

CONSTRUCTION OF STABLE STRUCTURES IN OCEAN: OCEAN CITY

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ABSTRACT

The ocean covers more than seventy percent of earth's surface. Still a very little area of it is used for construction. Construction in ocean is often rejected by considering the stability, durability and cost of the structure. When a structure is constructed in ocean there are so many factors that should be considered. So, we have done a study on how to make the most stable and energy efficient structure in the ocean by causing least disturbance to the wave movement in the sea. One of the major challenges faced while construction is the effect of water. Wind load is another big challenge faced by the structures. Here the structures are designed to effectively resist the lateral forces which have a massive effect on structures. Constructing these structures provide more living area for the people. In urban areas, building structures in sea will increase the working space and living space. We can design the structures in such a way that it won't affect or harm the fishes. If we adopt construction in ocean it will tremendously increase the total available area that can be used by humans.



I. INTRODUCTION:

Even though seventy percentage of earth is covered by ocean, very little of it is used for construction. The reason for this is the difficulty to construct stable structure which can efficiently resist the natural forces and other elements of the sea. When a structure is constructed in the ocean there are so many factors to be considered. Whether the structure is stable against the natural forces in the ocean, how long the structure can exist, that is its durability and the cost of construction. The construction in ocean is often avoided by considering these factors. We have made a proper study on how to make stable structures in sea using best methods. We found that it is possible to construct stable, energy efficient and sophisticated structures in ocean. We encountered challenges faced during the construction. Here we have come up with the best way of using ocean effectively.

II. IDEA:

Our idea is to create an ocean city. Ocean city implies constructing more than one structure above and below water. The ocean city with best infrastructure can be constructed by causing only least disturbance to the ocean. The ocean city can be created by utilizing more natural energy sources. The ocean city we suggest is entirely different from the typical artificial islands. Artificial islands are usually made by reclamation or by filling the ocean with sand and other materials. It consumes lots of ocean area and the ocean bed in that area is completely taken by the island. Artificial islands have many disadvantages like excessive erosion, disturbance to natural water movement, easily affected by tsunami and earthquake, occupying natural sea bed etc. So we made an entirely different concept on building a city in ocean. It is more acceptable and durable. It doesn't have most of the disadvantages of artificial islands.

THE STRUCTURES NEEDED FOR THE CONSTRUCTION OF AN OCEAN CITY.

Under water buildings

As the name implies these are structures constructed under water. Glass, metals, concrete etc. can be used for the construction of these structures. These

structures can be used for living, working, and entertainment purposes etc. Here the regenerated system can be supplied by pipes or can be generated within the buildings. The underwater building can floating, autonomous, semi autonomous or one with an access shaft to the surface.

Floating buildings

These structures have a floatation system at the base. These structures cause least disturbance to the ecology. These are least susceptible to the changes in sea level.

Raised offshore buildings

These structures are raised above the water level. Corrosion resistant metals, concrete, reinforcement etc. can be used for its construction. Buildings are constructed on piles. They are weather proof. According to the studies we made we suggest these buildings the most. Because it doesn't disturb the aquatic life and very less ocean bed is occupied by it.

STRUCTURES NEEDED FOR CONNECTING THESE BUILDINGS.

Underwater tunnels

It connects the underwater structures. It is used for transportation. It can be constructed partly or fully under water. Tunnels are always constructed by providing proper ventilation. Any material which can withstand the forces on the sea and the weathering action can be used for tunnel construction. Walking or cycling tunnels can be made. Such tunnels can be given strong glass covering to enjoy the underwater view.

Bridges

They connect structures above water surface. They are also used for transportation. Separate bridges can be made for pedestrians and vehicles. Bridges are supported over tall pillars. Well foundation or pile foundation can be used. Any type of bridge according to the purpose can be used. Selection of bridge is very important. Bridges



which suits the geographic, topographic and climatic conditions of the region can be selected. The bridges should be designed to safely transfer the structural and lateral loads.

III. ENSURING THE SAFETY OF STRUCTURES:

EARTHQUAKE RESISTANT

In order to make the structure earthquake resistant we can use seismic dampers. Don't make the shape of the building very complex. We can provide hydraulic damping at bottom of the building. Tie the walls, columns, beams and foundation of the building like a rigid box.

WIND RESISTANT

To make the structure wind resistant foundation strength of the building must be increased. Curved surfaces can be provided. The height of the building must be reduced. Cluster the columns and beams in the core of the building. Proper ventilation must be provided for air flow.

HIGH WAVE RESISTANT

To make the structure high wave resistant bow shape can be given to buildings. Buildings can be elevated using pile foundations. Shock absorbers can also be provided.

VERTICAL LOAD RESISTANCE

Vertical loads can be resisted just by providing a strong and sound foundation. By providing columns, beams and bracings.

RESISTANCE TO WEATHERING

Weather resistant buildings can be made by providing corrosion resistant and also acid resistant materials for construction. Galvanized metals can be adopted. Weather proof paints can be used.

IV. ENERGY EFFICIENCY OF STRUCTURES:

Ocean is a place where energy is available in

abundance. By utilizing the following energy sources the ocean city can be made a energy efficient city.

WIND ENERGY

Wind energy can be produced by placing wind mills over the sea. The blades must be covered by a mesh to protect the birds. It can be also placed in roof tops.

TIDAL ENERGY

Tidal energy can be produced by using turbines and also by using piezoelectric panels. Turbines can be placed under the bridges and raised buildings. Providing a mesh covering to the turbine will prevent casualties caused to the aquatic beings. Piezoelectric panels can be placed in the pillars of structures which is in a direction opposite to the tides or direction in which the waves can easily hit the panels.

SOLAR ENERGY

By installing solar panels and heaters on roof tops we can produce solar energy. Solar energy can be harvested even by placing solar panels in the exterior walls of buildings.

PIEZOELECTRICITY

- By placing piezoelectric chips on bridges, floors, stairs, tunnels etc. we
- can produce piezoelectricity. These can produce tremendous amount of energy.

Thus we can make stable, energy efficient, strong ocean cities. In addition to all these techniques natural cooling methods can be used for maintaining an optimum temperature in the raised buildings. For this the position of the buildings, availability of wind and light, direction of air flow etc. should be considered while designing the structure. The water in the ocean can be used for daily uses after purifying it. For this purifiers can be used and if needed distillation can be opted.

Challenges faced while construction

One of the challenges is the cost. The construction of ocean city is very expensive. Another challenge is the climatic conditions. The weather in the ocean changes frequently and sometimes can be very challenging. The water and its movement is another factor which has a huge role during construction. Blocking the water during construction can be difficult.

V. CONCLUSION:

We prefer the construction of an ocean city by causing only effect on environment. The structure will be strong and stable, energy efficient and also weather proof.

The structure increases the space of living, space of working and also the tourist number. This improves the infrastructure, level of engineering.etc.

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