

Jetty Construction in Christmas Island

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1. Introduction

A jetty for docking a satellite recovery ship and other ships and related facilities for the National Space Development Agency of Japan (NASDA) are under construction in Christmas Island, Republic of Kiribati. The jetty consists of a 224 m long Trestle, Head End (80 m x 14 m) and two Mooring Dolphins. The jetty has a concrete panel deck supported by steel piles.

Christmas Island is located in the Pacific Ocean and has insufficient manpower, construction materials and equipment available for the works. Detailed planning and prefabricated design are essential for the smooth execution of the project.

2. Christmas Island

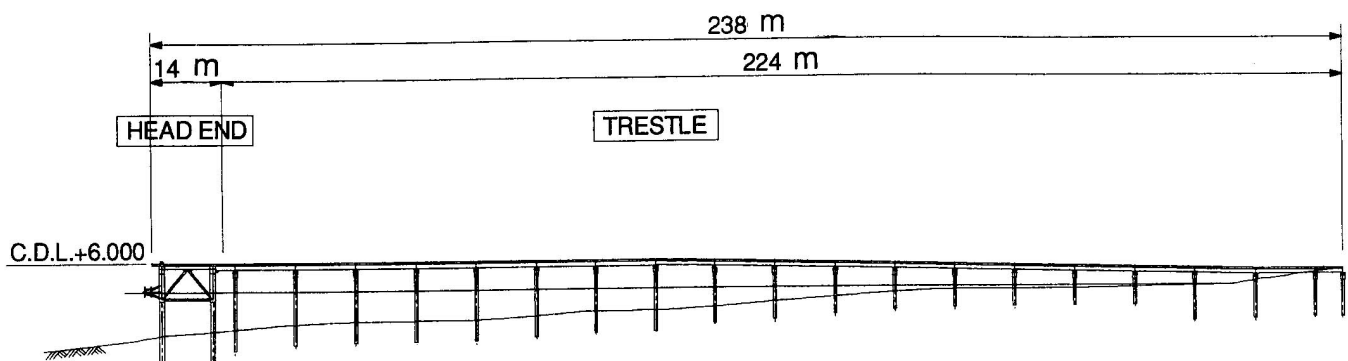
Christmas Island is one of the islands of the Republic of Kiribati in the Pacific Ocean. The island is located about half way between Hawaii and Australia and is 50 km long and 30 km wide. Since the island is well known as a wildlife sanctuary inhabited by many species of birds and other wildlife and it is surrounded by coral. Stringent environmental regulations are enforced for their protection.



3. Outline of Jetty

The jetty consists of the following structures.

- Head end: length: 80 m, width: 14 m
- Trestle: length: 224 m, width: 6 m
- Mooring Dolphins: 2 nos., 6 m x 4 m



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4. Feature of Jetty Construction

4.1 Environmental Consideration

In order to minimize the effects of the jetty construction on the environment, the jetty was changed from a caisson type to a jetty type supported by steel. The temporary jetty was also relocated so as to be outside the coral reef. These changes will minimize the amount of coral damaged by the construction. During the project, the following procedure has to be followed; 1) Birds have to be protected during spawning season. 2) Waste material has to be disposed outside the island. 3) Imported material has to be fumigated before import etc.

4.2 Prefabrication of the structure

Given the location of Christmas Island, it is difficult to obtain necessary construction resources on the island or nearby. Furthermore, stringent environmental regulations are applied to the island. For these reasons, prefabricated construction is used wherever possible so that the temporary area for construction and waste materials are minimized and imported labours are also minimized.

Accordingly prefabricated concrete panels were designed. The concrete panels are prefabricated abroad and transported to the site. Steel jackets covering the top of steel piles are also prefabricated, since jackets of sufficient quality are unavailable on the island. The environmental consultant to this project is satisfied with the benefit of the prefabrication method.

4.3 Bored Pile

Since the ground at the jetty location is mixture of coral rock and sand layer, the piles are being positioned in the boreholes drilled by a rotary drilling machine and the gaps between the piles and the borehole sides is filled with grout. The sequence of piling works is as follows:

1) Casing set

A casing is set by a vibration hammer in order to protect the surface of the hole drilled through the casing.

2) Drilling

After the casing is set, drilling is carried out through the casing by a rotary drilling machine. The drilled material is pumped out by a suction pump.

3) Pile installation

A pile is installed in the casing by a crawler crane. After the pile is installed, the pile is hammered so that the pile penetrates firmly into the ground.

4) Grouting

The gap between the pile and the side of the boreholes is filled with grout. The grouting is carried out before the casing is pulled out in order to avoid the collapse of the borehole.

4.4 Conclusion

Christmas Island is located in the Pacific Ocean and is a wildlife sanctuary. Accordingly, stringent environmental regulations are enforced on this project. Measures to comply with those regulations include concrete panels and steel jackets which were prefabricated off the island and a bored pile method being used on the coral rock.

Despite the restrictions, the jetty under construction is heading towards a timely completion.