

REVIEW STUDY ON GREEN BUILDING URBANIZATION EFFECT ON WORKER HEALTH AND FIRE SAFETY

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ABSTRACT

Green urbanization has its own significance of using different material and systems that could help in reducing emission and is been rating by different rating tools to identify the contribution of the building, so that system and material could have different majors to deal with that material could affect the health and safety of workers because of the lack of experience to with kind of material by going through that material (could be organic) and finding the health effect of and analyzing the green construction technology, the hazard attached to it and also that system and material could contribute to fire risk by going into the fire hazard and each phase of fire risk the contribution of each material or system had been named.

Keywords: Construction management, Green buildings, Safety, Project management

INTRODUCTION

The environmental the effect in the building sector is enormous and uses up to 40% of the extracted natural resources in the industrializing countries which leads to consuming electricity and water-based on [1] 70% of the electricity and potable water for 12%, and the manufacture of the waste disposed to landfills which accounted for 45-65%. The modern impulse to exploit renewable energy sources which directed to the rapid growth of the Zero Energy Building idea [2].

The building with zero energy is environmentally answerable and resource-efficient through building life from the beginning of the design phase to construction operation, maintenance, renovation, to the building demolition that they drastically reduce gases releases, material use, and water use to be the common feature of green construction. [26] The Green buildings have the ability to reduce up to 80% of energy-consuming or more efficient systems "heating, cooling, lighting, and water" uses some kind of different energy sources. "Passive solar, wind energy, bioenergy" retain energy "efficient insulation and windows, thermal mass" use recycled material that has low-energy. In Canada and in the United States of America (USA) certified green buildings represent 1.5% and 3% of the total respectively. [3][4].

Seven principles has been developed for renovation and sustainable construction for the entire life-cycle of a building by the International Labor Organization (ILO) the reduced consumption of resource, reuse resources, use recyclable resources, protect the nature, eliminate toxins, eliminate hazardous chemicals, apply life cycle costing (economics) and focusing on quality.[5]. The primary aim in green construction is to advance the safety and health of the final occupants even though the sustainable practice design and construction does not always benefit construction worker" safety and health " [6].

Green building initiation has been in existence for a long time ago to some practices like by resident and renewable material or by using solar design could be traced to millennia. The Anasazi (an ancient Native American culture from about A.D. 200 to A.D. 1300,) built

entirely villages in winter, all the designs show how houses received solar heat while the green building movement shows the need and desire for more energy efficient and the need for more environmentally friendly building practices, the increasing the oil prices in the 1970s and there is a Certification and

Assessment scheme. Assessment and certification tools devoting its work on measuring the sustainability of buildings and it has been operating for many years around the world more than a dozen countries are working to have their own national councils or forming certification standards, where currently there are eleven countries consider being members of the world green building council. [7][8].

One of the best assessment tools in Europe are the Building Research Establishment Environmental Assessment

A method is known as (BREEAM). It established by the Building Research Establishment (BRE) in the United Kingdom, BREEAM has assisted and certified more than 100,000 buildings since its establishment in 1990 [9].

The application of such tools needs a huge amount of effort in terms of time, cost and is usually carried out mainly for new buildings [10] yet, the virtuosity of green building becomes noticeable. Recently more than (40.000) certified professionals associated in green building in LEED. In the design, construction, operation or maintenance in the united states of America, regarding the 1,500 in India, 1,197 the number in BREEAM accredited professionals in the United Kingdom and in Australia 900 by GREEN STAR [11].T these numbers indicate the rise of green building concept and its good share in the construction market.

DISCUSSION

Based on [12] the primary purpose of USGBC, LEED or any rating system or documentation is to make the buildings “greener” by endorsing the building method to sustainability by meeting the performance in key areas of environmental health and human: first, the sustainability of the site development, water savings system, energy efficiency, materials selection, and indoor environmental quality.

To do so, USGBC aim is to minimize the impacts on the environment through the lifecycle of buildings and to protect the occupant's health. yet, the difference between the terms “green” and “sustainable” is confusing to some engineers, these two terms are used interchangeably in the construction industry. Green building or construction is a term for primarily the design and construction practices that have environmental impacts. The concept of the Sustainability, on the another hand, is broader, which extend to the continuity of the environmental aspect by addressing the economic and social aspects of human society, more consideration must be taken to account more than just protecting the environment for a green building to become sustainable, such as, in [13] argued that the term “sustainability” is focused on the environment and ignored other essential aspects such as worker safety.

They emphasized that no existence that presides over avoidable workplace deaths, injuries, or illnesses can ever claim to be sustainable. The construction industry in the The United States through history has employed about five percent of the workforce yet has accounted for an odd number which is approximately 20% per year of occupationally related fatal and nonfatal injuries and illnesses [14].

Injuries and illnesses in conventional construction had been recognized and their insistence continues to find a solution to construction safety and health practitioners and researchers such as [Hill 2003] has pointed to the best practices to improve the performance of a

construction worker's health and safety [such as the Construction Industry Institute, the University of Texas at Austin 2003.

However, fatality and injury/illness in the construction industry consistently experiences higher rates when it's been compared to the other industries [15].

The Sustaining control and controlling of safety and health hazards considered to be essential for improving the safety performance in the construction industry as the writers believe that this can be improved in the introduction to the concept of sustainability to the construction worker safety and health concerns [16.].

RISKS DURING CONSTRUCTION OF GREEN BUILDINGS

Known risks like height slips, trip and falls in the conventional buildings are also issued in at green building sites [17], in some situations are more severe. The complexity in design elements in LEED-certified green buildings appear to have much higher hazardous to construct than conventional designs [18], this was explained when six workers died in LEED gold-certified construction project in Las Vegas [18] the death causes been described as "mainly conventional accidents "such as, persons being hit by a large object, and falls or getting hit by a truck, the pressure in time was specified as the main reason for these accidents [19].

The green buildings are known to be more restricted and thoroughly when it comes to insulation for saving energy, ventilation may be reduced at the finishing work in the internal sections, this could make the exposure to volatile organic compounds higher. For example adhesives or paint and to dust, including crystalline silica [17] [18].

The essential part of the green buildings is insulation. The insulation of existing buildings may exposure the workers to the traditional materials of insulation [20]. For example, the manufactured mineral fibers (wool weightier its glass of rock). Installing this material (cutting, sawing) release fibers, exposure to these material fibers may affect the worker health to dermatitis, irritation in eyes and airway disease like bronchitis or asthma by using substitution material Such as polyurethane which contains isocyanides, these materials can cause (allergic) of airway diseases like asthma, irritation of the respiratory tract and mucous membranes of the eyes and gastrointestinal tract, and contact dermatitis [7].

Usually, one pack systems that have a limited amount of free isocyanate could be implemented. Although,

Two-pack systems are still being used for insulation, these are prepared in site (mixed) thus, the higher exposure to isocyanides in using one-pack products back, because of the manually added concentrated amount of isocyanate hardener. Therefore, isocyanate vapors become airborne, while controlling measures such as the local exhaust ventilation is usually caused by not enough at construction sites[7][21].

In addition, the workers who work on insulation by sprayed polyurethane foam, insulation workers were exposed to isocyanate more than recommended or even a lot concentrations exceeding the occupational exposure limits based on the National Institute for Occupational Safety and Health (NIOSH) [9].

Regarding, installing an energy-efficient heating system or hot water had conventional hazards, related to normal jobs like filters implementing pipe, sheet metal works or Heating, Ventilation, Air Conditioning [HVAC] and more, especially at Retrofitting built buildings [11].

In addition, the exposure to silica dust asbestos, the manual handling of heavy equipment the works that include high physical workload and the noise alongside vibration in drilling [20]. None the less, any activity that could be more attend in a frequent pattern in retrofitting or any works could include in this tasks or exposure to this kind of hazards.

GREEN BUILDINGS MATERIAL

In general the used of material in green buildings mostly recycled, renewable or water-based. Green building mainly use renewable materials in insulation such as bamboo, straw, sheep wool, and cork as well as woods which is conceder to be commonly known on how it's used. Wood dust exposure has a well- known risk: skin, eyes, airway irritation, asthma at minimum, and could reach nasal cancer and bronchitis, are among the recognized health effects, but the hazard is relative between the types of woods as it been noted some types like red cedar may relatively strong sensitivity [21]. Also, hardwood dust considered a carcinogen where the building occupational exposer should be limited to 5 mg /m³ as it has been established by the European Union Carcinogens Directive [22].

In additional, exposure to renewable organic sources could cause elevated risk due to protein-based allergens as well as the micro-organisms like bacteria and fungi or endotoxins using sheep wool as insulation blanket is not included in exposure to dust as long as it has been disinfected to get rid of the micro-organisms, although some people are allergic to this material and exposure by the skin may cause an allergic response.

Another way of insulation is by shells, which consist of 98% of chalk [23]. The shells are sprayed, the heavy load of the hose could make a high load and physical challenges for workers that have to be dragged manually. This kind of activities could cause exposure to noise as well dust, even though the chalk could not cause silicosis or lung cancer because it doesn't contain crystalline silica [24] although chalk dust consider being similar to any kind of dust that could cause the (COPD) Chronic Obstructive Pulmonary Disease [25].

FIRE SAFETY

Until now, there hasn't been any fire incident reporting systems to be specified in a survey, collecting and tracking data on green buildings fire incidents. However, going through surveys and web searching identifies more than a dozen fire incidents related to green buildings. For example, fires had been linked to photovoltaic(PV) planes and roof materials or insulation material or fire related to the exterior cladding that contain combustible material or the performance of timber frames under fire especially with LEL components (lightweight engineered lumber).[27]

Even though, some rating tools such as the sustainable building council in Germany (DGNB) included criteria for fire prevention. Detail fire prevention weights, relatively attributes to green building attribution, however, the rating tool gives some credit for fire protection feature such as smoke extract, automatic sprinklers, and structural fire protection.

For further detail in the fire risk level of green building by dividing fire steps into phases the green building system couldn't cause any problem in the first phase the Poses potential ignition hazard but to poses potential shock hazard only the fossil insulation system and it's a moderate risk when unmitigated. The danger begins in the second phase at the Potential explosion hazard and Poses potential toxicity hazard, it could be caused by the rigid foam insulation and spray-applied foam insulation and it conceder to be a high risk when unmitigated.

The third phase is readily ignitable, burns readily once ignited, contributes more fuel / increased HRR the systems of Rigid foam insulation and - Spray-applied foam insulation has been very high in risk and Structural integrated panel (SIP), Exterior insulation & finish (EFIS), Foil insulation systems and Vegetative roof systems presented as a moderate risk.

The next phase is the Material affects burning characteristics, faster fire growth rate, Significant smoke production/hazard, the danger will expand to Structural integrated panel (SIP), Exterior insulation & finish (EFIS), Rigid foam insulation, Spray-applied foam insulation, and Foil insulation systems would be high risk unmitigated. Moderate risk when unmitigated in some systems such as Bamboo, other cellulosic, Bio-polymers, FRPs, PVC rainfall water catchment, External cable/cable trays and Area of combustible material.

Failure affects burning characteristics and Material presents flame spread concern, which high risks to Structural integrated panel (SIP). Exterior insulation & finish (EFIS) rigid foam insulation. Spray-applied foam insulation, foil insulation systems in comparison to the phases between those two which are a concern in Failure presents stability. Failure presents smoke spread and also failure presents flame spread that has moderate risk on the High-performance glazing. Low-emissivity & reflective coating, Double-skin façade / cavity wall and dangerous to Extended solar roof panels, Exterior solar shades/awning.

Moreover, Material presents flame spread concern could attribute in it the Bamboo, other cellulosic, Bio-polymers, FRPs. Vegetative roof systems and Exterior cable in high risk insulating material type of vegetation and Exterior vegetative covering in moderate risk.

The High performance glazing low-emissivity & reflective coating. Double-skin façade cavity wall could contribute to the cause of saver contribution on smoke or heat venting and middle effect by area of glazing, area of combustible material thus the relative risk level almost all the material and system could contribute in risk.

CONCLUSION

The expansion of a green building which leads to green building urbanization has some risks, the high-performance building or how smart is it did not depend only on the green material and technology, it can only be green if it designs and implemented through safety standard for material and technologies need more studies and modifications for fire safety.

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