun or heaters to release it at night. Thermal mass is not a substitute for insulation as it generally stores and re-radiates heat. Insulation stops heat flowing into or out of the building. The right combination of these two elements, plus a building design that allows the capture of solar energy can improve the thermal performance of new buildings and lower energy requirements.

The thermal capacity of concrete structures can be utilised to improve the energy efficiency of buildings. Compared to air conditioning, Active Fabric Energy Storage (FES) reduces carbon dioxide emissions by up to 50%. About 90% of the environmental impact from buildings is from heating, cooling and lighting, and only about 10% is from the embodied energy used to produce the fabric of the building itself (taken over a 60 year life-cycle).

Concrete structures offer long-term construction solutions that do not need additional coverings or coatings for resistance, durability or sound insulation thereby reducing the embodied environment impact of a building still further. Furthermore, the UK is self-sufficient in concrete which is made locally whilst UK reinforcement is made from 100% UK recycled steel. This locally sourced benefit of concrete compares favourably with the fact that over 98% of the timber used in the UK is imported whilst approximately 60% of the country's requirement for steel is imported. This comes at a time when a recent research from the Institute for Physics and Atmosphere in Wessling, Germany, has found that global shipping is responsible for over 5% of the world's CO_2 emissions. To put this into context, air travel is responsible for less than 2% of world emissions.

Please contact us for further information, to discuss your requirements or request a quotation

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