Eco friendly construction methods and materials

Green building is not only a wise choice for our future; it is also a necessary choice. The construction industry must adopt eco-friendly practices and materials that reduce its impacts, before we reach a point of irreversible damage to our life supporting systems. The governments are beginning to recognize this urgency, and are committed to integrating green specifications into building regulations and codes, but the process of developing policy is slow. The industry needs to take its own initiative and find alternative ways to build, using green, renewable energy resources, and adopt non-polluting practices and materials that reduce, recycle and reuse, before it is too late.

The concrete industry embraces innovation and modern methods of construction (MMC) by offering concrete solutions which can be used to reduce construction time and promote sustainable development, as well as offering cost savings. Floor and wall units are produced off-site in a factory and erected on-site to form robust structures, ideal for all repetitive cellular projects. Panels can include services, windows, doors and finishes. Building envelope panels with factory fitted insulation and decorative cladding can also be used as load-bearing elements. This offers factory quality and accuracy, together with speed of erection on-site.

3D Volumetric construction (also known as modular construction) involves the production of three-dimensional units in controlled factory conditions prior to transportation to site. Modules can be brought to site in a variety of forms, ranging from a basic structure to one with all internal and external finishes and services installed, all ready for assembly. The casting of modules uses the benefits of factory conditions to create service-intensive

units where a high degree of repetition and a need for rapid assembly on-site make its use highly desirable. This modern method of construction offers the inherent benefits of concrete, such as thermal mass, sound and fire resistance, as well as offering factory quality and accuracy, together with speed of erection on-site.

Tunnel form is a formwork system that allows the contractor to build monolithic walls and slabs in one operation on a daily cycle. It combines the speed, quality and accuracy of factory/offsite produced ready-mixed concrete and formwork with the flexibility and economy of cast in-situ construction. This fast-track method of construction is suitable for repetitive cellular projects, such as hotels, apartment blocks and student accommodation. It offers economy, speed, quality and accuracy, as well as utilising the inherent benefits of concrete, such as fire and sound resistance. The formwork sections for tunnel form are large and need to be swung by crane out from the side of the building when the concrete is being struck. This means that it is not suitable for tight sites. Flat slabs are built quickly due to modern formwork being simplified and minimized.

Rapid turnaround is achieved using a combination of early striking and panelized formwork systems. Use of prefabricated services can be maximized because of the uninterrupted service zones beneath the floor slab; so flat slab construction offers rapid overall construction, as it simplifies the installation of services. In addition to saving on construction time, flat slab construction also places no restrictions on the positioning of horizontal services and partitions. This offers considerable flexibility to the occupier, who can easily alter internal layouts to accommodate changes in the use of

the structure. Post-tensioning of flat slabs enables longer and thinner slabs, with less reinforcement, and hence offers significant programme and labor advantages.

Hybrid concrete construction combines all the benefits of precasting with the advantages of cast in-situ construction. Combining the two, as a hybrid frame, results in even greater construction speed, quality and overall economy. Hybrid concrete construction can answer client demands for lower costs and higher quality by providing simple, buildable and competitive structures that offer consistent performance and quality. Thin Joint Masonry allows the depth of the mortar to be reduced from 10mm to just 3mm or less, resulting in faster laying and improved productivity, particularly on long runs of walling. Construction speed can be further increased by some 13. 5 per cent using large-format concrete blocks, which have a face size equivalent to two traditional concrete blocks. The mortar cures rapidly, achieving full bond strength within one to two hours, eliminating the problem of ‘ floating’ therefore enabling more courses to be laid per day.

Insulating Concrete Formwork (ICF) systems consist of twin-walled, expanded polystyrene panels or blocks that are quickly built up to create formwork for the walls of a building. This formwork is then filled with factory produced, quality assured, ready-mixed concrete to create a robust structure. The expanded polystyrene blocks remain to provide high levels of thermal insulation and the concrete core provides robustness and good levels of sound insulation. Precast concrete systems can be used to rapidly construct foundations. The elements are usually to a bespoke design and cast in a factory environment, giving assured quality for the finished product. The

foundations are often supported by concrete piles and connected together. These systems improve productivity, especially in adverse weather conditions, and reduce the amount of excavation required – particularly advantageous when dealing with contaminated ground.

RECOMMENDATIONS FOR BETTER USAGE

There are number of opportunities to contribute to the ecological materials better and comfortable lifestyle. There are several factors that may contribute to ecological materials: internal temperature, humidity, air pollutants in enclosed spaces and noise protection. The right choice of insulating material may help regulate the internal temperature. Well-chosen materials not only retain heat inside in the winter, but also slow down the heat coming from outside in the summer. Every material has a characteristic time required for the transport of heat from the outside to the inside of the building. In well selected insulation there is delay 8-12 hours, so that the heat reaches the inner surface tonight. The humidity inside the house may be regulated, for example with a plaster of clay. The top layer of the plaster may take excess moisture and releasing it again when the air is drier.

Environmental materials can contribute to a better indoor climate, if selected materials and paints are with low emissions. The wooden materials and coverings should not contain glue that separates formaldehyde and other volatile organic compounds. In addition, non-textile floorings are better for the health of people who are allergic to pests. Last but not least, cork, for example, can also contribute to sound insulation. Ecological building materials may be of benefit for the comfort and to contribute to the smaller environmental impacts caused by the construction of the house.

Today there are a wide variety of eco-friendly alternatives to conventional materials in the market. However, these materials should not be used only because of the environment. Their properties and scope of application should be carefully studied, as well as any of any other material. The latter should be compared with the thermal qualities in terms of conductivity and specific heat capacity, fire resistance and protection from noise. If the materials are used for heat and sound insulation properties, they must be dealt with together. Due to the varying resistance to water and moisture, some materials have a limited scope of application or need to be made with special steam insulation. For many product categories there are environmental labels. For organic food or class of energy efficiency there have been labels across the EU.

For construction products the situation is different. Besides the general CE-mark that all construction products must have, there is a confusing variety of labels across Europe. It is quite difficult to give you a general advice on the best product. All materials have advantages and disadvantages, and they are often clear to the specialist. The following recommendations are for all the people who want to have a healthy indoor climate, taking into account the environmental impact of your house:

1. Prefer natural materials instead of plastic.
2. Avoid PVC.
3. Look for products with eco-labels.
4. Buy fatty products.
5. Prefer wood or linoleum or laminate instead of using laminate with low emissions.

6. Use paints with low emissions.
7. Take note of the consumption of energy and water. Even the best eco-friendly material will not reduce the environmental impact of your home if the waste water and electricity and your home is poorly insulated.

CONCLUSIONS

The results from our study show that even without significant deliberate effort on part of the construction entrepreneurs a relatively high percentage of them use eco-friendly materials in the construction of buildings. Besides, all that they are aware of the fact that green building is not only a wise choice for our future; it is also a necessary choice. The construction industry must adopt eco-friendly practices and materials that reduce its impacts, before we reach a point of irreversible damage to our life supporting systems.

The governments are beginning to recognize this urgency, and are committed to integrating green specifications into building regulations and codes, but the process of developing policy is slow. This finding shows that even though the tunnel form is a formwork system that allows the contractor to build monolithic walls and slabs in one operation on a daily cycle it also combines the speed, quality and accuracy of factory/offsite produced ready-mixed concrete and formwork with the flexibility and economy of cast in-situ construction. Most likely the low embodied energy of green products ensures that very little energy went into their manufacture and production, with a direct reduction in carbon emissions. Eco friendly design methodology can further reduce energy consumption by minimizing energy inputs for heating,

cooling and light, and incorporating energy efficient appliances. Saving energy for the occupant also saves money – an issue that will become increasingly important as the cost of fossil fuels inevitably rises in the near future.

This study also shows that there are many good reasons why we should use eco-friendly construction methods and materials. They can improve the health of our planet, and the health of our own lives. It also supports local business and helps strengthen the local economy, which in turn helps to build our communities into vibrant, prosperous and desirable places to live. This suggests that opportunities in the concrete industry embraces innovation and modern methods of construction (MMC) by offering concrete solutions which can be used to reduce construction time and promote sustainable development, as well as offering cost savings.

Floor and wall units are produced off-site in a factory and erected on-site to form robust structures, ideal for all repetitive cellular projects. Panels can include services, windows, doors and finishes. In fact, as this study shows that hybrid concrete construction combines all the benefits of precasting with the advantages of cast in-situ construction. Combining the two, as a hybrid frame, results in even greater construction speed, quality and overall economy. Hybrid concrete construction can answer client demands for lower costs and higher quality by providing simple, buildable and competitive structures that offer consistent performance and quality.

Therefore, ecological building materials may be of benefit for the comfort and to contribute to the smaller environmental impacts caused by the

construction of the house. Today there are a wide variety of eco-friendly alternatives to conventional materials in the market. However, these materials should not be used only because of the environment. Their properties and scope of application should be carefully studied, as well as any of any other material