REPORTS ON THE MEANS OF IMPROVING THE PRESENT HARBOUR AND THE CONSTRUCTION OF DOCKS AT MONTREAL pdf

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Principles of maritime engineering Objectives The principal objectives of such works fall broadly into two classifications: Under the first fall works directed at providing facilities for the safe and economical transfer of cargo and passengers between land vehicles and ships; fishing ports for the landing and distribution of the harvest of the sea; harbours of refuge for ships and small craft; and marinas for the mooring or laying up of small private craft. Under the heading of reclamation and conservancy come works directed to the protection of the land area from encroachment by the sea, to the recovery and conversion to land use of areas occupied by the sea, and to the maintenance of river estuaries as efficient means for the discharge of inland runoff. In many places, without continuous attention to such maintenance, the coincidence of high tides with heavy rainfall would lead to frequent disastrous flooding of inhabited areas. MoodyGroove The civil engineering techniques used for either of these objectives are broadly similar, and indeed the realization of both objectives at the same time will frequently be a feature of the same project. An operation of maintaining a river estuary at a depth sufficient for navigation, for example, may at the same time greatly improve its capacity for the drainage of upland floodwaters. Hydraulic models The planning of maritime civil engineering works, whether for transportation, reclamation, or conservancy, has been facilitated by the development of the technique of model studies. Once regarded as scientific toys, such studies are now considered an essential preliminary step to any large-scale redevelopment of a port or coastal area and are useful even for minor modifications or additions. Scale models of the area, harbour, or estuary are made so that water can be caused to flow in such a way as to reproduce the various tidal and other streams in the same direction and with velocities equivalent to those occurring on the site. A variety of devices, usually electronically controlled, have been developed to produce both wave and tidal effects. The value of these experiments derives from the reduction in the time scale, which has been found to correspond to the reduction in the dimensional scales of the model. Thus, the large model of the Clyde estuary of Scotland works on a tidal cycle of about 14 minutes, or about 50 times the actual frequency. The effect of three years of tides following any modification of the profile of the harbour can thus be studied on the model in a matter of three weeks, and any tendency to otherwise unanticipated scour clearing by powerful current or siltation can probably be detected. The relative values of alternative positions of breakwaters in affording shelter can be similarly studied using the wave-generating devices available; and the development of secondary, or reflected, waves with undesirable disturbances within the sheltered area may be anticipated and, if possible, forestalled. Because such natural harbours are not always at hand where port facilities are needed, engineers must create artificial harbours. The basic structure involved in the creation of an artificial harbour is a breakwater , sometimes called a jetty , or mole, the function of which is to provide calm water inshore. Locations for artificial harbours are of course chosen with an eye to the existing potential of the coast; an indentation, however slight, is favoured. Yet it has often been found justifiable on economic or strategic grounds to construct a complete harbour on a relatively unsheltered coastline by enclosing an area with breakwaters built from the shore , with openings of minimum width for entry and exit of ships. Sea works for transportation Classical harbour works Improvements to natural harbours and construction of artificial harbours were undertaken in very ancient times. There is no conclusive evidence for the date or locality of the first artificial harbour construction, but it is known that the Phoenicians built harbours at Sidon and Tyre in the 13th century bce. The engineers of those days either knew or thought little about conservancy even as applied to the ports they constructed. Evidence is to be seen in the once thriving ports around the shores of the Mediterranean that now are not merely silent ruins but seem so far from even sight of the sea that it is difficult to imagine the presence of seagoing ships at the wharves, the alignment of which can occasionally be traced in the fertile alluvial land now occupying the site. Ephesus, Priene, and Miletus, on the Aegean shores of Asia Minor , are examples of this type of harbour disappearance, the destructive agent in each of these cases being the picturesque Meander now the Menderes River, whose creation of new land from the sea is readily perceivable from high ground adjacent to the river mouth. The formation of further bars is proceeding visiblyâ€"and, as there is currently no port in the vicinity whose livelihood can be threatened, it is interesting to speculate how far out to sea this process will ultimately continue in the course of the next millennium or so. In this case, not only the river in the vicinity but also littoral drift, the movement of sediments by a current parallel to the coast , which produces and maintains extensive beaches to the east and the west, must be held partly responsible for the scale of siltation. Of many of the ancient port structures, no physical trace remains, but knowledge of the fact that they existed and even a measure of technical description has come down through the written word. With these descriptions and the monuments that still remain, some picture may be formed of the work undertaken by the maritime civil engineers of ancient times. Given the frailty of the craft for which they were providing, shelter from the weather was the prime consideration; and much effort was devoted to the construction of breakwaters, moles, and similar enclosing structures. Cheap labour was abundant, and the principal material used was natural stone. Surviving structures built in this way are likely to give an appearance of indestructibility, which occasionally attracts favourable comparison with the lighter, more rapidly depreciating modern structures. It is not, however, necessary to credit the engineers of antiquity with a conscious intention to build forever. Given the materials they had to use and the purposes they were implementing , they could do little else; moreover, because there was no rapid pace of advance in the development of ships or land transport, they were undisturbed by the shadow of obsolescence. In the 20th century, far from wanting to build forever, the port engineer had to be careful to avoid saddling posterity with structures that might long outlast their usefulness and turn into liabilities. The modern balance between excessive durability and dangerous frailty is one that the ancients never had to strike. Aided by the characteristics of the material they employed, the ancients constructed maritime works on a scale that is certainly remarkable to this day. Interesting technical practices included the use by the Romans of the semicircular arch in constructing moles or breakwaters, an arrangement that allowed a measure of ingress and egress by the sea to produce a beneficial scouring action in the harbour. The Romans underpinned their structures with timber piling and frequently resorted to the construction of cofferdams watertight enclosures that they could dewater by the employment of Archimedean screws and waterwheels. This practice enabled them to carry out much of their foundation work in the dry; and the use of their famous hydraulic cement, pozzolana , gave their structures a durability far exceeding that afforded by the lime cement available to their predecessors. Among the more interesting harbours of the ancient world are Alexandria , which had on the island of Pharos the first lighthouse in the world; Piraeus , the port of Athens; Ostia, the port of Rome; Syracuse; Carthage, destroyed and rebuilt by the Romans; Rhodes; and Tyre and Sidon, ports of the earliest important navigators, the Phoenicians. Breakwaters Because the function of breakwaters is to absorb or throw back as completely as possible the energy content of the maximum sea waves assailing the coast, they must be structures of considerable substance. The skill of the designer of a breakwater lies in achieving the minimum initial capital cost without incurring excessive future commitments for maintenance. Some degree of maintenance is of course unavoidable. Breakwater design A common breakwater design is based on an inner mound of small rocks or rubble, to provide the basic stability, with an outer covering of larger boulders , or armouring, to protect it from removal by the sea. The design of this outer armouring has fostered considerable ingenuity. The larger the blocks, the less likely they are to be disturbed, but the greater the cost of placing them in position and of restoring them after displacement by sea action. Probably the least satisfactory type of armour block, frequently used because of its relative ease of construction, is the simple concrete cubic, or rectangular, block. Even the densest concrete seldom weighs more than 60 percent of its weight in air when fully immersed in seawater; consequently, such blocks may have to be as much as 30 tons 27, kilograms in weight to resist excessive movement. Boulders of suitably dense natural rock are generally much more satisfactory and, in a project completed in the United Kingdom in the s, it was found by experiment, and subsequently confirmed in experience, that armouring of this type could be composed of blocks of as little as six to eight tons to resist the action of waves up to 18 feet 5 metres in height. The same experiments showed that, to afford the same protection in the same circumstances, concrete blocks of 22 tons would have been necessary. In such cases, an intermediate layer of smaller blocks or boulders is inserted between the armouring and the inner core to prevent the finer material in the core from being dragged out by sea action between the interstices of the armourâ€"a process that leads to ultimate settlement and possible breaching by overtopping of the breakwater. The increasing cost and frequent unavailability within economic distance of suitable natural rock has provoked considerable thought to the design of concrete armour units that can, by reason of their shape, overcome the disadvantages of the simple cubic, or rectangular, block. Legs are bulbous, or pear-shaped, with the slightly larger diameters at the outer end. These units have the property, when placed, of knitting into each other in such a way that the removal of a single unit without the displacement of several others is almost impossible, while the interstices between them act as an absorbent of wave energy. Weights substantially less than those needed for cubic blocks are adequate in the case of tetrapods in similar storm conditions. The tetrapods can be mass-produced adjacent to the site through the employment of reusable steel forms. It is usual to construct some form of roadway along the crest of a breakwater, even when this is not required for any other dockside purposes, to facilitate inspection and access for labour, materials, and equipment for damage repairs. Solid breakwaters In certain circumstances, particularly in parts of the world where clear water facilitates operations by divers, vertical breakwaters of solid concrete or masonry construction are sometimes employed. Some preparation of the seabed by the depositing and leveling of a rubble mound to receive the structure is necessary, but it is usual to keep the crest of such a mound sufficiently below the surface of the water to ensure its not becoming exposed to destructive action by breaking waves. Repulsion of the waves by vertical reflection rather than their absorption is the philosophy of protection in all such cases, but it is not possible to state categorically which arrangement produces the most economical structure. This type of breakwater can be conveniently constructed through the use of prefabricated concrete caissons , built on shore and floated out, sunk into position on the prepared bed, and filled with either concrete or, less frequently, simple rubble or rock filling. A historical example of this arrangement was the Mulberry Harbour , built by the Allies and floated into position for the invasion of Normandy in No previous preparation of the seabed was possible, and only partial filling of the caissons had been carried out when the progress of the war rendered further operations unnecessary. Nevertheless, the fact that several of the caissons remained in position basically undamaged for nearly a decade after the invasion on this notoriously stormy coast demonstrated the possibilities of the method. Floating breakwaters Because of the large quantities of material required and the consequent high cost of breakwaters of normal construction, the possibility of floating breakwaters has received considerable study. The lee of calm water to be found behind a large ship at anchor in the open sea illustrates the principle. The difficulty is that, to resist being torn away in extremes of weather, the moorings for a floating breakwater must be very massive. They are therefore difficult to install and subject to such constant chafing and movement as to require substantial maintenance. Another problem arises, especially in areas of large tidal range. The unavoidableâ€"indeed, essentialâ€"slack in the moorings may allow the breakwater to ride large waves, so that they pass underneath it carrying a considerable proportion of their energy into the area to be sheltered. One approach to the problem is based on the concept of causing the waves to expend their energy at the line of defense by breaking on a large, floating horizontal platform. Docks and quays Because the principal operation to which harbour works are dedicated is transfer of goods from one transportation form to another e. Ships must lie afloat in complete shelter within reach of mechanical devices for discharging their cargoes. Although in emergencies ships have been beached for unloading purposes, modern vessels, particularly the larger ones, can rarely afford contact with the seabed without risking serious structural strain. In either case, large areas of firm, dry land immediately alongside the ship are required; the engineer must find a way to support this land, plus any superimposed loading it may be required to carry, immediately adjacent to water deep enough to float the largest ship. The capital cost of such works probably increases roughly in proportion to the cube of the deepest draft of ship capable of being accommodated; thus the economic challenge posed by the increase in the size of modern ships is considerable. The advent of containerization â€"the packaging of small units of cargo into a single larger oneâ€"has not fundamentally altered this problem, except perhaps to reduce the number of separate individual berths required and to increase greatly the area of land associated with each berth. A figure of 20 acres 8 hectares per berth is freely mentioned as a reasonable requirement. The problem of land support at the waterline remains the same. Gravity walls The solution initially favoured, and indeed predominant for many years, was that of the simple gravity retaining wall , capable of holding land and water apart, so to speak, through a combination of its own mass with the passive resistance of the ground forming the seabed immediately in front of it. To ensure adequate support without detrimental settlement of the wall, to ensure its lateral stability, and to prevent problems of scour, it is necessary to carry the foundations of the wall below the seabed levelâ€"in some cases a considerable distance below. In earlier constructions, the only guide to this depth in the planning stage was previous knowledge of the ground and the acumen of the engineer in recognizing the characteristics of the ground upon seeing it. Many projects were carried out in open excavation, using temporary cofferdams to keep out the sea. In particularly unfavourable or unstable soils , accidents caused by collapse of the excavation were not unknown. In modern practice, no such project is initiated without exhaustive exploration of the soil conditions by means of borings and laboratory tests on the samples. Continuous monitoring of the soil conditions during construction is also considered essential. Even so, accidents caused by soil instability still occasionally occur. The material composing the walls is today almost universally concrete, plain or reinforced, according to the requirements of the design. This material has entirely superseded the heavy ashlar natural rock masonry at one time used for such construction, when the techniques for the large-scale production of concrete were not so well developed as they are today. In some circumstances, particularly those in which the water is reasonably clear or the design and soil conditions do not require very deep excavation into the seabed, the construction of quay walls is adopted by means of large blocks, sometimes of stone but generally of concrete, placed underwater by divers. The economics of this method of construction are influenced by the high cost of skilled divers and by the cumbersome nature of diving equipment. The development of lightweight, self-contained equipment, which leaves the diver considerably more mobile, may relieve this problem. Concrete monoliths The risks and difficulties attendant on the construction of gravity walls have been avoided, in suitable conditions, through the use of concrete monoliths sunk to the required foundation depth, either from the existing ground surface or, where the natural surface slopes, from fill added and dredged from the front of the quay wall on completion. This technique amounts to the construction above the ground of quite large sections of the intended wall, usually about 50 feet square in plan, which are then caused to sink by the removal, through vertical shafts, of the underlying soil. Another lift of wall is then constructed on top of the section that has sunk, more soil is removed, and the process is repeated until the bottom has reached a foundation level appropriate to the required stability. Considerable skill is sometimes necessary in the sinking process to prevent the monoliths usually provided with a tapered-steel cutting edge to the lowest lift from listing, an eventuality that can occur if any part of the periphery encounters material that is particularly difficult to penetrate. Differential loading of the high side and special measures to undercut the material composing the obstruction may be necessary. The shafts through which the excavated material is removed are generally flooded throughout the operation simply from the intrusion of the groundwater; if necessary, this water can be expelled by the use of compressed air. The excavation of difficult material in detail and in the dry can then be undertaken. It is an operation of some delicacy, because the flotation effect of the compressed air adds a further element of instability to the monolith, and a blow sudden leakage of air under the cutting edge may result in flooding of the working chamber.

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2: Trautwine, John C. (John Cresson), | The Online Books Page

"Rival routes to the ocean from the West; and docks at Montreal. Considered in a letter to the Harbour commissioners. By the Hon. John Young" (p. [65]) also issued www.enganchecubano.com of access: Internet.

The mouth of the harbour pointed west. The islands used to be a low sandy peninsula forming the southern limit of the bay. The Scarborough Bluffs are much larger bluffs that lie approximately ten kilometres east of the harbour. Strong lake currents over time washed the sand eroded from the bluffs westwards to form the peninsula surrounding the bay. Built in , Gibraltar Point Lighthouse was located on the southwest-end of the Toronto Islands, and was used to guide ships into the harbour. The eastern shore of the bay, approximately six kilometres east, was a marsh around the mouth of the Don River. In addition to the Don River, a number of smaller creeks flowed into the bay. The original site of the town of York had half a dozen short creeks that flowed through it. As the town developed they all became polluted and were buried. A garrison at the entrance to the harbour, at the mouth of Garrison Creek, was established to guard the harbour along with a blockhouse on the island. In , York became an official port-of-entry for immigrants and cargo. In , the Gibraltar Point lighthouse was built on the island to guide ships. American forces moved to capture Fort York centre , which guarded the entrance to the harbour, and York , the predecessor of Toronto. In the early 19th century, cargoes destined for York would be transferred at Montreal to smaller boats such as Durham boats and batteaux to traverse the rapids of the St. Although not fully established by the War of , the British colonial army was determined to set up boat-building for defence at York. An armed schooner was under construction when the Americans attacked and the British burned the hull rather than surrender it. The invaders occupied Fort York, looted the town and destroyed military facilities. Some of the boats used for cargo were now being built at Toronto Bay. The first harbourmaster of Toronto, Hugh Richardson, was named in Richardson held the position until The Distillery had been conceived as a plant to make flour, but the distillery business was much more popular. The Toronto Islands were still a peninsula, connected to the mainland from the east. The peninsula was permanently severed in , after a series of storms created a channel that eventually became the Eastern Gap. By , the waterfront was completely taken over by government and merchant wharves. The waterfront was extended to a survey line from the point of the Gooderham windmill west to a point due east of the old Fort Rouille. The Esplanade and infill project was complete by The rail lines moved to a viaduct in the 20th century. The peninsula became the Toronto Islands through the result of two storms and man-made activity. In , a storm created a channel through the eastern edge of the peninsula that formed the south edge of the bay. The storm washed through excavations made for sand for local construction. In , another storm widened the channel and made it permanent. The next rail line was the Grand Trunk, which underwrote the Esplanade project in exchange for an easement to enter the City. Manufacturers of products such as soap received raw materials via boat, produced the product at their location on the harbour, and distributed it via rail. As well as cargo, the harbour also became a major passenger waypoint. By the s, the harbour was handling 1,, passengers annually through passenger steamship docks at the foot of Yonge Street. Passenger boats operated on Lake Ontario and the St. Excursions to Niagara also departed from the Yonge Street docks. The barge was unable to shelter in the harbour. The existing channel could not be dredged to a lower depth as it was solid rock. Map of the Port Lands in The lands of the waterfront that were owned by the City of Toronto were transferred to the Commission to administer. In , the commission delivered its first plan for the harbour and the waterfront from the Humber River in the west, to Woodbine Avenue to the east. The Commission dredged the harbour to a depth of 24 feet 7. The final infill on the north shore was in the s, from Yonge Street east to the Don River, providing room for the Redpath Sugar Refinery, the Victory Soy Mills and several marine terminals. Ice skating at the Harbourfront. Beginning in the s, the city began to expropriate former industrial lands, converting them from recreational use. By the time that the plans to build the St. Lawrence Seaway were announced, commercial usage of the harbour was already in decline. The previous infill on the eastern side created in the s was used to build modern port facilities. In the s, the northern shore was in decline and there was a new political initiative to rebuild the waterfront without industry in a manner seen in other cities. The Harbourfront project expropriated the lands west of York Street. Several facilities were renovated, such as the Terminal Warehouse, and others were demolished, creating space for recreational and cultural uses. The area around Yonge Street remained in private possession and a hotel and condominiums were built on the shoreline. The area east of Yonge Street remained in light industrial use under public possession. On the north side of the harbour, there are a few buildings left from the industrial period. Some are in use, such as the Redpath Sugar Refinery. Others have been demolished or are slated for demolition, including grain storage elevators at the east and west end of the harbours. The 10 billion cubic yards of material was used to build the aquatic park on the Outer Harbour headland. The service used a marketing name called "The Breeze". While Rochester had a custom-built ferry terminal, the Toronto terminal was a temporary facility, near the end of Cherry Street for security and customs screening facilities while a permanent marine passenger terminal was still under consideration for construction. CATS discontinued the service after only 11 weeks; among the problems cited was the absence of a permanent marine passenger terminal in Toronto and little Canadian interest in the service. Most of the former wharves disappeared when the waterfront was filled in along with the now "missing" creeks of Toronto.

3: Harbours and sea works | www.enganchecubano.com

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