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Floating Dry Process Caissons for Maintenance of Submerged Ocean Structures

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ABSTRACT

According to trend on quality control of construction and maintenance, a development of semi-permanent method of construction is required for maintenance of submerged part of ocean structure, such as bridge, riser, jetty, pier, dolphins, etc. The present structures were being maintained incompletely, partly due to unskilled divers' work and limited working environmental conditions. Considering the easiness of access to the maintenance area and the cost for set up the working structure, especially for the case of structure slabs close to the sea surface and harrow pile span structures, we developed the floating type circular and sector dry process caissons (DPC), which are effective to the submerged ocean structures near the waterline by allowing dry working space. The DPC was appeared easy to move around the working area and handle. It also showed not only a significant reduction of maintenance expenses and time for anti-corrosion work but also better protection. Circular type caisson was fit for small steel or concrete piles but we propose a sector type for a large cylinder structures greater than diameter of 3m, instead of the full circular caisson. By doing this, it is easy to disconnect the caisson rapidly in emergence case. Therefore, we expect that the floating DPC will contribute to reduce working time and improve the quality of underwater work, and furthermore the use of DPC to other construction industry might be expanded in future days.

KEY WORDS: Submerged ocean structure; Dry process; Steel pile; Floating caisson; Anti-corrosion work

INTRODUCTION

Background of Study

Recently, together with the trend of enhancement in domestic industrial development and economic progress due to import and export, the demand for construction of the roads, bridges, port facilities, several coastal protection, and ocean structures is increasing rapidly. Especially, port facilities, which take in charge of main role of ocean shipping together with land transportation facilities such as road, railway, etc., are being constructed newly in the form of piers, dolphins, wharves, jetties, and landing stages, etc. adopting ferroconcrete, steel pipe, PC concrete, with the help of Korean government policy of 9 new ports and renovation of the existing fishery ports. As is well known in the construction industry, these support members and the base are subject to damage due to corrosion, erosion, collisions, etc. and are likely to require repair and/or replacement from time to time. It is especially true of those portions of the support members which extend through the splash zone which experiences the forces generated by the action of the waves. As the extension of durability for existing port facilities is expected to be very important in curtailment expenditure of national finance, these are being repaired and maintained with high costs and for long construction periods adopting iron plate molding and concrete work under water every year but is not reached at the satisfying level yet.

Moreover, most of seawalls, supporting bulkheads and piles are located at the waterline or under the sea surface after construction, it is difficult to figure out the status of structures and not enough to get maintenance and strengthen the structures. Also, as it is necessary to stop leaking considering structure durability but it needs high cost caissons and complex installations at the field which accompany divers for repair and reinforcement works, there exist a lot of obstructions and bottlenecks in construction quality control. The repair of these elements, especially in the splash zone, have proven costly due to the specially trained personnel including highly trained divers and the excessive time normally required to perform the work.

Fig. 1 Tidal zone of concrete pile and bridge base