5

Gravity-Type Quay Walls

5.1 GENERAL

By definition, gravity-type structures are those which rely primarily on their weight and grip on the foundations to resist any of the possible adverse load combinations.

Gravity-type quay walls may be used at wharves receiving ships of any size and type; from small general cargo vessels to the largest contemporary container ships, and very large bulk carriers and supertankers. These walls are particularly useful and durable under severe marine environmental conditions, such as salt water, hot and cold temperatures, large waves, and heavy ice loads.

A great variety of gravity-type quay walls has been developed in the past. Typically, the type of walls used for the marine application was influenced by specific site conditions, such as availability of certain constructions materials, dry dock facilities, cost of local labor, and others. In the past and at present, in a great many cases gravity-type structures are used where local foundation conditions preclude pile or sheet-pile driving.

In general, because of their heavy weight and the character of the load distribution at the base, the gravity-type structures require reasonable foundation conditions.

In the past century, the gravity-quay walls were generally made of rubble masonry (Fig. 5–1a) or cast-in-situ concrete (Fig. 5–1b) built in the dry, provided that the site could be dewatered and a sufficiently strong foundation was available. In some cases where relatively weak foundation soils were present, heavy gravity walls built in dry were founded on piles (Fig. 5–2). Because wood completely submerged in water does not usually rot, the pile foundation was typically made from wooden piles. The top of these piles was usually embedded in concrete and located below the mud line, thus providing protection from attack by marine organisms.

Invention of reinforced concrete and improvements in concrete technology was followed by increased refinements in quay wall constructions. Slender cast-in-place L-shaped walls and the counterfort walls have been introduced (Fig. 5–3). However, construction of the high quay walls in dry at
Figure 5-1. Dock wall at Greenoch, U.K. (1980). (a) Portion built of rubble masonry; (b) portion built of concrete with rubble masonry superstructure.

Figure 5-2. Mass concrete wall at Limerick, U.K. built on piled foundation.