June 12, 1913.

It was decided, therefore, to place an asphalt wearing surface on the deck, and this has proven very effective.

The piers, at the foot of 31st and 33rd Streets, South Brooklyn, have been in service for about three years. No signs of cracking or other imperfections have appeared, and the piers, as a whole, are a complete success.

Repairs .- For the modern type of concrete deck pier, the cost of maintaining the fender system is about the same as that for the wooden pier; deck sheathing repairs are practically eliminated, except such minor asphalt patching as may be required, and can be considered negligible in a good asphalt deck under cover; the deck plank is eliminated; the life of the ranger and cap system is prolonged by the protection from moisture given by the impervious concrete deck, and the cost of maintenance and repairs, therefore, is reduced to a minimum.

(c) The supporting part, below the water line, is permanent; and

(d) The resulting structure is such that it can be readily extended, reconstructed, or, if necessary, entirely removed at a cost not prohibitive, as would be the case, for example, with most types of reinforced concrete deck-supporting structures.

II. That the department has produced permanent parts in the structures where these are essential. No attempt was made to obtain absolute permanency above low water, in the structure supporting the deck, for the reason that.

III. This portion of the structure, the caps, piles, braces, etc., protected as they are from saturation by urine and other objectionable fluids by the concrete and asphalt deck forming a protecting roof, can be maintained in good condition at a very low cost.



Conclusions.-From the foregoing it will be observed that the problem which confronted the department was the elimination of the timber deck and deck-supporting structure of the wooden pier, by the substitution therefor of some permanent form of construction meeting the following requirements :--

(a) Economy in cost of construction and maintenance, the unit cost to be such as to produce or make possible a re-muneration

munerative return on the capital invested. (b) The construction to be of such character as to be readily extended, reconstructed, re-modeled, or, if necessary, entirely entirely removed, reconstructed, re-modeled, or, in an area occupied has more intensive development of the area <sup>occupied</sup> by the pier or system of piers might be made neces-sary by the

sary by the growth of commerce and shipping. From what has been stated the following conclusions

may be deduced :---I. Admitting that timber piles and foundation work are generally permanent below the mean low water line in New York Hart York Harbor, the Department of Docks and Ferries has met the requirements of the problem by producing piers having the following characteristics :-

(a) The deck is absolutely permanent; (b The deck is absolutely permanent; cheaply, above mean low water, is easily and cheaply repaired and maintained;

IV. The type of structure produced, approximating permancy, is now being built by the department at a first cost no greater than that of the former type of wooden pier throughout, and the cost of repairs and maintenance of the deck structure is almost entirely eliminated.

## SELECTION OF SAND FOR CONCRETE.

The two most essential qualities to consider in sand are cleanness, that is, freedom from impurities, and coarseness of the grains. The sharpness of the grains and the mineralogical composition, according to "Concrete Costs," by Taylor and Thompson, while affecting to a slight extent the strength of the mortar for concrete, are not in themselves sufficient for accepting or rejecting a sand.

Cleanness, meaning by this not so much freedom from fine, clayey material as freedom from vegetable matter, is of prime importance, since such impurities may so affect the strength of the mortar as to make even a well-graded sand absolutely dangerous to use. The fineness of the sand and its percentage of silt passing a sieve having 100 meshes per linear inch, may also be a ground for rejection, since a fine sand always makes a weak mortar or concrete.