DESIGN PROJECT ON UNDERWATER CONSTRUCTION FOR THEATRE

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ABSTRACT

An Immersed theatre construction technique in deep water is the latest technology and trend in the industry. The theatre is mainly constructed by improving the architectural structure at our nation and then interact the peoples by the provision of world class construction materials.

The total area of the building is 3250 sq. meter it consist of 336 luxury seats with cushion effect 1x2m size seat, the total size of the theatre is 65m x 50m, and the large ticket counter and the canteens are provided.

The infrastructure of the theatre is designed at dramatic look and the concrete arc type columns and beams are provided, the roofing's are fully covered with tuff fiber glass without leakage, and it provides such a wonderful aquatic nature through this ceiling design.

IS 456:2000 codes is the basic code for general construction in concrete structures, hence all the structural members are designed using limit state method in accordance with the IS 456:2000 code and design aids. The structural members are designed using HYSD rods with fe500 grade of steel and M30 grade of concrete.

It is a innovative structural system, very durable and safety with good appearance .the method of limit state is used in this design. It provides wonderful entertainment and it improves the inland tourism.

KEYWORDS: Mix design, Density, Water absorption, Compressive strength, Tensile strength , Flexural Strength.

I.INTRODUCTION

Constructions of large infrastructures in the sea are supported by a lot of special construction techniques. For instance, the underwater structure construction industry has developed many innovated techniques such as under water drilling, platform construction, pipe installation. Some of these techniques can be applied to construction of sub-sea facilities in the field of civil engineering, naturally.

Theatre almost by definition includes a parking, projection, sound surrounding system and the screen resolution etc.

Because of there under water construction, the number of seats which would fit on the viewers, the main objective of our project is to improve the infrastructural elements of our nation and then implement the rate of foreign tourist people strategy.

This was not an ordinary structure, this is a world's largest under water theatre, it was placed at the cuddulore, the structure fully submerged at the depth of 30m below the water level.it includes ticket counter, snack point, ice cream parlor, separate toilets, operator room etc.

The entrance of the theatre is placed at the sea shore, the tunnel was provided at the ground to the reception. The length of the tunnel is 30m and the design specifications are similar to the theatr.

Krzysztof Kotala – "An Underwater Tennis Stadium Dubai-2015"

This project is constructed an underwater for the purpose of implement the new trend on tennis. The designer kotala is a polish architect. This project is his dream project. The tennis game is generally played at the surface of soil ground, but the game is played under water to implement the new trend for other games

This structure roof is fully covered with fiber glass with steel arch beam. This project is proved for fully strengthen near other masonry and other fabricated structure.

The width of this stadium is more than 50m. It is the new problem for design the structure, but it is designed for parabolic arch.

This project is fully designed and wait for good investors to start the project construction.

Carol.A.SABICK, Dr.FRANCOIS GRABIER "Integrated theater construction management informational and functional requirement-2014"

The Integrated Theater Construction Management (ITCM) research at USACERL focus on identifying the feature progress of the army. This theater is only used for war times only.

The integrated theater is constructed for under water. This the new technic for protect our forces and attack our enemy. It is not quickly recognizable for enemies.

This structure is constructed with fully concrete structure. It resist for wave and water pressure, stability against earthquake. These are important for war time to observe the vibrations for bam blast.

It is used to research the depends purpose an army.

Louis C Baleros "Famed Hong Kong Hotel On Harbour's Edge"

This project is help to make a dramatic elevation of the structure. The famed hotel is the shape of elliptic and half portion is submerged to the sea water. This structure like a ship. It counter balance its self-weight and imposed loads.

It is used to make an incredible interior for the structure. This hotel contain Mini Island of parks itself.

It helps to provide Evans dreamed up the floating structure, which provides guests with a unique way to experience the Great Barrier Reef. Accessible only by boat or helicopter, most visitors arrive via high speed catamaran to enjoy a day of scuba diving, snorkeling, and sunbathing.

Claire Suttles "Building Beneath The Sea Underwater Construction Projects"

This project is useful for how to make a foundation for under water structure. This building is constructed sea near sea shore. So this areas are containing loose sandy soil. This soil is not preferred for make a foundation. So the hard surface is select for make a foundation.

It is used to what are the progress providing make a underwater construction. The underwater construction is not easy for compared to ground surface construction. The dewatering progress is implement for remove water. So the casions and coffer dams are used.

It helps to which type of foundation is provide this construction. Generally this areas are pile foundation is to be used.

Jordan G. Teicher "Florida's Strange and Beautiful Mermaid Theme Park"

This project is helpful for make glass curtain walls. Basically the underwater museum type of structures are make a glass curtain walls to visible the incredible views under the sea.

Which type of glass material is used for under water construction. The problem occur during provide the glass walls to resist the high pressure of under water. So the glass is properly designed to resist the forces.

How to provide the leak proof joints on glass. The glass walls are provide under the water to make a joint for one to another. Such joints making by leak proof materials to avoid the leakage of sea water.

II.MATERIALS USED

1.CEMENT

In the present investigation OPC 53 Grade PENNA brand cement confirming to IS: 12269-(1987) was used and its properties are tabulated in Table 1.

Sl.No	Physical properties of cement	Results
1	Specific gravity	3.15
2	Standard consistency (%)	27%
3	Initial setting time (min)	30
4	Final setting time (min)	690

Table 1 Properties of cement

2. FINE AGGREGATE

The fine aggregate used in this experimental investigation was natural river sand confirming to zone II as per IS: 383-1987. The properties of fine aggregate are shown in Table 2.

3. COARSE AGGREGATE

Crushed aggregates particles passing through 20mm and retained on 10mm I.S sieve was used as natural aggregates which met the grading requirements. The properties of coarse aggregate are shown in Table 2.

Properties of aggregates	Fine aggregates	Natural coarse aggregate
Specific gravity	2.67	2.74
Fineness modulus	2.8	7.4
Water absorption	0.815%	0.195%
Impact value	_	16.73%
Grading of sand	Zone II	_

Table 2: Properties of Aggregate

III.SPECIFICATION

1.Foundation

Foundation for all column will be taken up to a depth of 7m below ground level and 1.5m width in hard rocks. The foundation concrete will be placed with pile foundation.

2.Footing

The footing shall be provided from the size of 4mx4m size and the M30 grade concrete will be used, the Fe500 steels are provided from the footings.

3.Column

The column provided is square column and its dimension is 1.5x1.5m. The height of the column is 25m, the grade of concrete is provided in the column is M30, Fe500 steel used in the column reinforcement.

4.Plinth beam

The main reinforcement of the plinth beam is 25mm dia of 160mm center to center spacing, and the stirrups dimensions are 25mm of 56 number of bars are placed.

5.Lintel beam

The size of the lintel beam is 1mx1m, the reinforcement details of the lintel beams are 22mm dia of 300mm center to center spacing.

6.Arch beam

The size of main rods are 56mm diameter and the stirrups dimensions are 25mm at 250mm center to center spacing.

IV.DESIGN

DESIGN FOR ARCH BEAM

Length of the arch beam= 50m

Rise of the arch = 8.5m

Size of the arch beam = 1.2m x 1.2m

Load at crown=700KN

Load at spring=350KN

Maximum moment act at crown=8750KNm

Provide 28# 40mm dia rod at 35mm c/c spacing

DESIGN FOR COLUMN

Size of column=1.5mx1.5m

This column is long column

Ultimate load=2000KN

Total design moment=510.3KNm

Provide 32# 56mm dia rods

Provide 16mm ties at 300mm c/c

DESIGN FOR LINTEL BEAM

Length of the beam= 5m

Size of the beam = 1m x 1m

Live load = 350KN/m

Design bending moment = 17578.125KNm

Provide 15# 56mm dia rod

Provide 22mm dia 2 legged stirrups at 300mm c/c

DESIGN FOR PLINTH BEAM

Length of the beam= 5m

Size of the beam = 1.5m x 1.5m

Live load = 1000KN/m

Design bending moment = 50000KNm

Provide 25 # 56 mm ϕ rods

Provide 25mm ϕ 2 logged stirrups @ 160mm c/c

DESIGN FOR FOOTING

Size of column = 1.5m x 1.5m

Live load = 3500KN

Soil bearing capacity = 185KN/m^2

Size of footing = 4m x 4m

Depth of footing = 0.9m

Provide main reinforcement on 5#16 ϕrods 190 mm c/c spacing.

Provide distributer reinforcement on 32 mmϕ rods 170 mm c/c Spacing.

DESIGN FOR PILE FOUNDATION

Total load = 9000KN

Number of piles = 9nos

Depth of hard stratum = 6m

Size of the pile = 0.4m x 0.4m

Provide 4# 28mm dia rod

Provide 8mm ties at 185 mmc/c spacing

Provide 8mm dia spiral pitch at 75mm for the length of 1.2m near the pile head

Provide 8mm dia ties at 60mm c/c for the distance of 1.2m from the both ends of pile

Provide 40mm dia holes at 1.5m from the ends

V.CONCLUSION

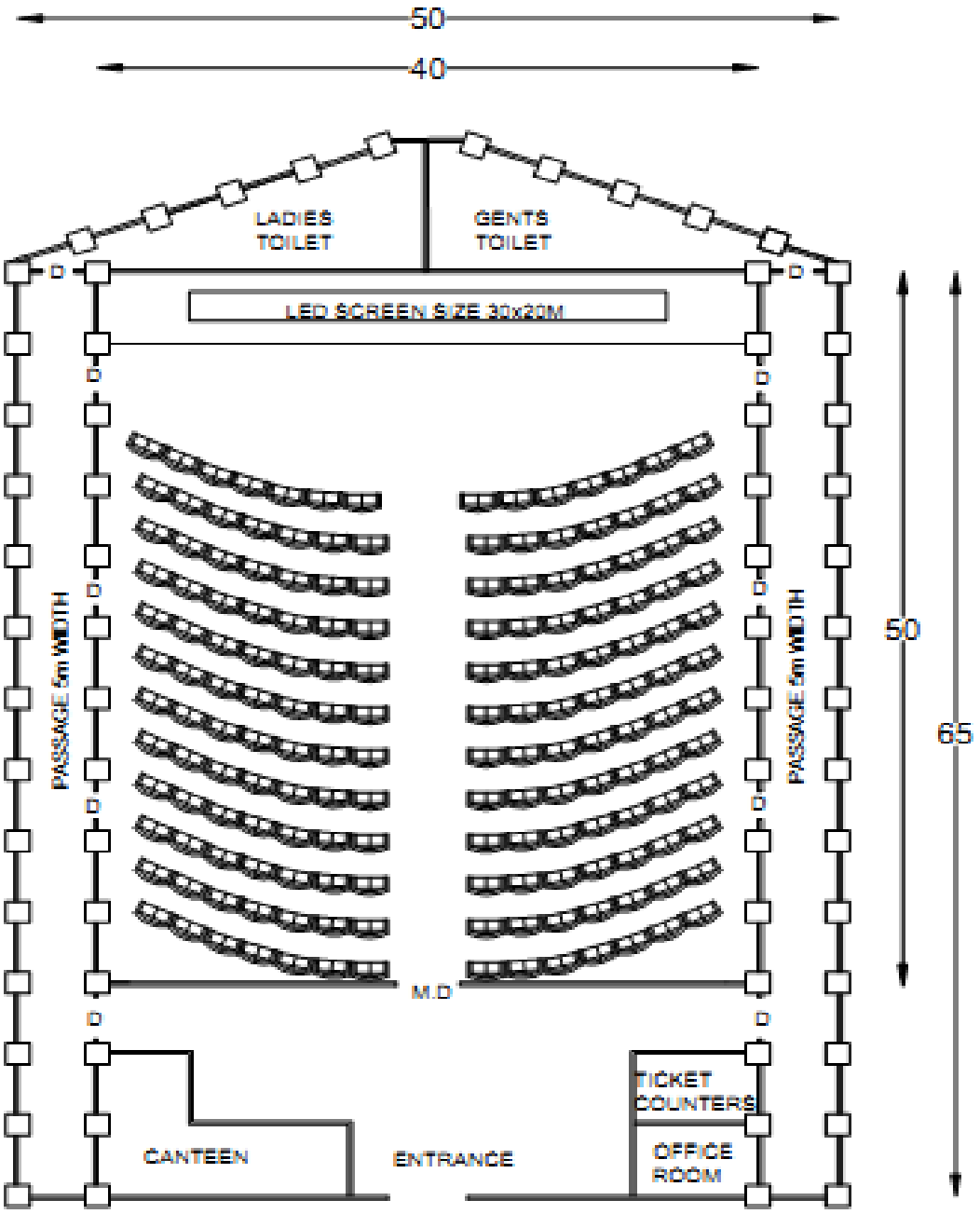
The design of underwater theatre is to facilitate the luxurious massive structure under the water.

From this project we come to the conclusion that, designing these type of structures the tourism in India by this the revenue of the country can also be increased.

In Singapore underwater theatre is made completely of concrete but in our theatre we had included fiber glasses along with concrete so the scenic beauty of the aquarium is visible to us.

The effective Design of underwater theatre has been created by using the following Indian standard code books IS: 4090-1967, IS: 456-2000

Appendix-A


50
40
LADIES TOILET
GENTS TOILET
LED SCREEN SIZE 30x20M
PASSAGE 5m WIDTH
PASSAGE 5m WIDTH
50
65
M.D
TICKET COUNTERS
CANTEEN
ENTRANCE
OFFICE ROOM

PLAN

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