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NEW CONSTRUCTION TECHNOLOGY FOR HOUSING BUILDING COMPLEX USING EPS CORE PANELS

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Abstract:

Expanded Polystyrene Core Panel System (EPS) Technology for Housing and Buildings are demonstrated here taking one case study in Bhubaneswar city. In this case high strength hard drawn wire is used having diameter ranging from 3mm to 4mm and 2.5mm to 4mm with a wire mesh size of 50mmx50mm and 100mmx100mm respectively having ultimate tensile strength of steel wire 550 Mpa or more. The high density concrete of 15Kg/cum is used for a core thickness of 40mm to 120mm which is depends upon the intended use of panels generally it is made for non-load bearing walls of a core 40mm to 50mm to a load bearing walls of core 100mm to 120mm and it is used for roof slab thickness varying from 80mm to 120mm as required by the type of structures. In this case the construction was made for a five storied residential building

1. Introduction

Advanced technologies in housing construction are not used as frequently as the more standard construction technologies described in earlier chapters, which involve the use of masonry, timber, and concrete. However, as with other innovations, it is expected that over time these newer technologies will gain wider acceptance. For purposes of the World Housing Encyclopedia, advanced technologies include seismic isolation and passive-energy dissipation devices. As of this writing, the WHE database contains three reports describing the applications of advanced technologies Hurricane Andrew in 1992 was recorded by that time as the most destructive and expensive natural disaster in US history, which caused $25 billion damage and 65 deaths [2]. The post storm investigation found the hurricane created enormous amount of windborne debris and the windborne debris impact is highlighted as a major cause of damage to building envelope including wall, roof, door, windows shutters or screens etc. [3]. Windward wall is the most prone to debris impact among the building envelope. In a windstorm, unfixed objects or fixed objects such as roof tiles, roof gravel and rafter, which might turn loose under strong wind are the primary sources of potential windborne debris. The windborne debris can be classified into three types i.e. compact-like, rod-like and sheet-like [4]. Medium sized timber of 5.4–6.8 kg, 100 mm _ 50 mm was found as the most representative of the windborne debris [5]. If wind speed is fast enough, the windborne debris might penetrate the building envelope, imposing threats to people inside the building. It also creates an opening. The opening in the envelope allows excessive amount of wind and rain to enter the building. Moreover, the opening might cause internal pressures increasing which results in more severe damage to the building such as collapse of the structural panel, entire roof lift-off, and total structure failure Therefore, the windborne debris is a decisive factor to the performance of the building

2. Experimental investigations

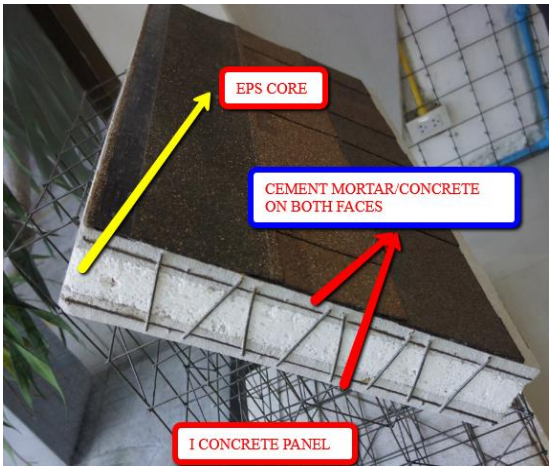
The green revolution has also some effects on this industry. Global movement of saving the natural environment has emerged the latest concept. It means while constructing buildings, natural environment should not be spoiled and

materials used for building must be eco-friendly. This concept should be implemented to all types of construction including domestic as well as commercial construction. Green construction is actually an eco-friendly construction system that follows the regulations, which are created to save the environment of our planet. The latest approach in construction technology is LEED (Leadership in Energy and Environment Design). It is also introduced to monitor the green construction level in the industry. It assures the quality and checks the eco-friendly mode of construction. It also works to search and introduce the materials for green construction. Moreover, it also pays attention to all related aspects and monitors it keenly to make all the process eco-friendly by keeping a balance in energy level of system.

The principle of seismic isolation is to introduce flexibility at the base of a structure in the horizontal plane, while at the same time introducing damping elements to restrict the amplitude of the motion caused by the earthquake. The concept of seismic isolation became more feasible with the successful development of mechanical energy dissipators and elastomers with high damping properties. Seismic isolation can significantly reduce both floor accelerations and interstory drift and provide a viable economic solution to the difficult problem of reducing nonstructural earthquake damage. One case study is introduced by the application of EPS core panels to five storied building

2.1 Construction methodology

The materials used are prefabricated panels factory made, Splice mesh, stapling gun, Reinforcement bars as per the structural design,Machinery, Shotcreting machine, Shuttering and scaffolding materials, Man power, Semi-skilled-Few in numbers, Unskilled-Mostly



2.2 Advantages

- Fast and easy erection with unskilled labour
- Economical use of local materials
- Structurally stable construction
- Good thermal insulation
- Use of prefabricated elements produced on an industrial scale
- Great variety of design features
- Minimum installation work on sites

3. Design Methodology

Components of 3D elements can generally be dimensioned and designed as other reinforced concrete components. Especially the connecting bars equal to the connecting reinforcements required for conventional reinforced concrete structures. The amount of connecting reinforcement depends on the structural requirement. Vertical connecting bars in the following details are designed for areas with small earthquake loads. In areas with small earthquake loads. In areas with higher risk of earthquakes the connection reinforcement has to be strengthened accordingly

3.1 Characteristics of core panels

Energy savings is measured in whole wall R-Value, not just insulation values. Our 6-inch core walls outperform standard steel or stick built walls by over 50%. Choose from the standard R-18, R-26, R-33 or R-40 walls. The colder the outside temperature, the higher R-Value of wall you will want to use. All types of buildings can be engineered in varying dimensions. Solid Core walls have no sagging insulation, no compressed insulation, no air movement, only solid cores. Our Solid Core panel system is 15 times better at stopping air infiltration, offering you a more comfortable, warmer building over stick or steel walls. EPS Solid Core panel systems also offer the same limitless options for roofs and siding as many materials can be easily attached to the panel surface. Many customers choose to use trusses with purlins or SIPs roof panels for their roof options.Impact resistance is another standard feature of structural insulated panels. The continuous bonding of EPS insulation to the OSB plywood offers incredible strength and resistance to impact. Vertical and horizontal stress loads are tested two times stronger than conventional stud walls. EPS walls resist up to 7,000 pounds per foot which results in structures that are stronger, straighter, taller and wider. PS buildings are engineered in accordance to IBC codes to your region's wind and snow loads and can be stamped in 50 states. EPS has state-of-the-art production facilities and five truss lines to give you cost-effective solutions.

- Closed cell foam walls stop the transfer of moisture that can increase rust and corrosion
- Can be sized for a single car, truck or tractor or include enough space for your entire farm operation
- Great humidity control for maintenance, painting and restoration
- Can be designed with panel foundation and Form-a-Drain to create dryer concrete
- Various interior finishes can be pre-applied, including Interior Glass Board
- Solid Core walls can reduce energy costs up to 50%
- Larger clear-spans and vaulted ceilings available

3.2 EPS Solid Core is Proven Stronger

Impact resistance is another standard feature of structural insulated panels. The continuous bonding of EPS insulation to the OSB plywood offers incredible strength and resistance to impact. Vertical and horizontal stress loads are tested two times stronger than conventional stud walls. EPS walls resist up to 7,000 pounds per foot which results in structures that are stronger, straighter, taller and wider. EPS buildings are engineered in accordance to IBC codes to your region's wind and snow loads and can be stamped in 50 states. EPS has state-of-the-art production facilities and five truss lines to give you cost-effective solutions. As the core of 3D panel, expanded polystyrene (EPS) is one of the most inexpensive materials having good mechanical and electrical insulation properties and a significant structural flexibility. The installation process is simple and requires no special tools or skilled labor. As eco-friendly material, it is indispensable for thermal insulation of underground parts of buildings, foundations, walls, basement, floor. It is adaptable to all types of structures from affordable housing or upscale homes, motels, condominiums and warehouses as well as schools and strip malls, and low cost concrete privacy walls. Construction of building from expanded polystyrene 3D panel with concrete blocks is strong, reliable, economical and comfortable. It has thermal insulation and high strength, excellent sound insulation and very good resists moisture.

4. Conclusions

- The repair and construction of roads and streets, runways, industrial areas as an insulating material. Effectively protects the base of roads from freezing and can withstand the load of heavy vehicles.
- For the repair and construction of railways, as well as for railway transport (cars, trains).
- To improve the coverage of the soil (used for strengthening, for example. Embankment slopes extreme foundations of bridges, thus achieving efficiency design).
- During the construction of refrigerating equipment (display cases, freezers, cars - refrigerators, coolers, containers for the transport of dry ice, warehouses).
- For refrigeration (refrigerated trucks, refrigerated vans).
- In the shipbuilding industry for the device floating jetties and pontoons.
- As a packaging material is quite possible extension of the scope expanded polystyrene as to further improve its insulating qualities, strength and deformability characteristics.

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