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Submerged Tunnel

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Abstract – A Submerged Tunnel or Submerged Floating Tunnel (SFT) is a progressive engineering solution across deep sea, river, etc. were conventional bridges and immersed tunnels face limitations. Which is also known as Archimedes bridge. It is based on buoyancy principles, they offer several advantages like minimum environmental disturbance, economical in cost and adapting underwater conditions. The design, challenges in construction, and advantages are overviewed in this paper.

***Keywords*:** Submerged Tunnel or Submerged Floating tunnel, Buoyancy, Minimum environmental disturbance Design.

1. INTRODUCTION

The Submerged Floating Tunnels (SFTs), also known as Archimedes bridges, present a new approach under the surface of water. An SFT is suspended within the water body, supported by floating pontoons, columns or tethers. They are not totally suspended in water. This concept was first proposed in 19th century, and is a convenient alternative for crossing deep water bodies.

2. Body of Paper

Structural Components of SFT An SFT consist of absolutely necessary structural elements that helps maintain it is stable and function effectively.

- **Tube:** This is an important component that adapts traffic. It is preferably constructed by using concrete, steel that is shaped circular, elliptical, and polygonal. The considerate length for each tube section should be between 100 to 500 meters.

- **Anchoring System**: An essential part that ensures the stability of the SFT is anchor. That helps tunnel to suspend at designed depth. Four major anchoring types are:

1. **Pontoon-Based SFT**: Utilizing floating pontoons for support. This system is sometimes highly affected by environmental actions like water flow, waves and wind. It should be designed such that it can work even if one of the pontoons is damaged.

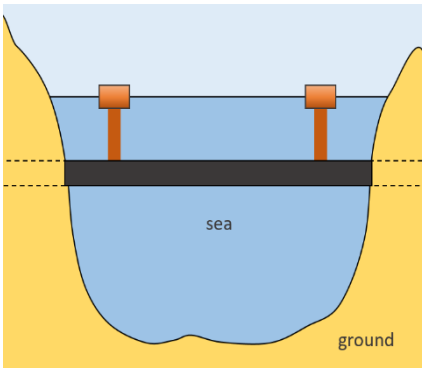

Figure 1

2. **Column-Supported SFT**: Acts similarly as piers provided to bridge but is underwater supported on the seabed or river bed. These columns are mostly designed to handle compressive forces but also needs to resist tensile loads.

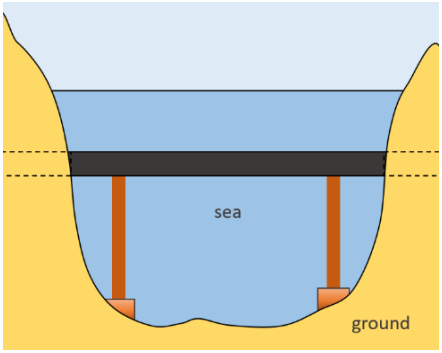

Figure 2

3. **Tethered SFT:** These are strong tensioned cables attached to tunnel and fixed in seabed. They are fixed in by 3 methods:

    - Gravity Anchors: This is method is used for hard seabed. By placing heavy

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concrete or steel blocks on the seabed, their weight allows them to be in place and avoids movement.

- Pile Anchors: This method is used for soft seabed. It is likely to pile foundation, long concrete piled are hammered into seabed using hydraulic hammers.
- Suction Anchors: Huge, hollow cylinders are fixed creating vacuum that pulls them to the seabed tightly to create tension in cables.

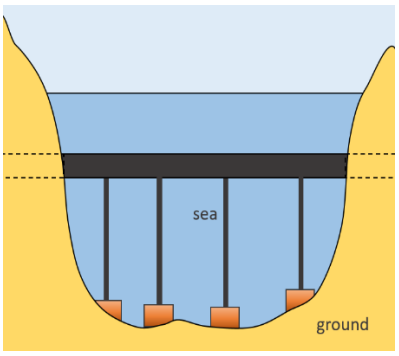

Figure 3

4. **Unanchored SFT**: This method does not consist of any type of anchoring as it is only supported at the ends of the tunnel.

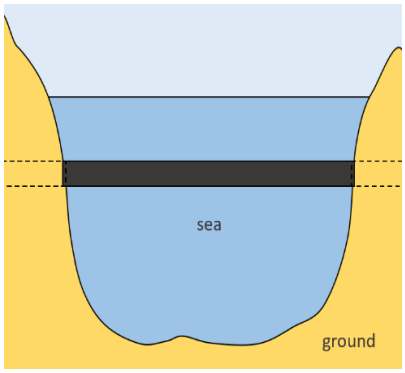

Figure 4

- **Shore Connections:** These is connection between submerged tunnel and solid tunnel on the earth's surface. This connection allows some movement to submerged tunnel. They are connected tightly to avoid water leakage.

3. Construction Challenges

- **Hydrodynamic Effects:** Since this is submerged tunnel, strong water current can affect its stability or intend it to move. It should resist the water currents.
- **Seismic Resilience:** It should withstand ground motions in areas where occurs often earthquake.
- **Corrosion Protection:** As the structure is built under seawater, it is necessary to use materials that are less corrosive to maintain its strength.
- **Risk Mitigation:** Safety against fire hazards, ship accident impacts, failure of structure should also be prioritized to avoid any risk to living bodies.

4. Advantages of SFTs

- **Reduced Environmental Footprint:** SFTs are different from traditional bridges and immersed tunnels, they give less disturbance to seabed allowing marine life to live freely.
- **Suitability for Deep Water Crossings:** SFTs can be constructed where bridges and immersed tunnels are impracticable.

5. Conclusion

The submerged tunnel presents a new solution to transport over large water bodies. While considering construction challenges, cost economy, environmental condition they can be constructed over time as new innovative machineries, strong materials are coming in use. This infrastructure can surely be beneficial for crossing seas and can increase the flow of traffic.

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REFERENCES

- Fathima, S. (2021). A Detailed Study on Design and Challenges of Submerged Floating Tunnel.
- Km, P., Sah, M., & Srivastava, P. (Year Unknown). Submerged Floating Tunnel.
- Vishwajeet, K. (2018). A Study on Submerged Floating Tunnel.
- Er. Hashmat, A. (2022). Submerged Floating Tunnel.

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BIOGRAPHIES

	Ms. Neha Pawar Civil Department ME structure BE Civil a dedicated mentor and educator with significant contributions to the field of civil engineering education. She has mentored us. Her efforts ensure us to get hands on experience and relevant skills
	Ms. Pranjal Kamble She collected data and did case study analysis.
	Ms. Disha Shelar She prepared final presentation, ensuring proper formatting.
	Ms. Urmila Dukre She analyzed construction challenges and directed us about it.
	Ms. Komal Dhawale She administered conclusion and provided us information.
	Ms. Nandini More She focused on structural components of SFT.