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An Overview of Underwater Constructions

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Abstract: To make a structure in underwater is the difficult work for engineers, so we discussed in this paper, about what type of technique's are there and also their types, what type of material required, method of underwater construction, and investigation of structure.

Keywords: Underwater construction, inspection, Caisson, Cofferdam.

Introduction

Underwater construction is process on how to settle the concrete material in underwater, during underwater construction, the main impartial is to produce dry and waterless environment for working. so that the stability of the construction is balanced.

Underwater construction is a component that quite various complexities. The project required that a large volume of tremie concrete be placed up to 57 m below the water surface. All the tremie concrete was produced on a floating batch plant. Each tremie placement was carried out continuously day and night for 3 days. Each tremie pipe covered a 100-meter square area. A total of 50,000 m3 of concrete was placed in the steel casing.

Construction Techniques

A. Caissons

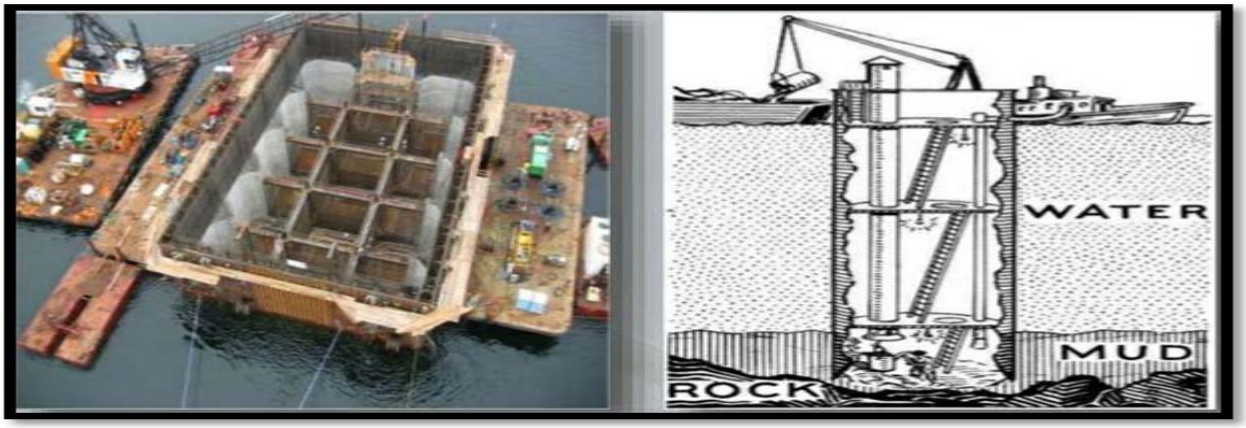

Fig. 1: Caisson

A caisson is keeping watertight structure used to work for the building of a concrete dam, on the foundation of a bridge pillar or for the fixing of ships. They descend through the water during the operation of the cavity of basis to exclude water which ultimately enhances a necessary part of the infrastructure.

Types of Caissons

1. Box Caissons

Box caissons are the prefabricated solid boxes of different aspects with watertight ground including cliffs, which are fixed fur on the qualified beds. Once they are in spot, they are loaded with pavement to enhance a portion of the sound structure.

2. Open Caissons

Open caissons are box-type structure related to box caissons without that they don't have a bottom face and mainly consists of upright surfaces. These caissons are leaned by self-weight, pavement, water sandbags placed on top, by water powered tools depending on site.

3. Suction caissons

Suction caissons are represented as an inclined basin that is rooted in the maritime trash. The embedment is delivered either by bootlegging or by forming negative stress. This type is usually used in maritime fabrication.

4. Pneumatic caissons

Pneumatic caissons are the ones which are enclosed in the head and initiate at the ground. The compressed air is used to eliminate liquid from the caissons assembly. The development of this kind of caisson is similar to the other expectations that the working assembly and the beam are made unassailable.

B. Cofferdam

Cofferdams are shifting watertight room tapped drain below the liquid line to perform the construction work to be conducted on hardcover.

Fig. 2: Cofferdam

Components of cofferdams

1. Sheet piling
2. Bracing frame
3. Concrete seal

The standard cofferdam consists of film quantities arranged throughout a stimulating framework and are encouraged in the soil adequately to cast off the course of soil and to improve parallel and upright comfort and in some circumstances to make the course argument of liquid.

Comparison of caissons and cofferdams

Caissons and cofferdams are chosen depending on site conditions. Caissons are stable edifice used for little space where the water elevation is larger than 12m whereas Cofferdams are unstable buildings which are used for large area with water height up to 12m.

Placement Methods

Tremie method: A Tremie is a watertight passage which is maintained on a functioning program over water level.

Pump method: It's a technique where the pavement is pumped directly into its terminal design including both horizontal and upright charge of pavement.

Toggle bags: Toggle bags are perfect for a short quantity of cement position. They are supplied among moist pavement plus is pressed escape through a tanker.

Bag work: In this process, bags are loaded beside gorgeous mix pavement, which are composed of open-weave matter. They are each tanker checked bags or installed utilizing a lift. This technique is utilized during short performances either quick course resolutions:- Bridge Selection Criteria.

Various Inspection Methods

a. **Routine investigation**: This is an underwater visual/feel investigation. This investigation is oftentimes described being a "dive by" investigation. The primary objective is to identify reasonable injuries or difficulties. This investigation should do of Level I. This investigation shall be taken escape formerly within a time. This is the most period at which all sunken parts of a bridge-whist, yet if it is in vibration state, must be investigated. Some difficulties recognized throughout the investigation may need moving in for Detail Investigation.
b. **Detail inspection:** This investigation is also nice and focused on getting insufficient measures of broken or degenerated regions that may be covered by aquatic extension.

The marine button requires to be erased for covering investigation and beforementioned cleansing is bound to test regions of the whole underwater buildings. In increase to this, Article Investigation shall also be done on these buildings anywhere difficulties must be recognized/confronted during Routine Inspection. This review should be of Level II and shall be sent escape one in five times. That is the most interval at which all sunken parts of a bridge-whist, even if it is in harmony state, essential be investigated. Through the investigation, while there is noticeable damage to the bridge-whist or one difficulty is conceived/distinguished which may constrain further investigation, Level III investigation should be

taken out. Though, exclusive Sr.DEN/DEN should initial determine the requirement of bringing out Level III investigation ere directing to carry out that investigation.

c. Special inspection: This investigation is an unscheduled Investigation. This investigation is expected to be brought out in the next circumstances.

- Beside unprecedented tides.
- Behind container influence (besides it is evident that no destruction has happened).
- Build-up of trash at docks and abutments (flat bands on the buildings and seek beca1800s decreased cross-section of the stream).
- Unique assistance wave from containers.
- In a situation of arrangements or extra data of extreme cleanse.
- This investigation should originally comprise of Level I. However, a greater level of investigation can be provided if supposed.

Fig. 3: Underwater Construction Materials

Underwater Construction Materials

Any of the foremost standard elements that are located on a bridge are steel, concrete, stone, and asphalt. Additional materials include iron, timber, aluminum, rubber, plus.other joint materials. Here is a description of some standard utilities for these mattersin a bridge.

a. Concrete

Concrete is usually utilized for various bridge superstructure segments mentioned as decks, pre-stressed precast columns, edges, paths, and barriers (side intercourse trench partitions). It is used widely in modern building for the whole abutment, including the foundations, stalk (main front wall), side partitions, rudeness partitions, reverse partitions, end partitions (for

traffic block connection), column support, and the landings with related affiliates. It can also be used for cast-in-place or precast concrete piles to support the abutments and piers.

b. Steel

Steel is usually utilized in the bridge superstructure for armoring extension connections, support, frames, ground columns, beams, strengthening poles in pavement, traffic limits, and reinforcements. It is utilized in the foundation during the reinforcing ribs in pavement, armoring for extension connections, reporter rolls, etc. It is also utilized for collections to maintain the abutments and landings.

c. **Stone**

Stone was generally used for developing the abutments and docks in the 1940's and beginning. This is especially right where confined fieldstone was quickly accessible. Many sensational sand arc bridges did made for the B&O line system in the 1800's. In Herford County, the remains of any MA & PA Railroad bridge abutments and docks are still reaching.

d. **Asphalt**

Asphalt is the matter that has remained utilized widely for the difficult exteriors on crumpled metal layers, timber layers and concrete layers in Herford County.

e. Iron

Iron was utilized commonly into columns and reinforcements that were created before 1900. Steel reestablished iron because it has higher tensile power than iron and is less crumbly. There are no applications for iron in today's bridge designs.

f. Timber

Timber is utilized for some layers and traffic difficulties in Harford County. It is also utilized for the columns on one bridge and the abutments and heaps on another bridge.

g. **Aluminum**

Aluminum is sometimes utilized in forming bridge railings.

h. Rubber

Rubber and artificial rubber stocks are utilized for frames and expansion of common matter.

i. Cement

Concrete comprises three components: sand or gravel, water, and cement to maintain it all unitedly. The variety of cement utilized for the largest3+ building, including underwater construction, equals Portland cement. Created of burned mud including lime, Portland cement is the mystery to concrete's strength to deposit underwater.

Conclusion

The underwater construction is mainly required where the transportation & field area is no available for required living than make a underwater Construction there are many difficulties has to be faced in the underwater construction. We first see the place of construction right or wrong and there is no damage to be aquatic life. It provides better transportation path or public transportation and consumes less time or transportation, the disadvantage is that it consumes more time in

construction. To make this type of construction only good materials are used stable life long time. So to make this type of effective construction we must follow this processer.

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