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SUBMERGED FLOATING TUNNELS - SENSITIVITY IN HIGH CURRENTS

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SUMMARY

This paper outlines aspects of the work completed as part of a feasibility study on behalf of the Philippines Government for a permanent crossing between Sorsogan and Samar islands. An optioneering exercise identified the possibility of a Submerged Floating Tunnel (SFT) to be designed as the permanent crossing. The relatively high speed and the bidirectional current in this location required an iterative series of sensitivity tests for a net buoyant SFT solution. These sensitivity tests are defined and explained, and their results are presented for future SFT designs in high currents.

Keywords: *Submerged Floating Tunnel, Tension Cable Structure, Marine, Concrete, Innovation.*

1. INTRODUCTION

A Submerged Floating Tunnel (SFT), or Submerged Floating Tube Bridge, is an enclosed tube structure, suspended beneath the water surface at a prescribed depth providing a permanent crossing which is invisible at surface level. An SFT can be tethered to the sea bed (net buoyant) or moored to the surface using pontoons (net "heavy"). The structural form in cross section resembles a tunnel, in long section resembles a bridge and as a global system resembles an offshore platform, requiring design methodology from all three disciplines. Although no permanent SFT has been built (at the time of this report being written), a number of SFT projects have undergone feasibility and even detailed design, particularly in Norwegian Fjords, where water current is relatively low (circa 1 m/s). The structural principle is now widely accepted, and some clients are now investigating the opportunities presented by SFTs to permanently connect deep water and even tidal sea crossings. The Norwegian solution of a net heavy tube, suspended by pontoons is less globally stiff than it's buoyant-tethered counterpart. This inherent stiffness of the buoyant tube solution means that it is generally capable of withstanding the higher water speeds found in open sea crossings. The added benefit of this system is the removal of ship impact risk from striking the support pontoons, a critical load case for net heavy SFTs. Fig. 1 shows the different SFT support concepts diagrammatically.

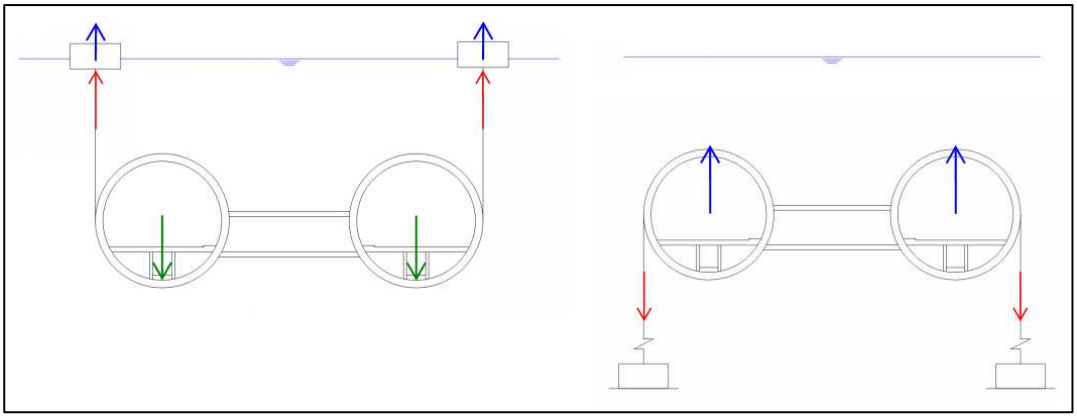

Fig. 1. *Submerged Floating Tunnel Support Concepts.*

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