ANALYSIS OF WATER-RESISTANCE STRUCTURE AT COASTAL AREA WITH HSC

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Abstract

Over the years studies have revealed that location and environmental impact are important factors to be considered in building materials selection. These have become major criteria in selection of appropriate building materials especially in the coastal regions of the world. Hence, in order to curb these effects, understanding the impact of this saline air on building materials and the way towards improving the resistance of buildings within this area to salt reaction is necessary. This study present the result gotten from the review of literature on the effect of salt on buildings in coastal areas and the possible ways of ensuring a reduction of the negative effect of this salt reaction with building materials. Findings revealed that salt attack on concrete and steel reinforcements leads to structural failure in buildings. Also, moisture penetration leads to blistering, chalking, and peeling of paints, which leads to constant re-painting of buildings. Cracking of walls, deterioration of floorboards and wood degradation a

Keywords *Building: Materials, Saline Environment, Salinity, Corrosion, Defibrationre some of the effect of salt on buildings within the coastal areas.*

Introduction

In construction, several factors affect the choice of materials used in building construction one of which is the building location (Ogunkah and Yang, 2012). According to the World Bank (2009), the coastal area as a building location has grown to be the most developed areas in most parts of the world today. However, in more recent times these part of the world has been affected by the tremendous climatic change, which according to Susmita et al. (2014) can lead to increased salinity from sea water, loss of wetland, a flood from as a result of the rise in sea level, and storm damage. The impact of salinity on building materials is not a truth farfetched among buildings in Lagos state, Nigeria. This part of the country is located around the Atlantic Ocean which according to Oyewo et al. (1982) and Folorunsho (2004) experience low and high sea tides on a daily basis which leads to release of salt into the area. Folorunsho and Ahmad (2013) further stated that buildings with close contact with the Atlantic Ocean in Lagos state are affected by the impact of saline air from the ocean. The effects of increased salinity from sea water and inundation due to sea level rise have been a threat to buildings around the coast today. Thus, the Federal Emergency Management Agency (FEMA, 2005) explained that the durability of any home around the coastal area depends on the type of building materials used in constructing it. Fabio (2014) opined that salt crystals are often the reason why buildings show signs of aging at an early stage. This is because these salts crystallize inside the building materials making them crack and crumble. Wilson (2003) has earlier stated that in some cases, cracked bricks or stone, mortar turning into dust, and cement render

flaking off on internal and external walls can be seen when salt crystals come in contact with these building materials. Department of Environment and Climate Change (2008) affirmed that when building materials are exposed to seawater they are prone to physical and chemical damages; these damages can be in the form of deterioration of mortar and bricks, corrosion of metals and decay of wood.

Building Materials; Building material is any material required for a construction purpose (Jana, 2014). It can simply be referred to as a material used in constructing a building. They usually occur in form of natural material such as clay, sand, wood, stones or man-made materials such as glass, Poly Vinyl Chloride among several others. Florins et al. (2017) explained that it is necessary for buildings materials to perform environmentally. This performance can be ascertained through an assessment of the compatibility of the material with the environment where such construction is to be executed. In determining this compatibility, the function, durability, and mechanical performance of such material are considered. Therefore, based in the inherent responsibilities of architects and other similar professionals in the specification appropriate materials for construction, it can be deduced that it is imperative for professionals to know the characteristic behavior of the chosen building materials and their compliance with the environment before they are selected. Venkatarama and Jag dish (2003) have earlier submitted that materials and technologies chosen for construction of buildings should considerably satisfy the felt needs of the user and the society without impact on the environment negatively.

Factors affecting the choice of building materials: The choice is regarded as the mental process of judging the advantages of several options and selection of the most preferred is usually a topic of discourse. Florins et al (2017) opined that choosing a particular material out of the available options could be challenging. According to Ogunkah and Yang (2012), the numerous number of building material options has made the selection of building materials a daunting task for most construction participants. However, Van Kesteren et al. (2005) have earlier highlighted some possible factors to consider in material selection and these include; product-personality, use, function, material characteristics, shape, and manufacturing processes. Fernandez (2006) opined that architects select materials based on performance attributes of the required material. Nevertheless, this has the disadvantage of impeding the vital qualities inherent in the materials. Cagan and Vogel (2002) asserted that six factors are basically important in the materials selection process. These are emotion, aesthetic, product identity, ergonomics, core technology, and quality.

3. High Strength Concrete Columns:

In the last two decades the use of high-strength concrete (HSC) in construction and bridges has increased. In terms of strength and enhanced performance HSC provides advantages over normal-solid concrete. However, the increase in strength is accomplished at the cost of deformation. HSC structural components show fragile behavior in cases of failure which compromises their use in seismically active regions where considerable inelastic deformations and dissipation of energy are necessary to withstand seismically caused forces of inertia.

Containment can enhance the inelastic deformability of the concrete. Contained concrete can develop adequate ductility with properly engineered transverse reinforcement so that structures produce ample late drift without a major degradation of strength. The confines, however for HSC components, when traditional steel ties, hoops, hoops and spirals have to be used, the requirement becomes prohibitively strict. In order to contain the HSC columns, the unnecessary amount of traditional reinforcement requires the cage congestion and subsequent concrete positioning difficulties. Fiber reinforced polymers (FRP) fabrics, on the other hand, provide an enticing alternative to cement containment. FRP pre-made forms provide many advantages: light and effective shape with higher handling features; (ii) an effective and durable, cross-containment enhancer that is capable of generating high lateral containment pressures; and (iii) a protection coating that protects against corruption, weathering and chemical attachment. FRP preformed shape offers a range of advantages. This study is aimed at identifying the effectiveness for HSC columns with circular and square cross sections, subject to simulated seismic loading, of pre-shaped FRP shapes as a concrete reinforcement.

Table 1.1: Categories of HSC:

Category	**Strength**	
Category I	50–75MPa	Generated using high quality materials commonly used, current manufacturing technology and a W/B ratio of approximately 0.4. There is no requirement for mineral admixtures. To achieve the necessary connectivity, values of quality can be used,
Category II	75–100MPa	High quality materials are needed, commonly used. Because of the very small w/b ratio between 0,25 and 0,30 super plasticizers have to be adequately workable. It is also highly advised to use mineral admixtures. The ground aggregates must be round or cube
Category III	100-125MPa	Materials of high quality, efficient blending techniques and strict quality controls are required. The ratio of w/b should be reduced to

		0.22-0.25. In combination with silica fume high doses of super plasticizers are necessary.

4. PEB Structures ASs Modern Building Solutions:

Pre-engineered building (PEB) structures are a promising, highly requested option for environmentally sustainable construction. Inherently green buildings are PEBs and, as opposed to conventional steel and cement structures, they have an unfair environmental effect. PEB buildings the only by-product of this construction is the fully recyclable metal scrap. The splendor of the pre-engineered solution is its wide variety and its utility. Many new commercial and administrative buildings now often opt for pre-engineered metal structures. Even PEB solutions captivate also housing installation and maintenance. The accurate and cost-effective delivery schedules for PEB structures by construction firms have led in recent years to a higher level of investment. In India, the PEB market is rising quickly, with massive car, power and infrastructure opportunities. As PEB systems become faster infrastructure building systems, the industry's edge is becoming feasible and increasingly businesses are taking over. In the manufacturing and business industries, experts expect that demand will rise by 50% in existing and new sectors such as energy supply, bridges, roads, railways, the metro, stadiums etc. In the next years, the site manufacture job will change considerably into shop manufacturing, because it takes time and efficiency. Pre-engineered buildings would therefore have a great future in India as they have in other industrialized economies.

Pre-Engineered Building under construction

Literature Review

Yusuf Dinar et al (2010) the results of building series analyses for rigid frames of concrete and steel models of various configurations and linear static analysis were analyzed. For steel and concrete buildings, six separate floor heights were considered. The study showed that the performance of a nonlinear static analysis is increasingly critical, whereas each additional floor generates an important charge over the columns. Sequential construction analyses often attract a bias for long-term charging results of steel structures over RC structures. Steel structures were found to require a maximum of time because they were less moving than RC structures and building sequence caused a larger moment of all material structure than linear analysis.

Peter Brown and Yu Si (2015) the interaction between the structures, the foundation framed and the soil underpinning was studied. A design sequence for spaces and aircraft has been examined. For this purpose, a steel-framed model of office buildings has been

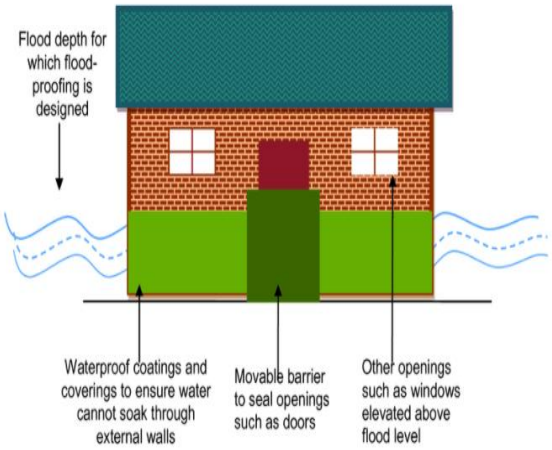
constructed with concrete floors and roof slabs. Analyses using FOCALS revealed that the building's effective rigidity is approximately half of its finished strength when it is being gradually loaded during construction. The maximum differential settlement between columns within a spatial frame is 20%, compared to the 20% obtained from a 2D analysis. A simpler solution was proposed, the method of correcting sequence problems without detailed step-by-step analyses.

Methodology

Design Considerations

In order to make low-cost flood resistant homes, following steps can be adopted. Walls can be rendered from brick to window level to make them more resilient. Jute panels often render robust walls that do not cost much but simple and easy to repair. Treated bamboo pole on the base of concrete is reinforced to keep the wall secure and firm by means of metal tie rods. A plinth builds a building over the surrounding country. Made up of soil, cement and stones and bricks–powerful and high enough to last for repeated floods, contrary to traditional earthen floors which simply wash away.

Fastenings and bindings tie the walls to the "skeleton" of the house through a hollow and notch structure called a 'clam system,' and the whole building can be held up by wind and rain as high as possible. A sensitive construction layout, which minimizes the need for resistance and resilience measures, is one of the key means to escape flood impacts. In designing the development plan, the safe movement of people within or outside the areas, particularly near potentially flowing water areas, must be taken into consideration the location of overland flow routes and the design might be required to distract flood water from the property or to construct in other places. Border and fencing walls may be built to build barriers to flood resistance. Strong doors with discreet waterproof measurements are options.



Showing various flood proofing measures

Analysis of autoclaved aerated concrete (AAC) blocks

Standard bricks are the most widely used building material in construction and industry. One of the most recent construction materials is autoclaved concrete blocks. Autoclave Aerated Benton is a fly-ash product that's combined with lime, cement, and water. AAC can be manufactured as pre-fabricated panels and cuboids. An autoclaved aerated form of concrete has many shutdown vacuum cleaners. AAC blocks are energy efficient, durable, lighter and less dense than traditional concrete. The foaming additive is added to concrete in different moulds depending on the requirements. The panels and blocks are then cut with wire, and the resulting cake lump is 'heated using steam' this is known as autoclaving. This is a very important operation. This material was found to be an environmentally-friendly building

material, made from industrial waste, and containing non-toxic ingredients

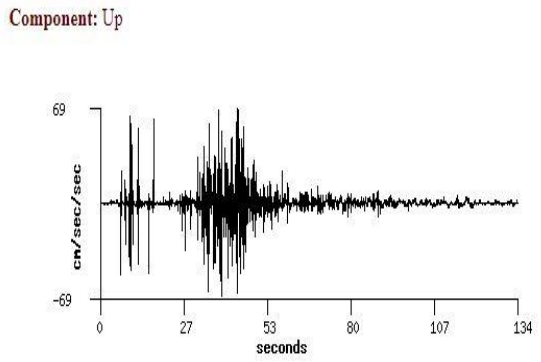
India's main building materials are traditional bricks. Block furnaces, which were developed quickly due to rapid urbanization and growing interest in development materials, have caused an increase in ecological and medical problems. Block making activities contribute to an Earth-wide temperature rise and environmental change. To reduce natural contamination and global warming, the different types of blocks can be used in place of the red ones. Block substitution might be possible with AAC blocks. Autoclaved Aerated concrete (AAC), which is similar to froth concrete can be used for private, modern, and business development. It is suitable for use in structured segments. Due to its lightweight and high solidity-weight ratio of circulated air through solid objects, their use results in a clear economy for the auxiliary people and consequently, concrete and steel support are not required.

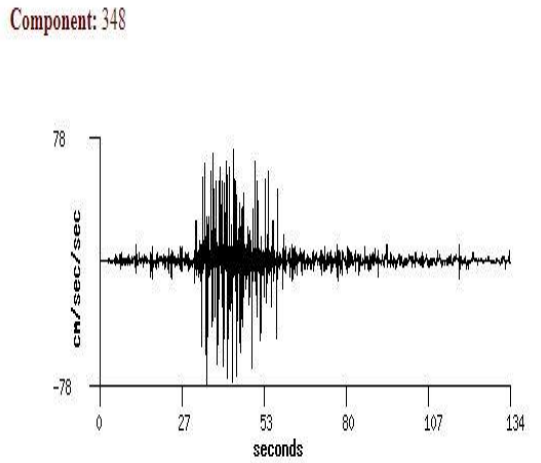
Aerated Autoclaved Concrete (AAC) Blocks

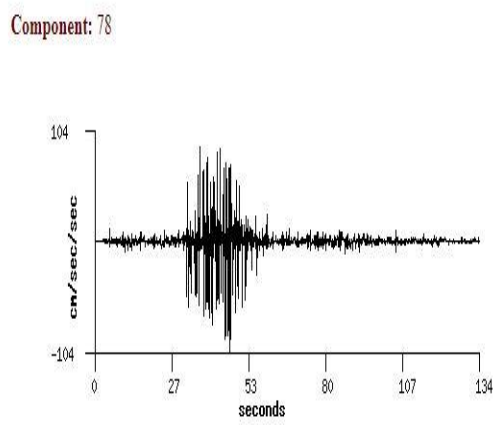
RESULTS

Earthquake Data Description

During the recent earthquakes several structures in India have been heavily damaged or collapsed. This has revealed the need to evaluate the seismological adequacy of existing structures and alternative new design methods, such as in the earthquake that took place at Gujarat buildings and structures. Special attention is given to the seismic reconstruction of older concrete structures in high seismicity areas, as damage-prone structures need to be determined in order to perform such evaluation, simplistic linear elastic approaches are insufficient and structural engineers can apply more complex inelastic nonlinear techniques such as nonlinear dynamics.







Peak accelerations in the bhuujj earth quake

CONCLUSION

The results are significantly higher. Software usage can be used to analyses different parameters. However, the software's reliability is affected by certain assumptions. This means that it is necessary to research ways to reduce software use for better results. Some reports stated that seismic wave recording was used for the study. This will yield a better result because it can easily be calculated by an earthquake that provides both the actual production and the damage caused by an earthquake. However, there are many limitations because it is difficult to establish a true problem with sand quakes. There are also factors to consider such as the liquefaction and boiling of sand during earthquakes. This review article focuses on earthquake resistance analysis and liquid retention structures design. Moreover, other studies and guidance provided by organizations can make it difficult to determine the correct seismic conduct of water retention structures.

Recommendations

There are four options for houses in flood-prone areas: flood-resistant (dammed), floor-to-ground, flood-resistant and elevated and durable mixed. These last three options offer the most realistic alternatives.

Flood-prone houses must consider the time, depth, flow rates, directions, and effects of debris.

Variations are observed between buildings in situations where water levels are up to one meter.

Flood resilience is a broad term that covers well-found, well-broadened and durable concrete and masonry structures. It can be used to reduce the cost to people and their neighborhoods'.

Flood-resistant design should be used for buildings, houses and the land surrounding them.

Future scope

If flood occurs, occupants of a house can respond to important community and personal needs. If your house is at high risk of flooding, you should consider installing plumbing or energy plants. Pay attention to the effects of rain on devices.

Pick products that are easy to wash from silt and water. This is especially true for floors, walls, skirts, and architraves.

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