

# ACBM - ARTICULATED CONCRETE BLOCK MATTRESS

## Description

The Articulated Concrete Block Mattress (ACBM) is a rectangular unit made of concrete blocks joined together by polypropylene ropes. The ACBM is flexible along two dimensions and is available in different dimensions and thicknesses to suit client requirements. The ACBM is specifically designed to ballast and protect underwater pipelines and electric cables, and to protect structure foundations against scouring generated by currents and waves.

ACBM has been tested in accordance with Det Norske Veritas DNV-RP-F107 and certified to withstand up to 40 kJ impact energy of falling objects.

## Manufacturing

The ACBM formwork is a modular system that can be shipped where needed enabling mattresses to be cast as close as possible to the project or launch site.

The concrete used within ACBMs is XS2 exposure class, 35 - 45 N/mm<sup>2</sup> resistance class, S3 consistency class, water/cement ratio of 0.45, and a density of 2400kg/m<sup>3</sup>. The blocks are connected to each other by polypropylene ropes in order to provide a high degree of flexibility in both directions. Rope loops are located at the edges of the ACBM to facilitate lifting operations. A specifically designed lifting frame is used to demould and stock the ACBMs.

## Installation

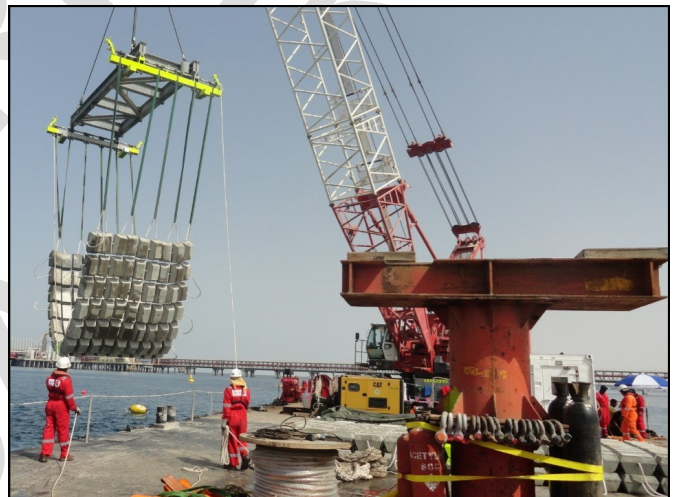
Maccaferri has designed, manufactured and tested a specific ROV-friendly automatic lifting frame for ACBM installation. A manual lifting frame has to be used to handle the ACBM from the storage area to the barge/pontoon, whereas an automatic lifting frame has to be used from the barge/pontoon to the final destination (pipeline or electric cable etc).

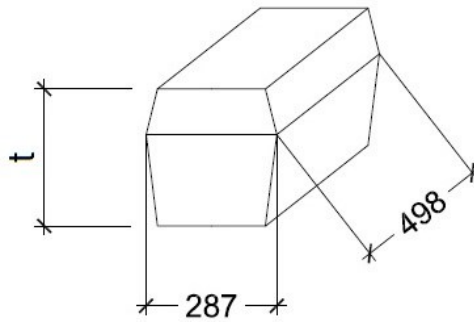
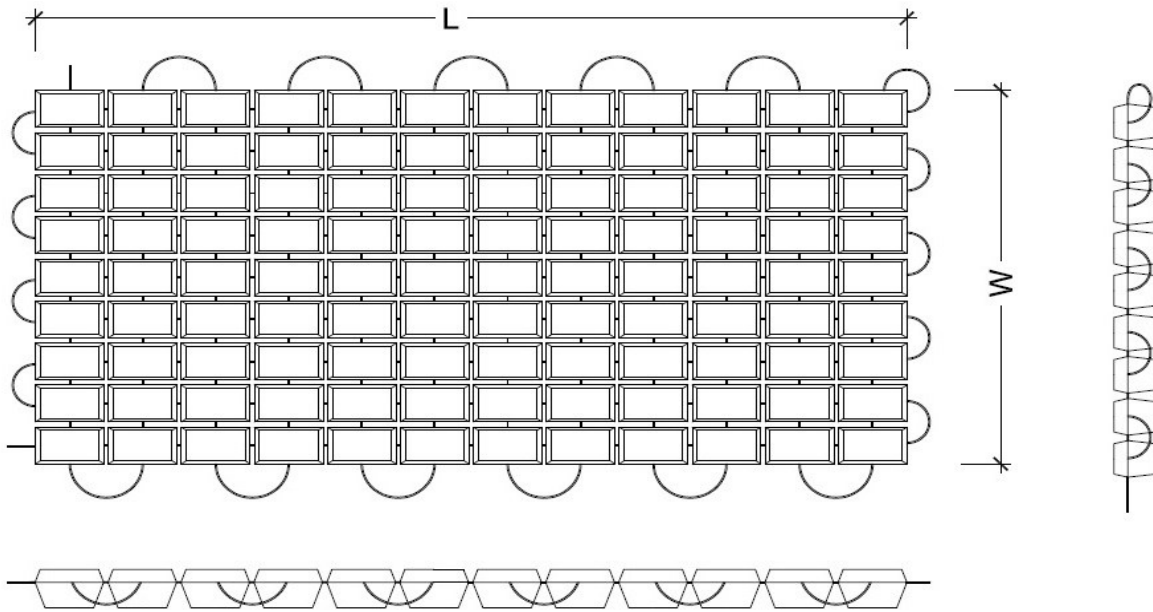
For deep water applications, when the ACBM is above the designed final position, the ROV strikes a target mounted on the frame which activates the frame release system. This releases the ACBM into its final position.

The rope diameter ensures a safety factor of 7 during lifting operations according to ISO.

## Dimensions

ACBMs can be manufactured and supplied with different dimensions. The ACBM length, width and thickness can be defined according to the project requirements. Some variations/tolerance on the theoretical dimensions can be expected: length and width tolerances are in the range of 0/+50% of ACBM thickness, whilst thickness tolerance is  $\pm 25$  mm.





W (m)	1.93				2.26				2.59				2.92				3.25				3.58				3.91				
	0.15	0.20	0.25	0.30	0.15	0.20	0.25	0.30	0.15	0.20	0.25	0.30	0.15	0.20	0.25	0.30	0.15	0.20	0.25	0.30	0.15	0.20	0.25	0.30	0.15	0.20	0.25	0.30	
	Weight in air (t)																												
L (m)	3.14	1.5	1.9	2.4	2.7	1.7	2.3	2.8	3.2	2.0	2.6	3.2	3.6	2.2	2.9	3.6	4.1	2.5	3.3	4.0	4.6	2.7	3.6	4.4	5.0	3.0	3.9	4.8	5.5
	3.67	1.7	2.3	2.8	3.2	2.0	2.7	3.3	3.7	2.3	3.0	3.7	4.3	2.6	3.4	4.2	4.8	2.9	3.8	4.7	5.3	3.2	4.2	5.2	5.9	3.5	4.6	5.6	6.4
	4.20	2.0	2.6	3.2	3.6	2.3	3.0	3.7	4.3	2.6	3.5	4.3	4.9	3.0	3.9	4.8	5.5	3.3	4.4	5.4	6.1	3.6	4.8	5.9	6.7	4.0	5.2	6.4	7.3
	4.73	2.2	2.9	3.6	4.1	2.6	3.4	4.2	4.8	3.0	3.9	4.8	5.5	3.3	4.4	5.4	6.2	3.7	4.9	6.0	6.9	4.1	5.4	6.7	7.6	4.5	5.9	7.3	8.3
	5.26	2.5	3.3	4.0	4.6	2.9	3.8	4.7	5.3	3.3	4.4	5.4	6.1	3.7	4.9	6.0	6.9	4.1	5.5	6.7	7.7	4.5	6.0	7.4	8.4	5.0	6.6	8.1	9.2
	5.79	2.7	3.6	4.4	5.0	3.2	4.2	5.2	5.9	3.6	4.8	5.9	6.7	4.1	5.4	6.7	7.6	4.5	6.0	7.4	8.4	5.0	6.6	8.1	9.3	5.5	7.2	8.9	10.1
	6.32	3.0	3.9	4.8	5.5	3.5	4.6	5.6	6.4	4.0	5.2	6.4	7.3	4.5	5.9	7.3	8.3	5.0	6.6	8.1	9.2	5.5	7.2	8.9	10.1	6.0	7.9	9.7	11.0
	6.85	3.2	4.3	5.2	6.0	3.8	5.0	6.1	7.0	4.3	5.7	7.0	8.0	4.8	6.4	7.9	9.0	5.4	7.1	8.7	10.0	5.9	7.8	9.6	11.0	6.5	8.6	10.5	12.0
	7.38	3.5	4.6	5.6	6.4	4.0	5.4	6.6	7.5	4.6	6.1	7.5	8.6	5.2	6.9	8.5	9.7	5.8	7.7	9.4	10.7	6.4	8.5	10.4	11.8	7.0	9.2	11.3	12.9
	7.91	3.7	4.9	6.0	6.9	4.3	5.7	7.1	8.0	5.0	6.6	8.1	9.2	5.6	7.4	9.1	10.4	6.2	8.2	10.1	11.5	6.8	9.1	11.1	12.7	7.5	9.9	12.1	13.8
	8.44	4.0	5.2	6.4	7.3	4.6	6.1	7.5	8.6	5.3	7.0	8.6	9.8	6.0	7.9	9.7	11.0	6.6	8.8	10.8	12.3	7.3	9.7	11.9	13.5	8.0	10.5	12.9	14.7
	8.97	4.2	5.6	6.9	7.8	4.9	6.5	8.0	9.1	5.6	7.5	9.2	10.4	6.3	8.4	10.3	11.7	7.0	9.3	11.5	13.0	7.8	10.3	12.6	14.4	8.5	11.2	13.8	15.7
9.50	4.5	5.9	7.3	8.3	5.2	6.9	8.5	9.7	6.0	7.9	9.7	11.0	6.7	8.9	10.9	12.4	7.5	9.9	12.1	13.8	8.2	10.9	13.4	15.2	9.0	11.9	14.6	16.6	
10.03	4.7	6.2	7.7	8.7	5.5	7.3	9.0	10.2	6.3	8.3	10.2	11.7	7.1	9.4	11.5	13.1	7.9	10.4	12.8	14.6	8.7	11.5	14.1	16.1	9.5	12.5	15.4	17.5	

The sizes in the shaded area are available but are only manufactured on request and are uneconomical unless manufactured in large quantities.

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