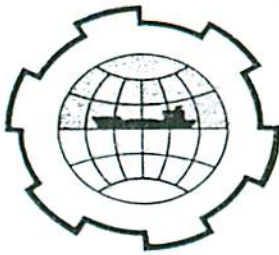


SECOND INTERNATIONAL CONFERENCE ON
PORT AND OCEAN ENGINEERING UNDER ARCTIC CONDITIONS
UNIVERSITY OF ICELAND
DEPARTMENT OF ENGINEERING AND SCIENCE



CORROSION OF MARINE STRUCTURES AT
GODTHAAB, GREENLAND.

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INTRODUCTION.

In the past it has been believed by many that the cold temperatures and the clean water of arctic regions would cause steel corrosion rates to be less than in other regions of the world. To investigate this some corrosion measurements were carried out in 1972 in cooperation with GTO and the Danish Corrosion Institute. The study involved measurements of a steel pile of an existing wharf structure at Godthaab, Greenland, figure 1 and 2.

The pile was located at the front of a wharf structure consisting of a superstructure of reinforced concrete supported on vertical steel piles (DIP 240 mm). The structure was built in 1952.

The mean value for the tidal range at Godthaab is about 3 m and the maximum value is about 6 m. The water depth is about 10 m below mean level. A cross section is shown on figure 3.

THE MEASUREMENTS.

At 6 levels above low water the thickness of the flange was measured.

At level $\div 2.0$, $\div 2.5$, $\div 3.0$, $\div 5.0$, and $\div 7.0$ m a diver cut pieces off the flange. The samples were investigated at the Danish Corrosion Institute.

The results of these investigations are shown on figure 4.

It shall be remarked, that the original thickness of the flange is supposed to have been 17 mm although the specified thickness is 18 mm.

CONCLUSION.

The measurements show that the maximum corrosion occurs at a level $\div 2.0$ m to $\div 2.5$ m, which is 0.5 - 1.0 m below the mean low water level. In this zone the reduction of the flange thickness is up to 8.6 mm. For another pile the maximum reduction at level $\div 2.5$ was measured at 15 mm. Below $\div 2.5$ the corrosion is about 1-2 mm and above level $\div 1.5$ m it is only about 0.5 mm.

The corrosion did not normally occur evenly on the two sides of the flange. For the pile described above, the maximum corrosion from one side was 6.0 mm, corresponding to $\frac{6.0}{20} = 0.30$ mm/year.

For a neighboring pile driven in 1955 the maximum corrosion from one side was measured at 6.45 mm corresponding to $\frac{6.45}{17} = 0.38$ mm/year.

It is evident that the corrosion of steel at Godthaab seems to be at least as severe as under more normal conditions. The investigations therefore did not provide any support for the belief that the arctic conditions would lead to reduced corrosion rates.

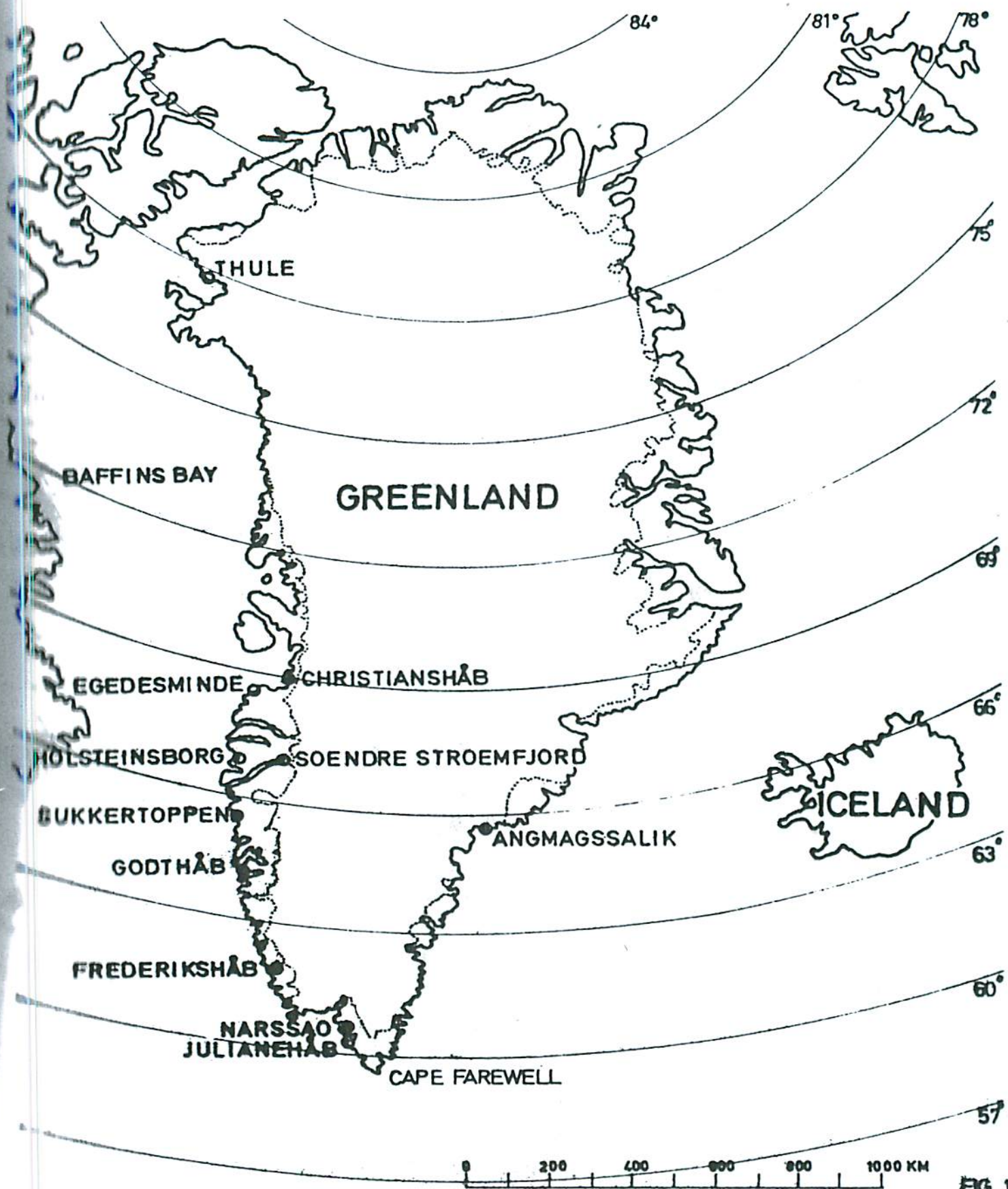


FIG. 1

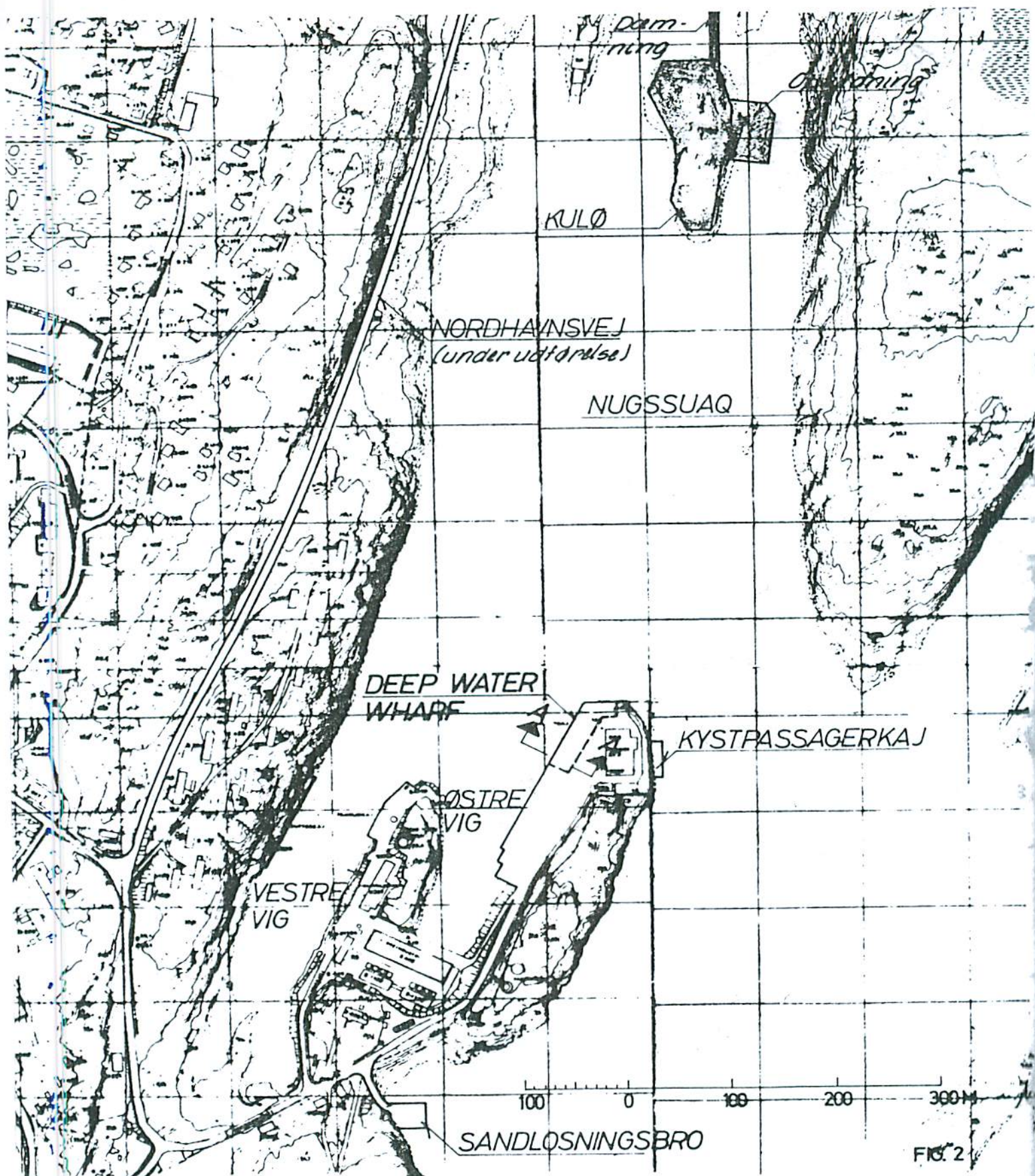


FIG. 2



LEVEL IN METRES

2

1

0

1

2

3

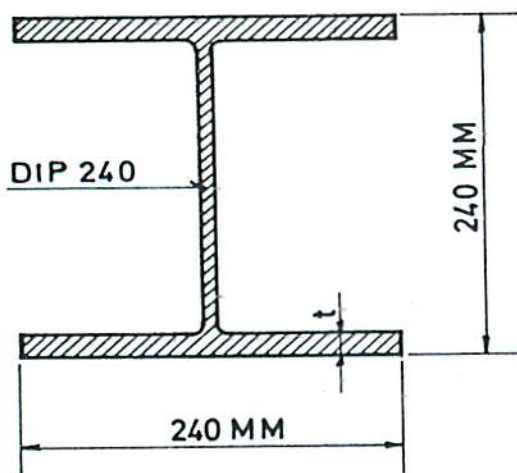
4

5

6

7

0



MEAN WATER LEVEL

MEAN LOW WATER LEVEL

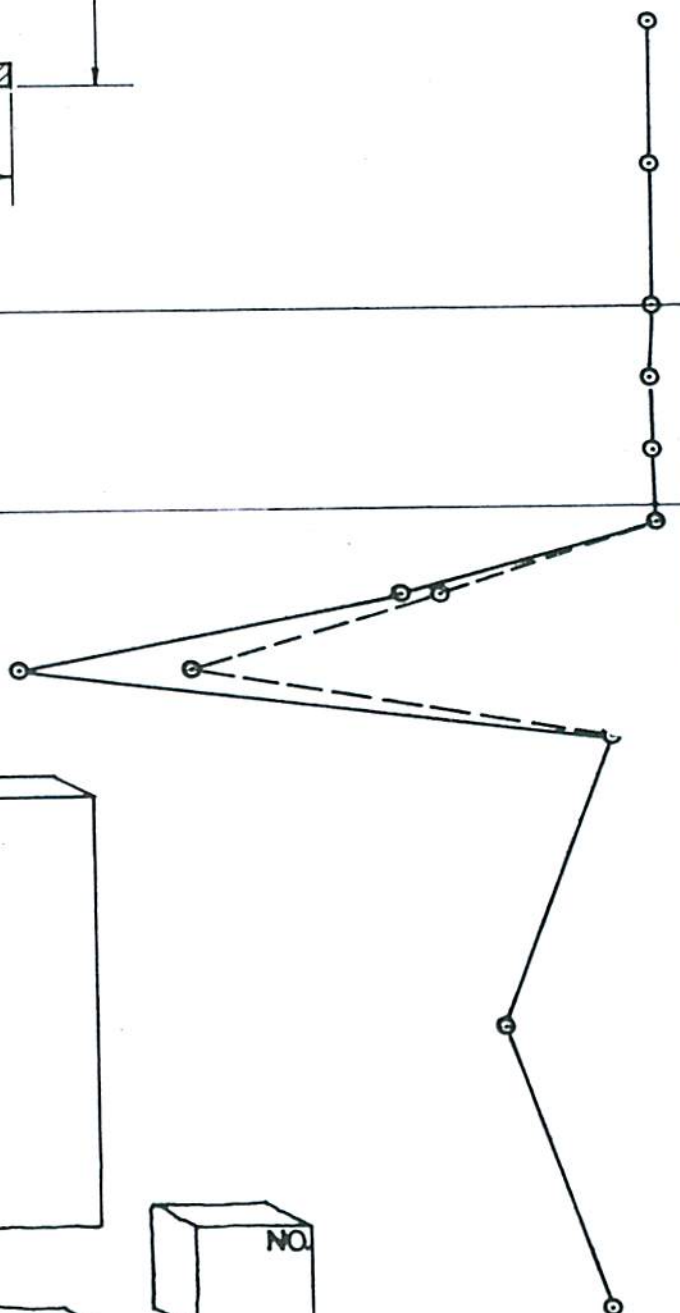
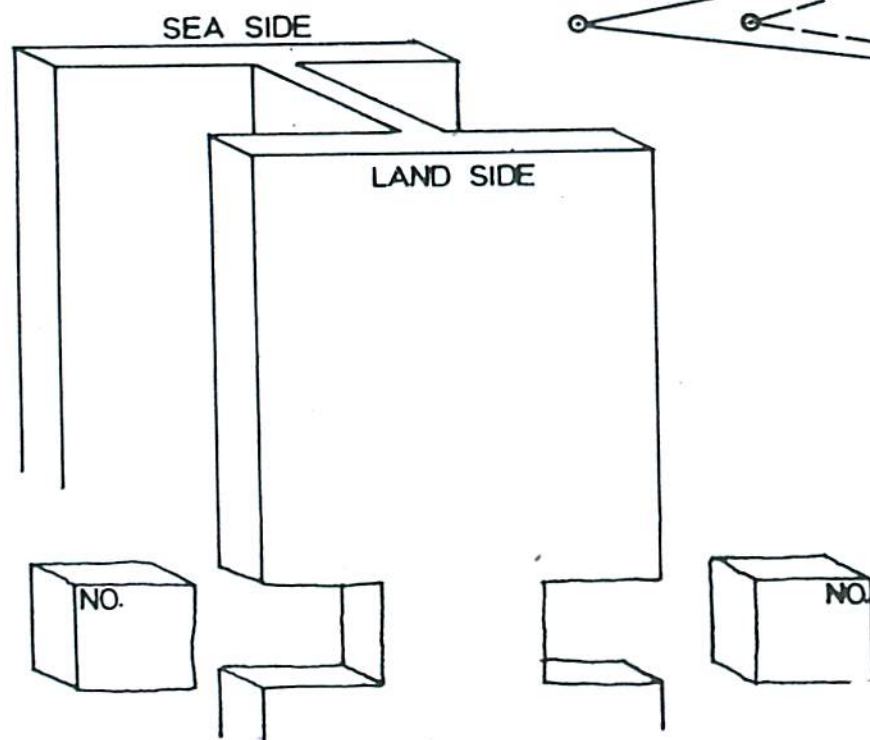


FIG. 4

17 MM t