

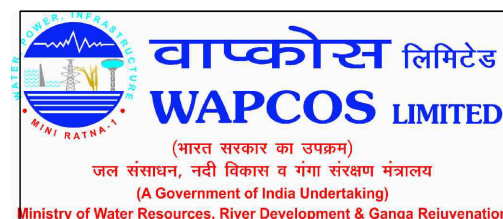
# PROPOSED HARBOUR AT H.DH KULHUDHUFUSHI

## DRAWINGS

MARCH 2018

CLIENT : MINISTRY OF HOUSING AND INFRASTRUCTURE

DESIGN BY





**Major Components :-**

**OFFSHORE:**  
Length of Breakwater : 638m  
Length of Revetment : 481m  
Length of Quay Wall : 473m  
Length of Ramp for : 20m  
Landing Craft

**ONSHORE:**  
Ferry Terminal Building 32 m x 23 m  
Fish Market Building 10 m x 30 m

**Legend :-**

- Coconut Palm
- Hut
- Lamp post
- PSM
- Levels
- Quay wall
- High Water Level (HWL)
- Low Water Level (LWL)
- Breakwater
- Veg Line
- Electric Distribution Box
- Housing Units

**Control Points:**

PSM 0108: Lat: N6°37'25.27"  
Long: E73°03'46.58"  
Orth. Height: 1.450m


PSM 0109: Lat: N6°36'52.21"  
Long: E73°03'56.20"  
Orth. Height: 1.708m

PSM 0110: Lat: N6°37'22.61"  
Long: E73°04'20.78"  
Orth. Height: 1.65m

Kulhudhuffushi Tide Details		
	LAT Datum (m)	MSL Datum (m)
Highest Astronomical Tide (HAT)	+1.25	+0.55
Mean High High Water (MHHW)	+1.00	+0.30
Mean Sea Level (MSL)	+0.73	+0.00
Mean Low Low Water (MLLW)	+0.30	-0.40
Lowest Astronomical Tide (LAT)	+0.00	-0.70


**Note:**  
Soundings (Depth) indicated in the chart w.r.t MSL

**Client:**



**Ministry of Housing and Infrastructure, Maldives**

**Consultant:**



**WAPCOS Limited (India)**

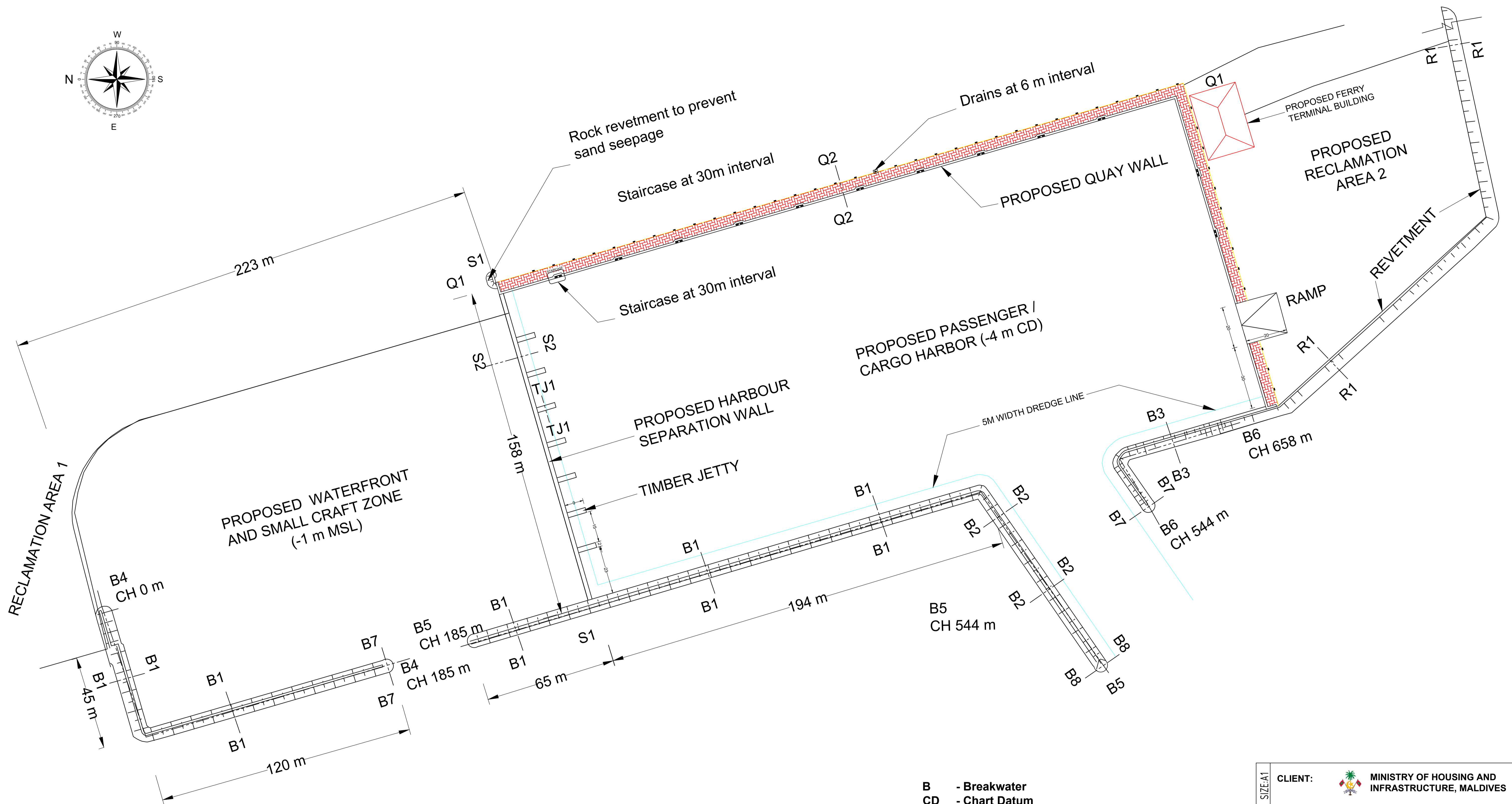
**Plate 1:**

**Kulhudhuffushi Harbour Layout**




**Unit:**

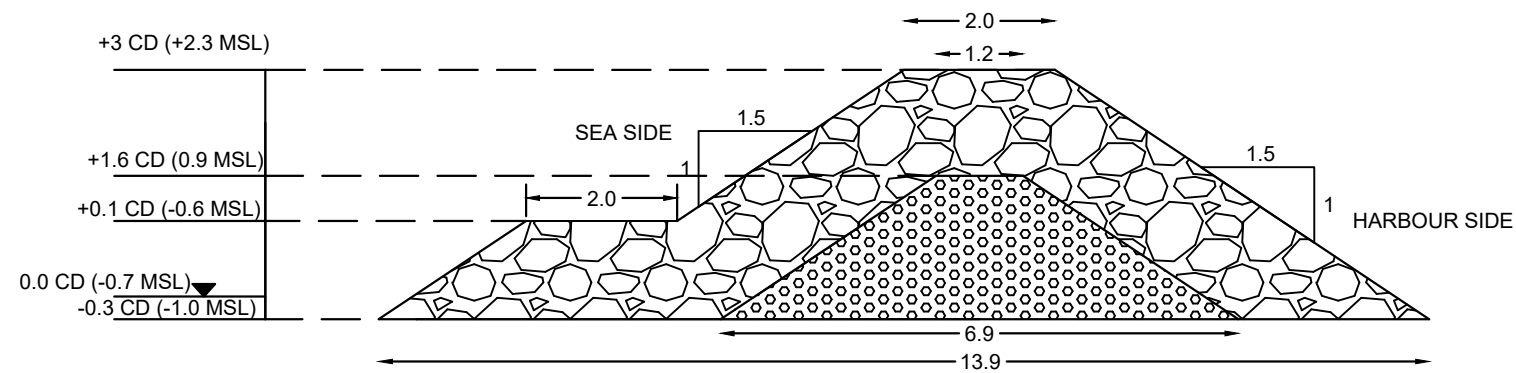
**All Dimensions are in Metre**

**Scale :**  
1 : 1700 (A0)



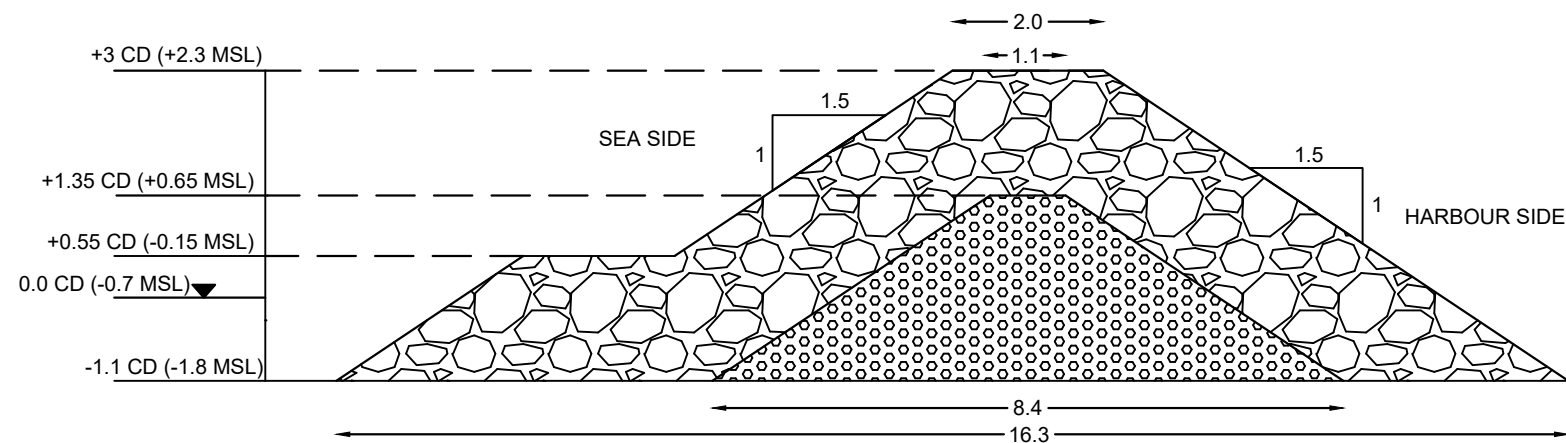
**B - Breakwater**  
**CD - Chart Datum**  
**CH - Chainage**  
**MSL - Mean Sea Level**  
**Q - Quay wall**  
**R - Revetment**  
**S - Separation Wall**  
**TJ - Timber Jetty**

ORIGINAL SIZE A1	<p><b>CLIENT:</b></p>  <p><b>MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES</b></p>
	<p><b>CONSULTANTS:</b></p> <div style="display: flex; align-items: center;">  <p><b>WAPCOS LIMITED, INDIA</b></p> </div>
	<div style="display: flex; align-items: center;">  <p><b>DEPARTMENT OF OCEAN ENGINEERING IIT MADRAS, INDIA.</b></p> </div>
SCALE 1:900	<p><b>PROJECT:</b></p> <p><b>KULHUDHUFFUSHI HARBOUR EXPANSION PROJECT</b></p>
	<p><b>PLATE 2:</b></p> <p><b>GENERAL ARRANGEMENT AND LOCATIONS OF LONGITUDINAL AND CROSS SECTIONS</b></p>



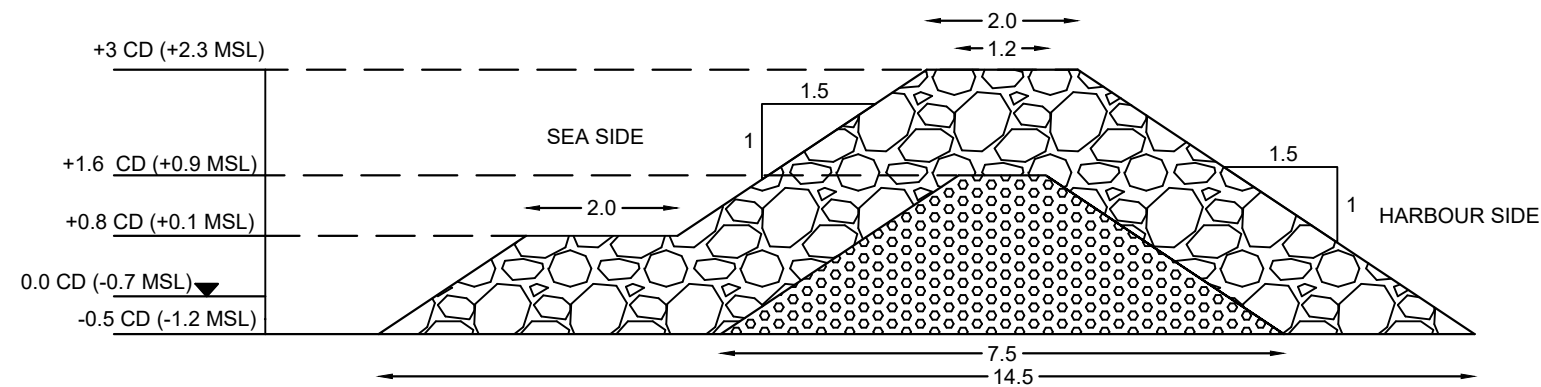
Water Depth -1 m MSL or -0.3 m CD  
CROSS SECTION OF BREAKWATER AT B1 - B1

- Armour layer with 700 kg - 1000 kg stones, of two layer thickness ( 1.4m )
- Core Layer with 30 kg - 150 kg stones.



Water Depth -1.8 m MSL or -1.1 m CD  
CROSS SECTION OF BREAKWATER B2 - B2

- Armour layer with 1300 kg - 1500 kg stones, of two layer thickness (1.65m)
- Core Layer with 30 kg - 150 kg stones.



Water Depth -1.2 m MSL or -0.5 m CD  
CROSS SECTION OF BREAKWATER B3 - B3

- Armour layer with 700 kg - 1000 kg stones, of two layer thickness. (1.4m)
- Core Layer with 30 kg - 150 kg stones.

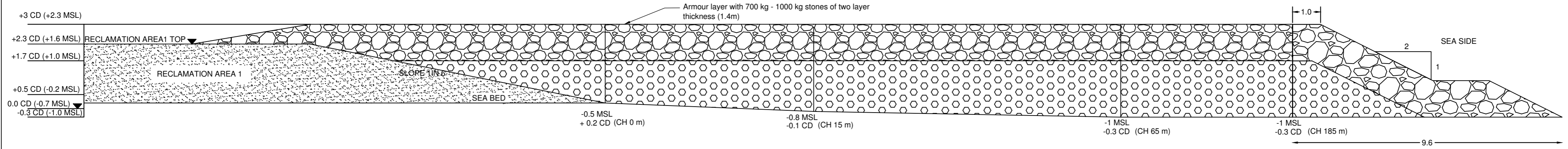
CD - Chart Datum  
MSL - Mean Sea Level

- Notes:-
1. All dimensions are in meters.
  2. This Plate should be read along with Plate 2.
  3. The Quarry stones should be used.
  4. The density of quarry stones should be 2.65 t/m<sup>3</sup>.
  5. Porosity should not be more than 30%.
  6. Bed preparation should be taken care at site.
  7. Armour units are placed randomly.

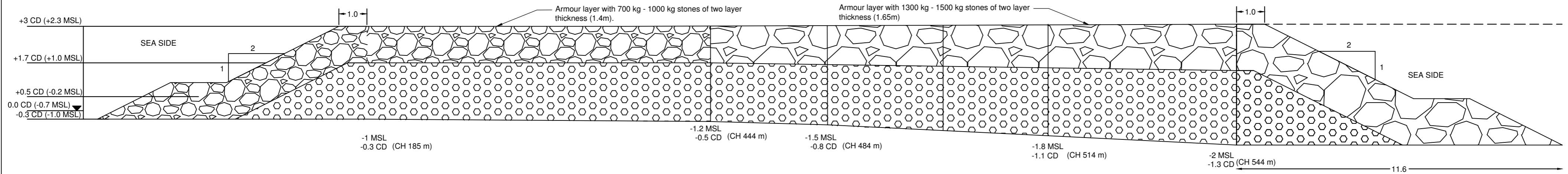
Tide Details:-

1. Highest Astronomical Tide	+1.25 MSL	+0.55 CD
2. Mean High Water Level	+1.00 MSL	+0.30 CD
3. Mean Sea Level	+0.73 MSL	+0.00 CD
4. Mean Low Water	+0.30 MSL	-0.40 CD
5. Lowest Astronomical Tide	+0.00 MSL	-0.70 CD

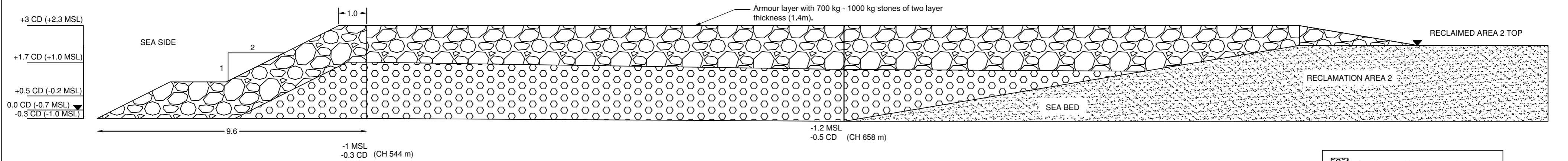
CLIENT:	MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES
CONSULTANTS:	WAPCOS LIMITED, INDIA DEPARTMENT OF OCEAN ENGINEERING IIT MADRAS, INDIA.
PROJECT:	KULHUTHUFFUSHI HARBOUR EXPANSION PROJECT
PLATE 3:	CROSS SECTIONS OF BREAKWATER



B4 - B4 - LONGITUDINAL SECTION OF BREAKWATER TRUNK UPTO 185 m CHAINAGE



B5 - B5 - LONGITUDINAL SECTION OF BREAKWATER TRUNK FROM 185 m TO 544 m CHAINAGE



B6 - B6 - LONGITUDINAL SECTION OF BREAKWATER TRUNK FROM 544 m TO 658 m CHAINAGE

Core Layer with 30 kg - 150 kg stones.




Major Components:-

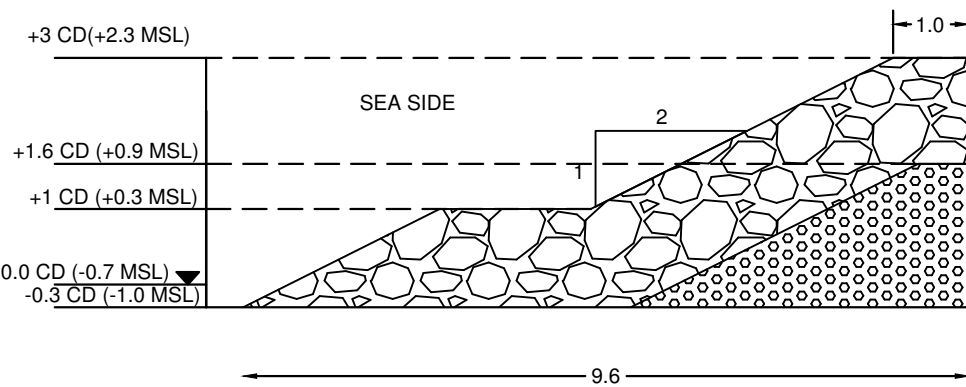
- Length of Breakwater - 658 m
- Length of Revetment - 481 m
- Length of Quay wall - 473 m
- Length of Ramp for loading craft - 20 m

Tide Details:-

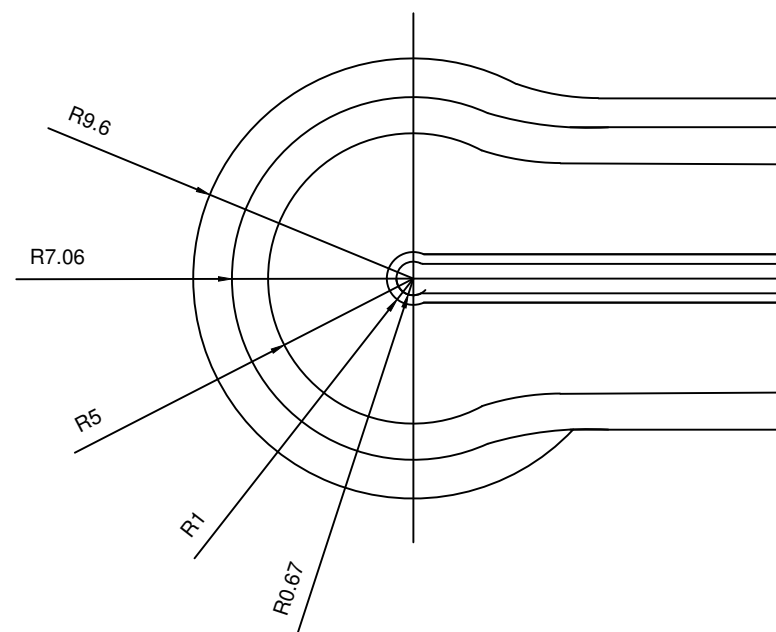
- 1. Highest Astronomical Tide +1.25 MSL +0.55 CD
- 2. Mean High High WaterLevel +1.00 MSL +0.30 CD
- 3. Mean Sea Level +0.73 MSL +0.00 CD
- 4. Mean Low Low Water +0.30 MSL -0.40 CD
- 5. Lowest Astronomical Tide +0.00 MSL -0.70 CD

- B - Breakwater
- CD - Chart Datum
- CH - Chainage
- MSL - Mean Sea Level
- Q - Quay wall
- R - Revetment
- S - Separation Wall
- TJ - Timber Jetty

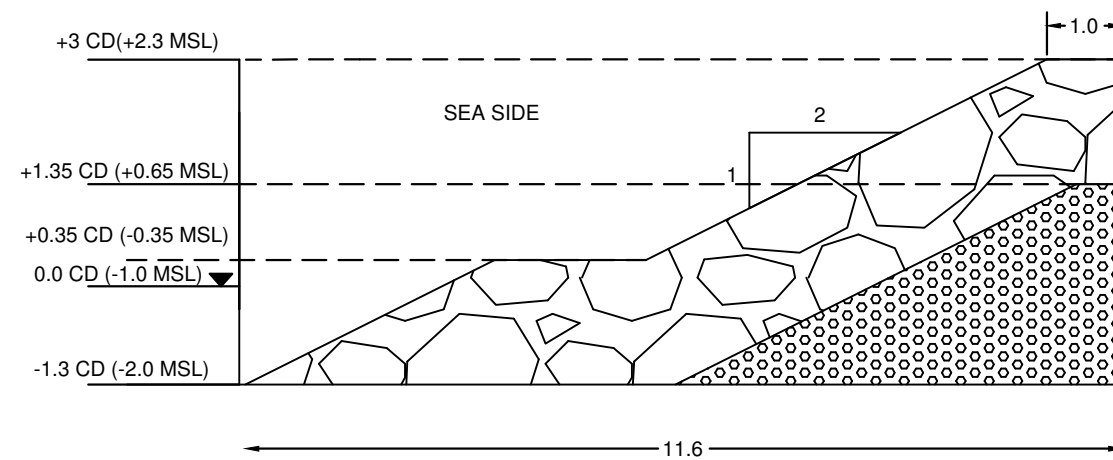
ORIGINAL SIZE A2	CLIENT:	 MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES
	CONSULTANTS:	 WAPCOS LIMITED, INDIA
SCALE 1:100		 DEPARTMENT OF OCEAN ENGINEERING IIT MADRAS, INDIA.
	PROJECT:	KULHUHUFFUSHI HARBOUR EXPANSION PROJECT
	PLATE 4:	LONGITUDINAL SECTIONS OF BREAKWATER



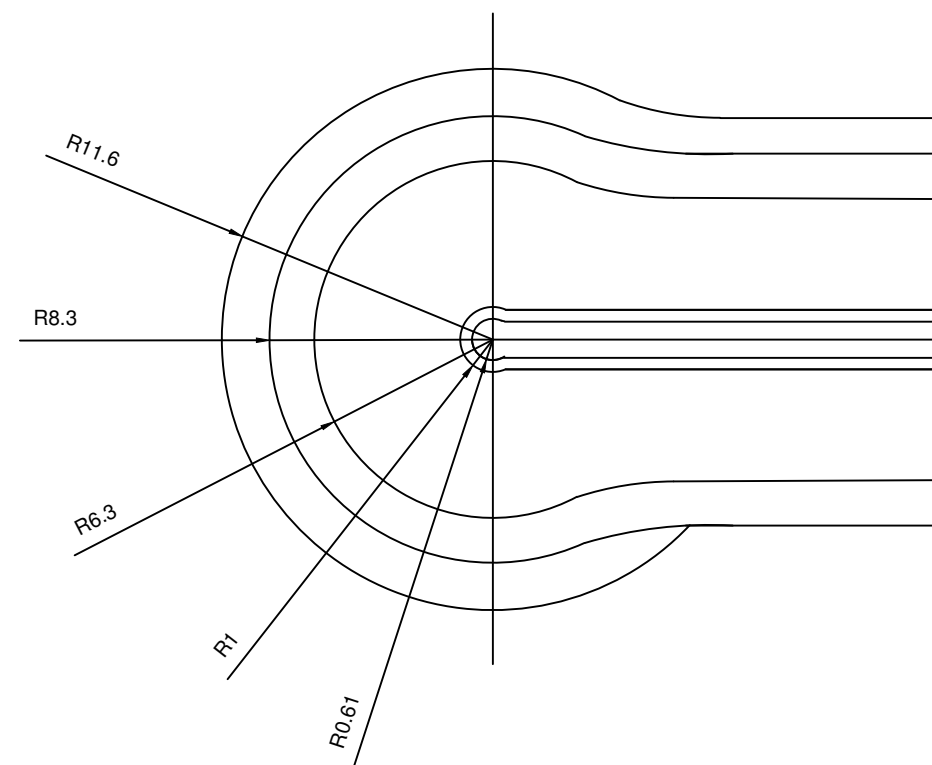
HEAD SECTION OF BREAKWATER AT B7 - B7



PLAN VIEW OF THE HEAD SECTION B-7



HEAD SECTION OF BREAKWATER AT B8 - B8.



PLAN VIEW OF THE HEAD SECTION B-8

- Armour layer with 700kg - 1000 kg stones of two layer thickness (1.4m)
- Armour layer with 1300kg - 1500 kg stones of two layer thickness (1.65)
- Core Layer with 30 kg - 150 kg stones.

CD - Chart Datum  
MSL - Mean Sea Level

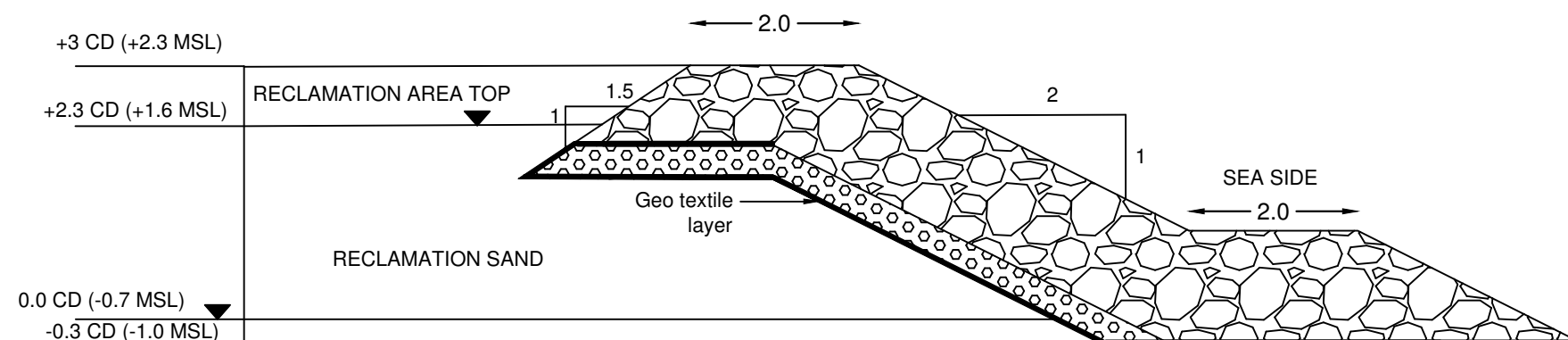
Notes:-

1. All dimensions are in meters.
2. This Plate should be read along with Plate 2.
3. The Quarry stones should be used.
4. The density of quarry stones should be 2.65 t/m<sup>3</sup>.
5. Porosity should not be more than 30%.
6. Bed preparation should be taken care at site.
7. Armour units are placed randomly.

Tide Details:-



- |                              |           |          |
|------------------------------|-----------|----------|
| 1. Highest Astronomical Tide | +1.25 MSL | +0.55 CD |
| 2. Mean High Water Level     | +1.00 MSL | +0.30 CD |
| 3. Mean Sea Level            | +0.73 MSL | +0.00 CD |
| 4. Mean Low Water            | +0.30 MSL | -0.40 CD |
| 5. Lowest Astronomical Tide  | +0.00 MSL | -0.70 CD |

ORIGINAL SIZE: A3 SCALE: 1:100	CLIENT:	MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES
	CONSULTANTS:	WAPCOS LIMITED, INDIA
		DEPARTMENT OF OCEAN ENGINEERING IIT MADRAS, INDIA.
	PROJECT:	KULHUTHUFFUSHI HARBOUR EXPANSION PROJECT
PLATE 5: PLAN AND CROSS SECTIONAL VIEW OF HEAD SECTION		



The Surface should be prepared with negligible projections and voids to be filled. This is to enable the laying of the geo-textile over which the back fill will be done.

CROSS SECTION OF THE REVETMENT AT R1 - R1

-  Armour layer with 700 kg - 1000 kg stones 2 layer thickness (1.4m)
-  Core Layer with 30 kg - 150 kg stones.

CD - Chart Datum  
MSL - Mean Sea Level

**Notes:-**

1. All dimensions are in meters.
2. This Plate should be read along with Plate 2.
3. The Quarry stones should be used.
4. The density of quarry stones should be 2.65 t/m<sup>3</sup>.
5. Porosity should not be more than 30%.
6. Bed preparation should be taken care at site.
7. Armour units are placed randomly.

**Tide Details:-**

- |                              |           |          |
|------------------------------|-----------|----------|
| 1. Highest Astronomical Tide | +1.25 MSL | +0.55 CD |
| 2. Mean High Water Level     | +1.00 MSL | +0.30 CD |
| 3. Mean Sea Level            | +0.73 MSL | +0.00 CD |
| 4. Mean Low Water            | +0.30 MSL | -0.40 CD |
| 5. Lowest Astronomical Tide  | +0.00 MSL | -0.70 CD |

ORIGINAL SIZE: A3  
SCALE: 1:80

CLIENT:  MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES

CONSULTANTS:  WAPCOS LIMITED, INDIA

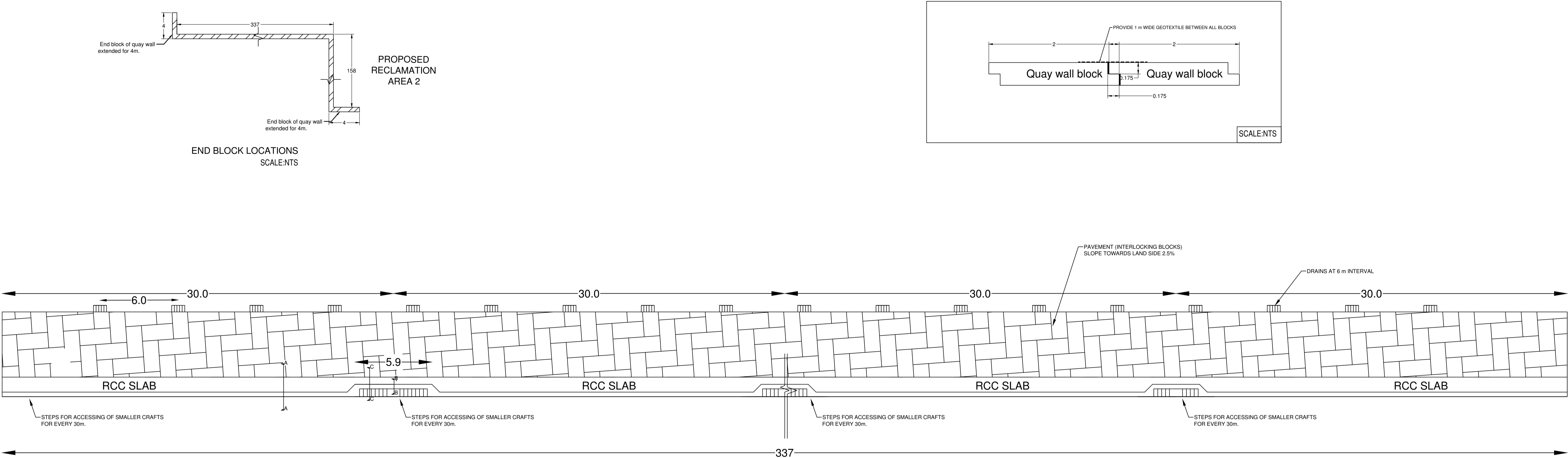


DEPARTMENT OF OCEAN ENGINEERING  
IIT MADRAS, INDIA.

PROJECT:  
KULHUDHUFFUSHI HARBOUR EXPANSION PROJECT

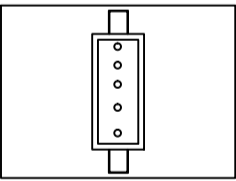
PLATE 6:  
CROSS SECTIONS OF REVETMENTS

B

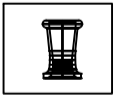


PLAN VIEW OF QUAY WALL

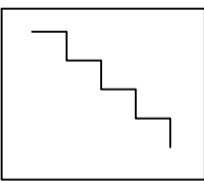
- Notes:-**
1. All dimensions are in meters.
  2. This Plate should be read along with Plate 2.
  3. Net safe bearing capacity of soil = 100 kN/m<sup>2</sup> at the founding level.
  4. N value at founding level is 12.
  5. Grade of steel shall be of B500A conforming to BS 4449.
  6. Grade of concrete shall be C40 conforming to BS 5328 PART 1 -1997.
  7. Lap and development length for C40 shall be 40 times the diameter of bar.
  8. Type of cement shall be of Port Land Cement confirming to BS 12



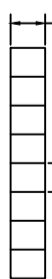
3 numbers of Arch fender MP 300 for every 30m @ 10m c/c.



4 numbers of 15 ton capacity Single Bitt bollards for every 30m @ 10m c/c.



STEPS FOR ACCESSING SMALLER CRAFTS FOR EVERY 30M.



Rise = 0.25m

Tread = 0.3m

Number of steps = 8

CD - Chart Datum  
MSL - Mean Sea Level

- Tide Details:-**
- |                               |           |          |
|-------------------------------|-----------|----------|
| 1. Highest Astronomical Tide  | +1.25 MSL | +0.55 CD |
| 2. Mean High High water level | +1.00 MSL | +0.30 CD |
| 3. Mean Sea Level             | +0.73 MSL | +0.00 CD |
| 4. Mean Low Low Water         | +0.30 MSL | -0.40 CD |
| 5. Lowest Astronomical Tide   | +0.00 MSL | -0.70CD  |

ORIGINAL SIZE A1	CLIENT:  MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES
	CONSULTANTS:  WAPCOS LIMITED, INDIA
SCALE 1:150	DEPARTMENT OF OCEAN ENGINEERING IIT MADRAS, INDIA.
	PROJECT: KULHUDHUFFUSHI HARBOUR EXPANSION PROJECT
PLATE 7: GENERAL VIEW OF QUAY WALL	



SECTION A-A (REFER PLATE 7)



CORNER QUAY WALL BLOCK

**Notes:-**




1. All dimensions are in meters.
2. This Plate should be read along with Plate 2 AND 7.
3. Net safe bearing capacity of soil =  $100 \text{ kN/m}^2$  at the founding level.
4. N value at founding level is 12.
5. Grade of steel shall be of B500A conforming to BS 4449.
6. Grade of concrete shall be C40 conforming to BS 5328 PART 1 -1997.
7. Lap and development length for C 40 shall be 40 times the diameter of bar.
8. Type of cement shall be of Port Land Cement conforming to BS 12
9. Water from drain pipe is drained into sea using PVC pipe as shown in cross section.

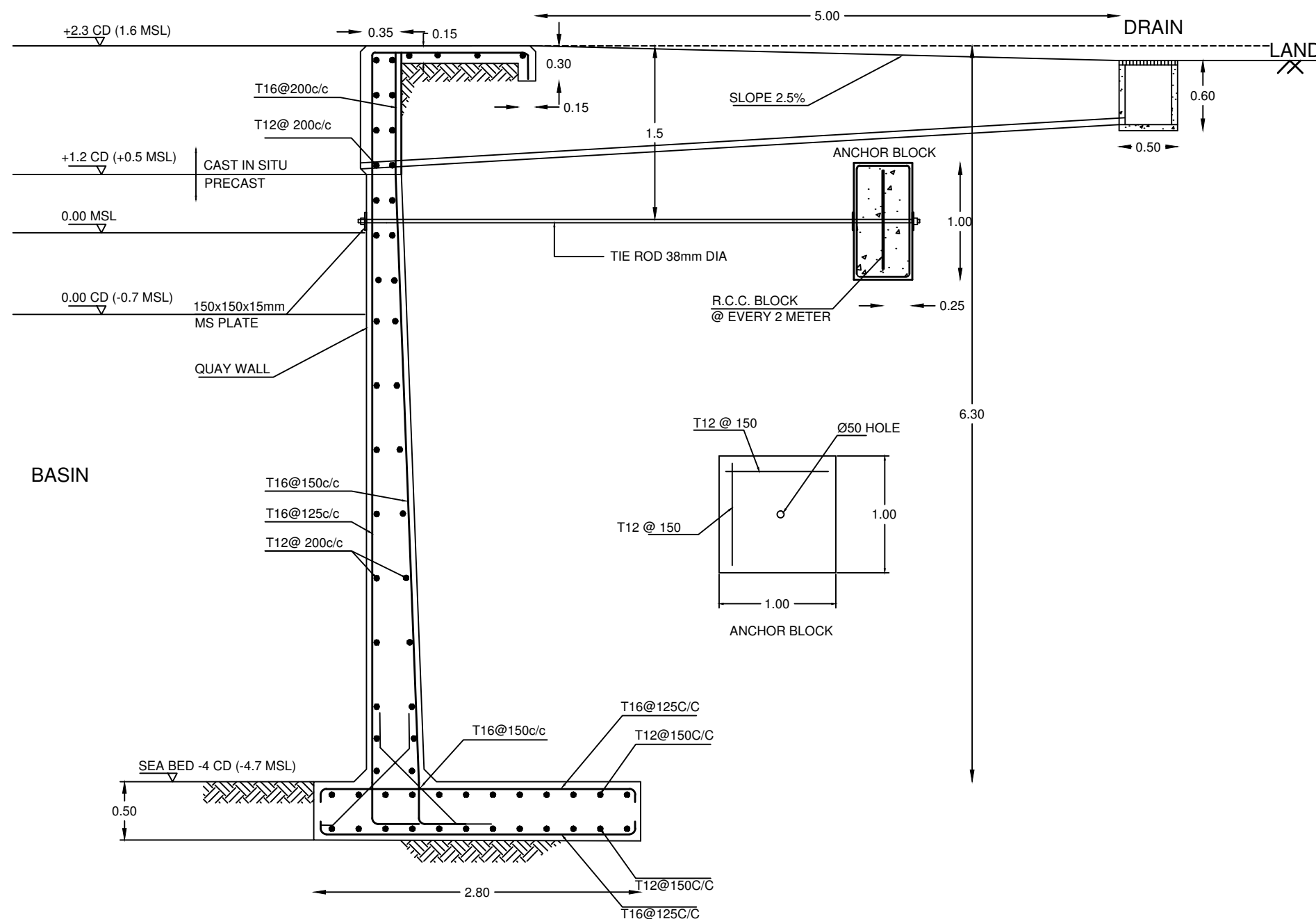
CD - Chart Datum  
MSL - Mean Sea Level



**Tide Details:-**

- |                               |           |          |
|-------------------------------|-----------|----------|
| 1. Highest Astronomical Tide  | +1.25 MSL | +0.55 CD |
| 2. Mean High High water level | +1.00 MSL | +0.30 CD |
| 3. Mean Sea Level             | +0.73 MSL | +0.00 CD |
| 4. Mean Low Low Water         | +0.30 MSL | -0.40 CD |
| 5. Lowest Astronomical Tide   | +0.00 MSL | -0.70 CD |

ORIGINAL SIZE A3	<p><b>CLIENT:</b></p>  <p><b>MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES</b></p>
	<p><b>CONSULTANTS:</b></p>  <p><b>WAPCOS LIMITED, INDIA</b></p>
	<p> <b>DEPARTMENT OF OCEAN ENGINEERING IIT MADRAS, INDIA.</b></p>
SCALE 1:65	<p><b>PROJECT:</b></p> <p><b>KULHUDHUFFUSHI HARBOUR EXPANSION PROJECT</b></p>
	<p><b>PLATE 8:</b></p> <p><b>PLAN AND CROSS SECTION OF QUAY WALL</b></p>



REINFORCEMENT DETAILING OF QUAY WALL PANEL AT NON-STAIR CASE POSITION

RC DETAILS OF SECTION A-A ( REFER PLATE 7)

**Notes:-**

1. All dimensions are in meters.
2. This Plate should be read along with Plate 2 AND 7.
3. Net safe bearing capacity of soil = 100 kN/m<sup>2</sup> at the founding level.
4. N value at founding level is 12.
5. Grade of steel shall be of B500A conforming to BS 4449.
6. Grade of concrete shall be C40 conforming to BS 5328 PART 1 -1997.
7. Lap and development length for C 40 shall be 40 times the diameter of bar.
8. Type of cement shall be of Port Land Cement conforming to BS 12
9. Water from drain pipe is drained into sea using PVC pipe as shown in cross section.

CD - Chart Datum  
MSL - Mean Sea Level

**Tide Details:-**

1. Highest Astronomical Tide +1.25 MSL +0.55 CD
2. Mean High High water level +1.00 MSL +0.30 CD
3. Mean Sea Level +0.73 MSL +0.00 CD
4. Mean Low Low Water +0.30 MSL -0.40 CD
5. Lowest Astronomical Tide +0.00 MSL -0.70 CD

ORIGINAL SIZE: A3  
SCALE 1:45

CLIENT:  MINISTRY OF HOUSING AND INFRASTRUCTURE, MALDIVES

CONSULTANTS:  WAPCOS LIMITED, INDIA



DEPARTMENT OF OCEAN ENGINEERING  
IIT MADRAS, INDIA.

PROJECT:  
KULHUDHUFFUSHI HARBOUR EXPANSION PROJECT

PLATE 9:  
RC DETAILS OF QUAY WALL