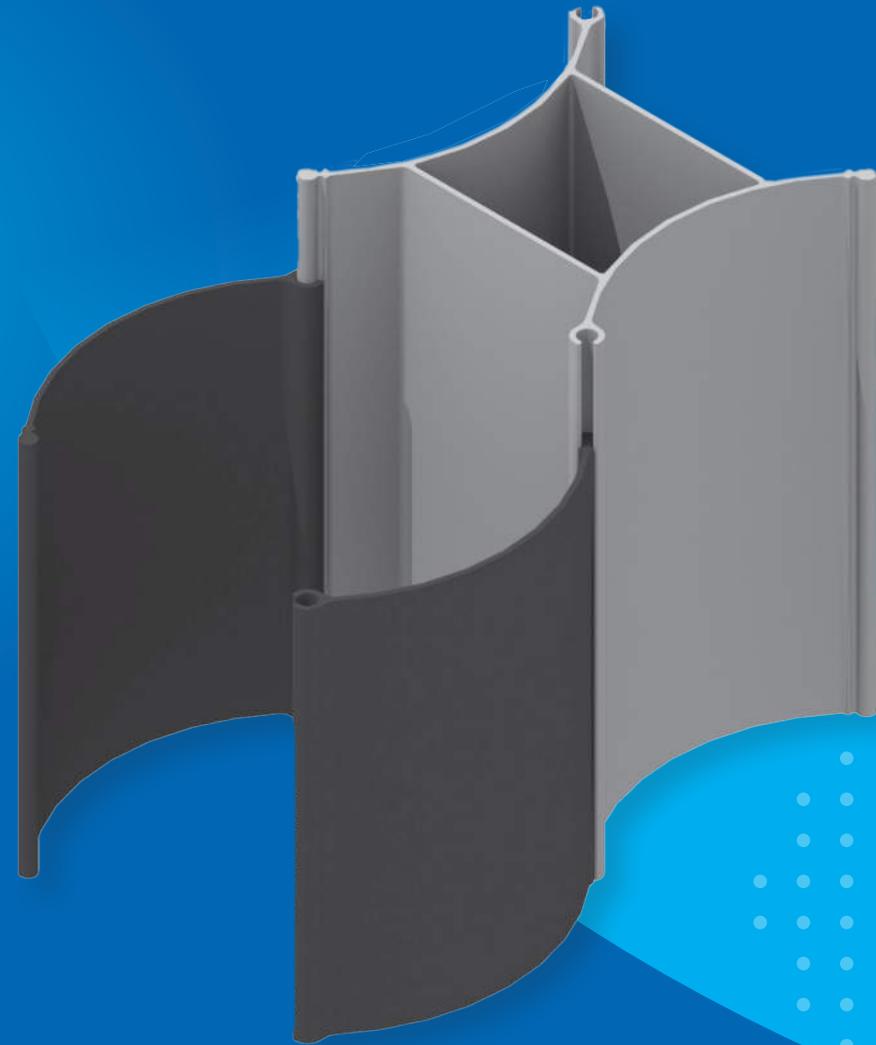




COMBILOC™ HAS BEEN
DEVELOPED AS A SOLUTION
FOR THE MARINE & CIVIL
CONSTRUCTION AND
GEOTECHNICAL INDUSTRIES.



www.combiloc.com





CombiLoc™ Introduction

CombiLoc™ is a Patented Ground Engineering System. **CombiLoc's** unique 3D modular cellular confinement and retention system is a solution provider for rising seas, coastal erosion, and Civil & Marine Construction projects. **CombiLoc™** is a New Zealand innovation inspired by an ideology of collaborating with the natural environment to create efficient eco-friendly robust coastal structures.

CombiLoc™ Brief Description

CombiLoc's three dimensional vinyl honeycomb system is comprised of unique structural elements that can be installed in various combinations according to specific design requirements. The individual **CombiLoc™** elements are installed vertically by connecting each panel in its designed arrangement, driving the elements to form cellular interconnecting structures. Once installed the assembled subterranean structure confines the insitu soils which may include cohesionless soils, unifying those soils to perform as robust ground engineering solutions. The confined soils contribute to the overall performance of the **CombiLoc™** Structure. Various standard structural columns can also be installed into the **CombiLoc™** cells and element enclosures to create hybrid structures.



CombiLoc™ Material Options

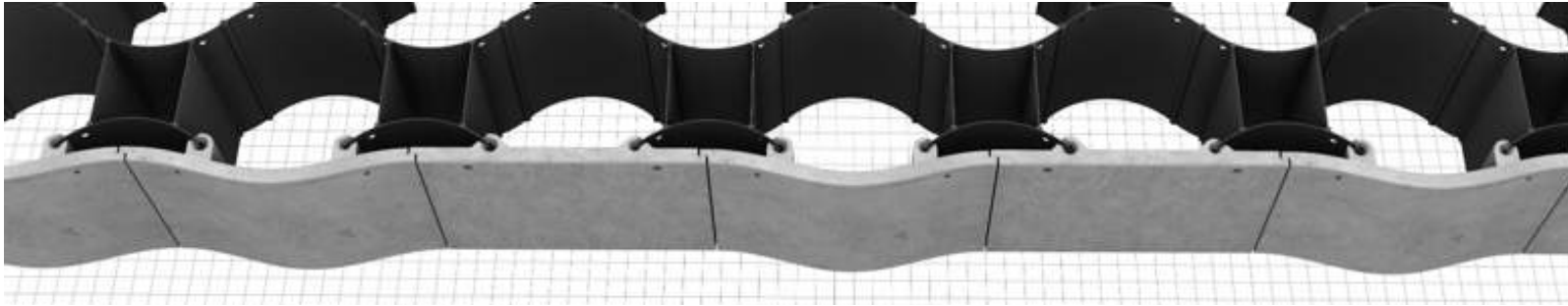
CombiLoc™ is offered in UV stable Vinyl PVC or FRP (Fibre Reinforced Polymer), and can also be supplied in Reinforced Concrete block or panel options dependent upon design requirements and end use. **CombiLoc™** Vinyl Panels can be connected to **CombiLoc™** Reinforced Concrete Panels where specific design aesthetics are required.

Other Benefits

- Can be installed in various arrangements to follow natural contours and curvatures.
- Can be supplied in various colour schemes.
- Can be used as retaining, cellular confinement, or gravity block.
- Can be used as contaminated soil encapsulation.
- Can be used a temporary turnkey marine structure.
- Can be Driven or Jetted.



CombiLoc™ Trial Installation



Precision Flat-packed Elements

CombiLoc™ Flat-pack technology provides significant savings on transportation with minimal impact to the environment. Specialist automated equipment has been developed to assemble the elements into the designed finished Link-Panels. The T-Joints connecting the curve flange and the straight panel are tight fitting and are winched into position during the assembly process. The automated assembly line is inexpensive to operate with low labour costs. Inventory and storage area can be planned and operated efficiently with some of the same crew and the installation staff with very low impact to production.



CombiLoc™ Flat-pack technology



CombiLoc™ Assembled Lightweight FRP Link-Panels

CombiLoc™ Advantages

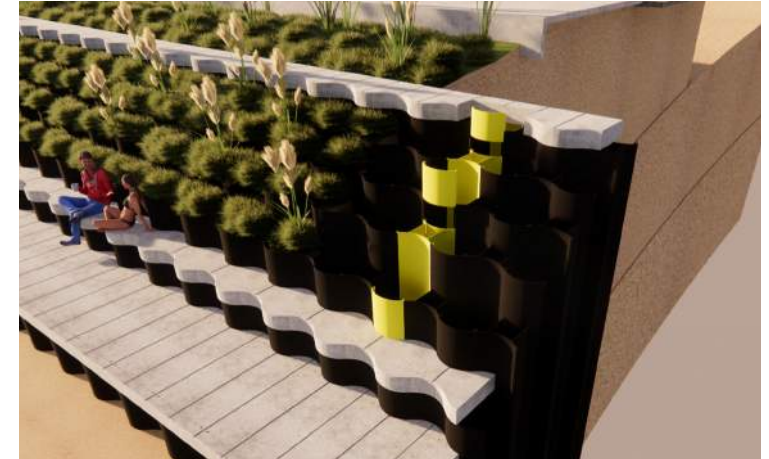
- + Environmentally sustainable recycled PVC and can be recycled over and over again.
- + 100% Environmentally friendly. Does not leach, breakdown, or corrode.
- + 100 year lifetime – Resistant to Corrosion and UV Stabilized.
- + Cost Competitive value for money system which can be utilized in many combinations and applications.
- + Impacts Resistant.
- + No maintenance.
- + Lightweight, easy to handle. Can be installed using lightweight jetting or driving machinery



Precision, Quick & Safe Installation

CombiLoc™ Proprietary installation technology has been developed by experienced marine and heavy industry piling specialists. The semi-automated plant including staging jigs and lifting equipment has been adapted in several configurations for varying ground conditions and environments. Jigs are provided with self-leveling and auto-positioning gates.

All panels are installed accurately from the first panel to the last. Pile drivers, jetting units, and mandrel options are all provided as custom equipment which can be adapted to varying applications and environments.



CombiLoc™ Applications

- + Seawall Solution for eroding coastlines.
- + Reinforcement and height increase of embankment walls.
- + Bulkhead wall and ground improvement solution.
- + Repair of embankments for rivers, streams, lakes, reservoirs etc.
- + Marina Wall & Breakwater solution.
- + Reclamation solution for rising seas and dredge spoil containment.
- + Structural footprint solution for artificial lakes and causeways.
- + Containment and Foundation system for tank farms.
- + Green living wall and active structure solution.





CombiLoc™ Environmental Advantage

CombiLoc™, the sustainable solution for coastal erosion protection including Seawalls, Breakwaters, and other marine assets. Our revolutionary construction methodology offers not only superior structural integrity, but also a significant reduction in carbon emissions.

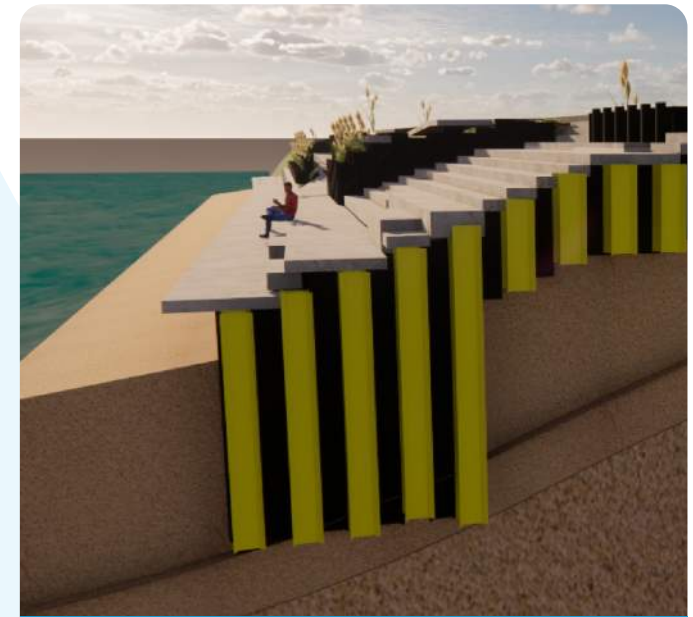
When compared to traditional building materials, **CombiLoc™** stands out as the clear choice for environmentally conscious builders. Medium Density Structural Steel and Standard Mix Concrete emit 1334.2 and 1636.25 kgCO₂e/m³ respectively, while Reinforced Concrete emits 1500.37 kgCO₂e/m³. **CombiLoc™**, on the other hand, has a carbon emission equivalent of only 477.54 kgCO₂e/m³. That's over 70% less carbon emissions than Reinforced Concrete and over 70% less than Medium Density Structural Steel.

KgCO₂e Case (Precast Post & Panel Seawall v CombiLoc Terraced Seawall)

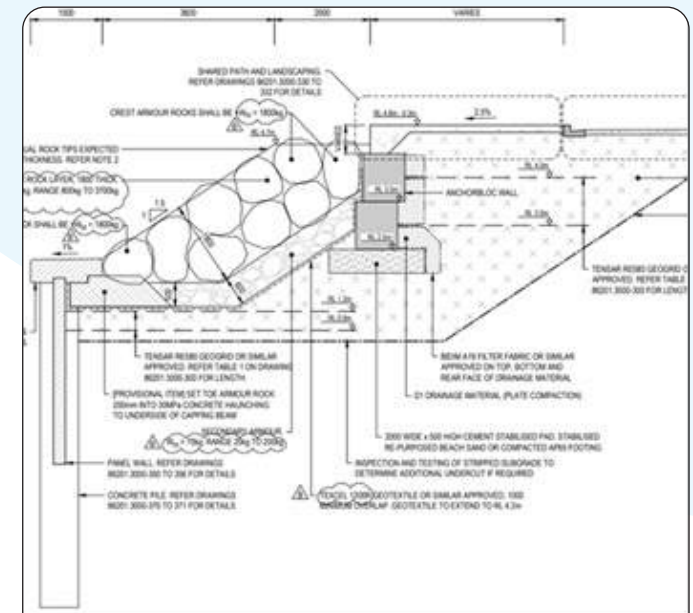
WALL TYPE	M3/ MTR WALL	KGCO ₂ E/M ³	TOTAL KGCO ₂ E/M WALL
Precast King Post & Panel Seawall (excl Rip Rap)	3.85	1537	5,911.05
CombiLoc™ Terraced Seawall	0.57	477.54	270.38
Total kgCO₂e Reduction			-95%

Not only does **CombiLoc™** reduce carbon emissions, it also offers superior strength and durability for coastal erosion protection. Our unique combination of materials and construction techniques ensures that your coastal structures will stand strong for years to come.

So why settle for traditional building materials with high carbon emissions? Choose **CombiLoc™** for a sustainable and effective solution to coastal erosion protection.



CombiLoc™ Terraced Seawall



Precast Post & Panel Seawall with RipRap



CombiLoc™ Environmental Outcomes by Design

Applying comprehensive engineering analysis comparisons were performed modeling several **CombiLoc™** cases against already designed steel and concrete structures. Analysis was carried out applying the same geotechnical conditions and peak cyclone wave loads.

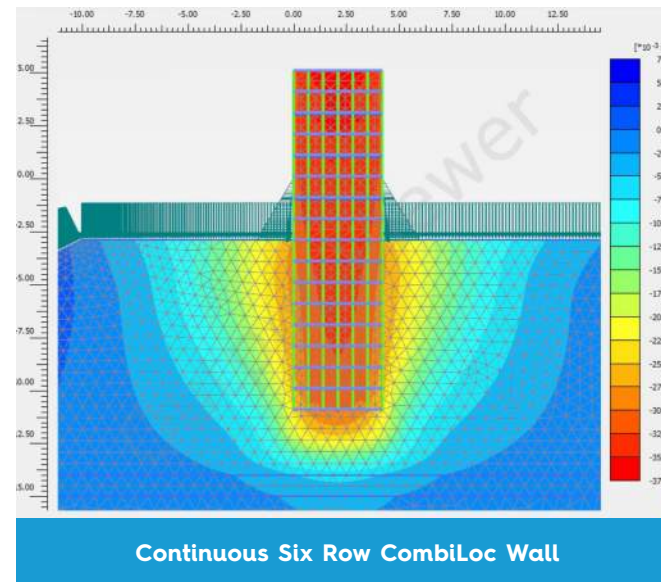
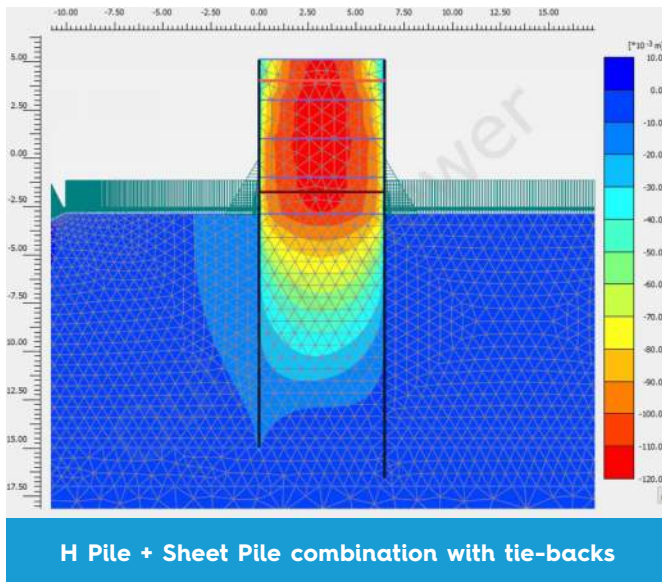
The below samples showcase noticeable differences to depth and width of walls when comparing double tie-back Steel King Pile with sheet pile inflill “combi-wall” versus a continuous **CombiLoc™** wall.

Settlement Analysis of Breakwater Wall Design Cases

Performance was analysed and measure for two design cases. The conforming wall consists of 22 metre length H King piles driven two metres into rock with 19.8 metre pile infills driven to top of rock with one row of 125mm tie backs and a second row of 85mm tiebacks.

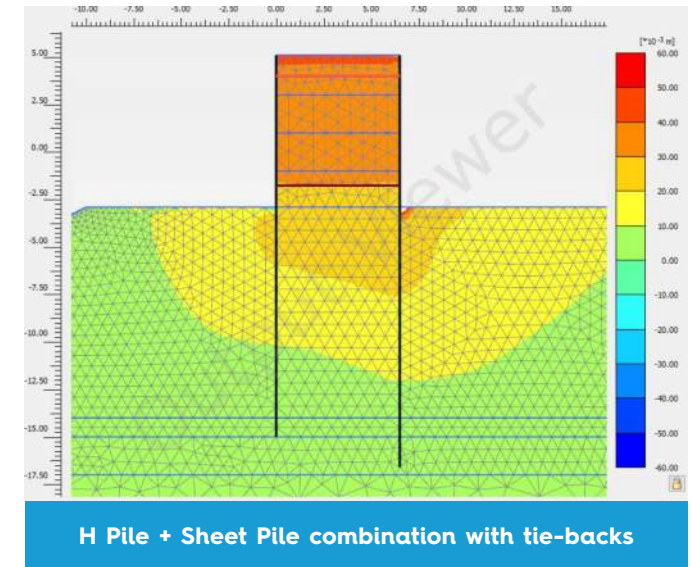
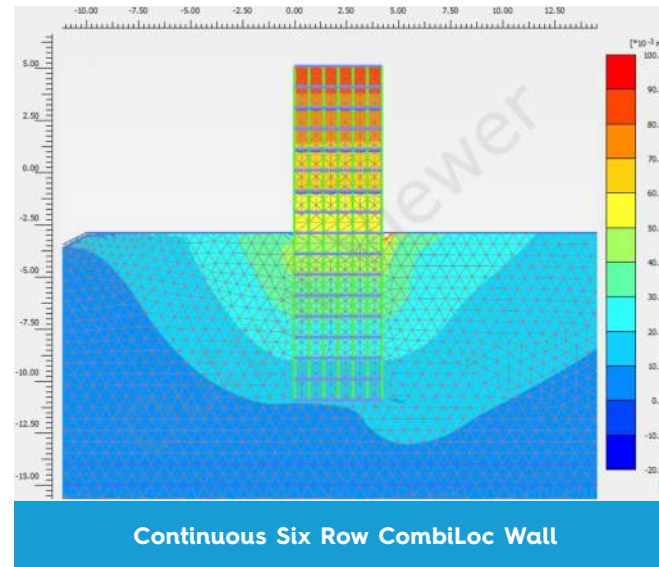
Based on our analyses the main results from the conforming design (H Pile + Sheet Pile combination with tie-back bars) led to less than 120mm settlement after the breakwater is filled with controlled fill, whereas **CombiLoc™** 6 row continuous wall led to less than 40mm settlement.

Engineering Analysis (SETTLEMENT) CombiLoc V Traditional Breakwater





Engineering Analysis (Lateral Displacement) CombiLoc V Tradition Breakwater



Lateral Displacement Analysis of Breakwater Wall Design Cases

Results of this analysis showed 60mm lateral displacement applying cyclone wave load of 41kPa (based on the original design calculations of the H Pile + Sheet Pile combiwall). Whereas, the six row **CombiLoc™** wall led to less than 40mm settlement after the breakwater is filled with controlled fill, and less than 100mm lateral displacement applying cyclone wave loads of 41kPa.

KgCO2e Case

(Steel H Pile + Sheet Pile Infill + Tiebacks v CombiLoc Breakwater)

WALL TYPE	M3/ MTR WALL	KGCO2E/M3	TOTAL KGCO2E/M WALL
H Pile with Sheet Pile Infill + Tiebacks	1.3395	1334	1,786.91
CombiLoc™ Terraced Seawall	0.48	477.54	22786
Total kgCO2e Reduction			-87%

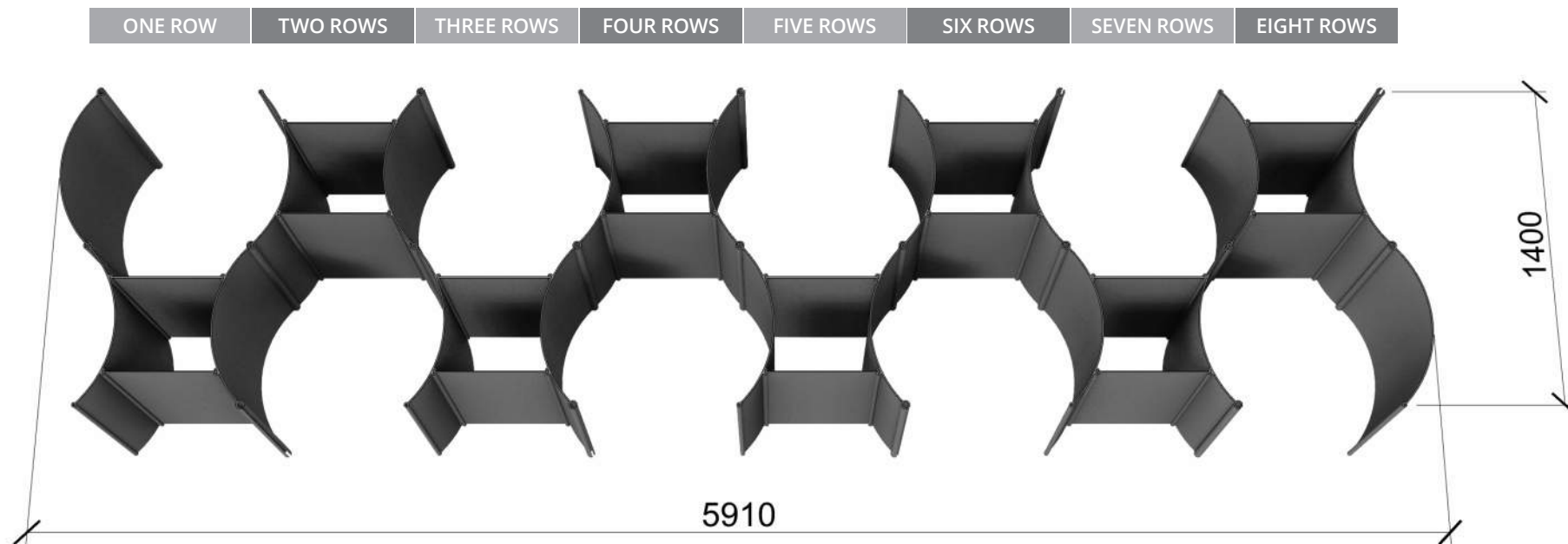
The table clearly demonstrates the environmental savings. However, observations are based on the materials ex-works and do not include significant KgCO2e savings as a result of shipping and local freight where **CombiLoc™** provides significant reductions due to its flatpack design compared to that of deep steel sections. Moreover, **CombiLoc™** is installed much faster utilizing smaller equipment as it is a portion of the weight and is not driven into rock at great depths as that of Steel Cantilever walls.

CombiLoc™ Capacities



SECTION PROPERTIES_6X700 [Ø980]

DESCRIPTION	UNIT	1-ROW	2-ROW	3-ROW	4-ROW	5-ROW	6-ROW	7-ROW	8-ROW
Section width	mm	1400	1400	1400	1400	1400	1400	1400	1400
Section depth	mm	1000	1700	2400	3100	3800	4500	5200	5910
Thickness	mm	6	6	6	6	6	6	6	6
Cross-section area	cm ²	300	483	664	845	1027	1208	1389	1571
Section modulus	cm ³ /m	4748	10968	21685	34642	50648	69668	91736	116806
Moment of inertia	cm ⁴ /m	236929	932273	2602161	5372899	9633263	15696116	23878805	34504396
Allowable Moment	kN-m/m	2327	3839	7590	12125	17728	24384	32108	40883
Ultimate Moment	kN-m/m	4653	7677	15180	24250	35455	48767	64215	81765
Ultimate Stiffness	kN-m ² /m	30462	119864	334564	690801	1238562	2018072	3070132	4436279
Circular pile opening diameter	mmØ	980	980	980	980	980	980	980	980

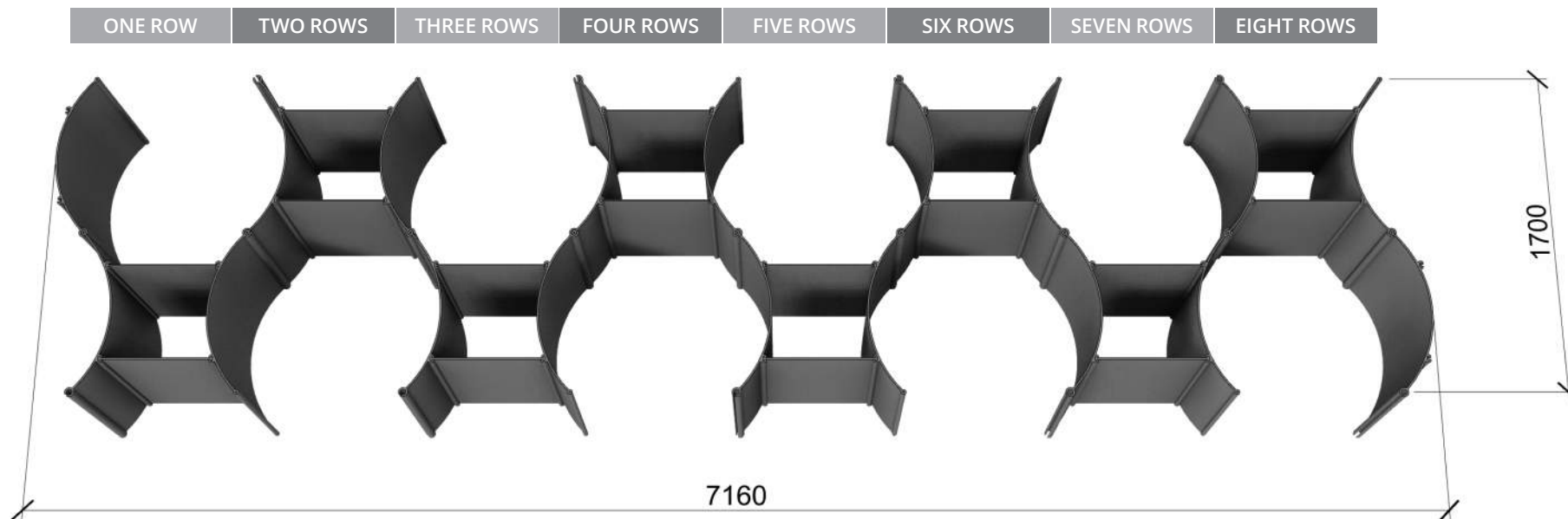


CombiLoc™ Capacities



SECTION PROPERTIES_9X850 [Ø1180]

DESCRIPTION	UNIT	1-ROW	2-ROW	3-ROW	4-ROW	5-ROW	6-ROW	7-ROW	8-ROW
Section width	mm	1700	1700	1700	1700	1700	1700	1700	1700
Section depth	mm	1210	2060	2910	3760	4610	5460	6310	7160
Thickness	mm	9	9	9	9	9	9	9	9
Cross-section area	cm ²	545	872	1200	1527	1855	2183	2510	2838
Section modulus	cm ³ /m	8566	21113	45794	62460	91307	125609	165368	210585
Moment of inertia	cm ⁴ /m	519075	2176767	6667631	11748786	21055330	34303706	52190022	75410386
Allowable Moment	kN-m/m	5097	7390	16028	21860	31958	43963	57880	73705
Ultimate Moment	kN-m/m	10193	14779	32056	43720	63915	87926	115760	147409
Ultimate Stiffness	kN-m ² /m	54961	230481	705984	1243989	2229388	3632157	5526002	7984629
Circular pile opening diameter	mmØ	1180	1180	1180	1180	1180	1180	1180	1180

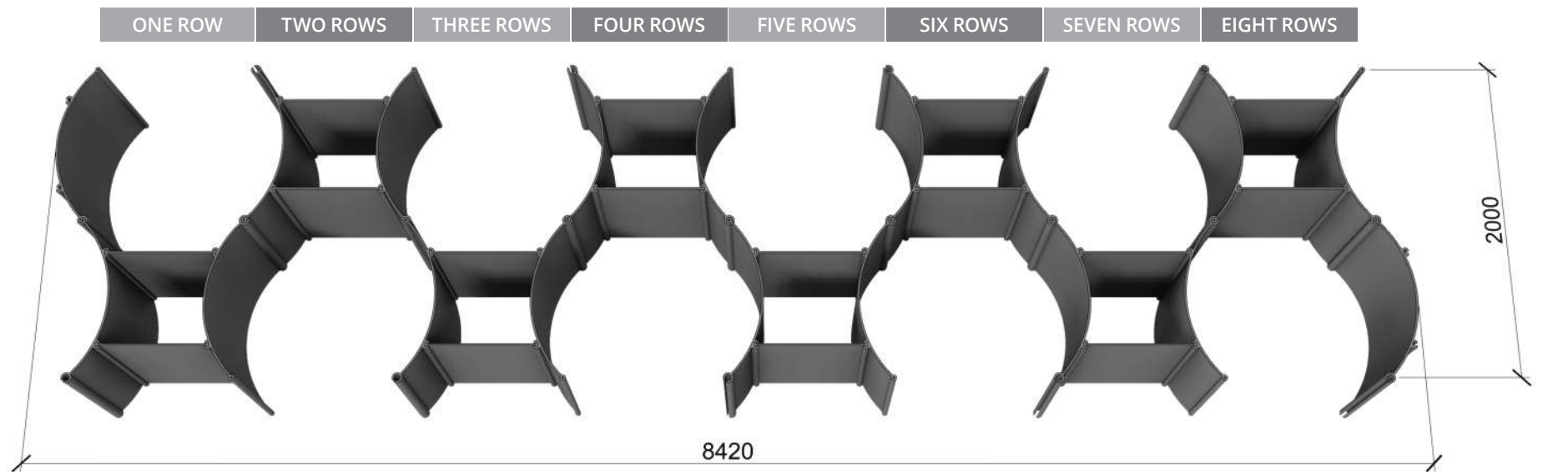


CombiLoc™ Capacities



SECTION PROPERTIES_12X1000 [Ø1490]

DESCRIPTION	UNIT	1-ROW	2-ROW	3-ROW	4-ROW	5-ROW	6-ROW	7-ROW	8-ROW
Section width	mm	2000	2000	2000	2000	2000	2000	2000	2000
Section depth	mm	1425	2425	3425	4425	5425	6425	7425	8420
Thickness	mm	12	12	12	12	12	12	12	12
Cross-section area	cm ²	873	1396	1919	2442	2965	3488	4011	4534
Section modulus	cm ³ /m	13744	33896	62573	117606	146028	200938	264461	336641
Moment of inertia	cm ⁴ /m	979938	4111627	10718820	26014457	39602852	64541404	98141522	141759343
Allowable Moment	kN-m/m	4810	11864	21900	41163	51105	70329	92562	92562
Ultimate Moment	kN-m/m	9620	23727	43800	82325	102210	140657	185123	185123
Ultimate Stiffness	kN-m ² /m	88194	370046	964694	2754472	3564257	5808726	8832737	12758341
Circular pile opening diameter	mmØ	1490	1490	1490	1490	1490	1490	1490	1490



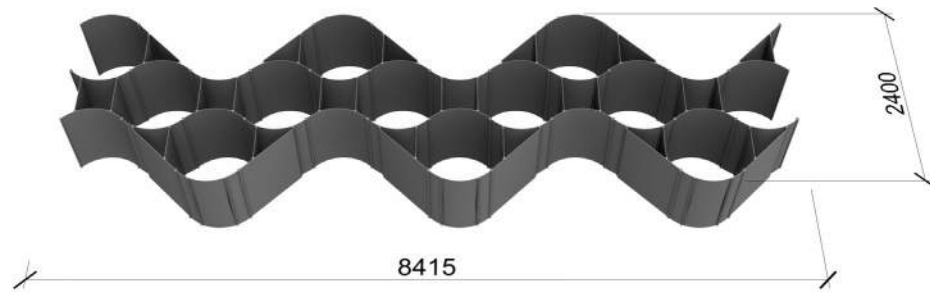
CombiLoc™ Capacities



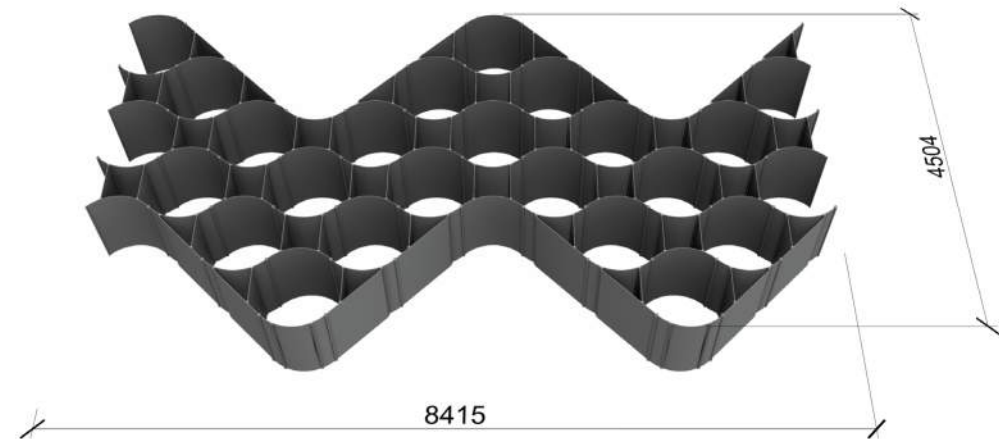
DESCRIPTION	UNIT	SECTION PROPERTIES_12X1000 [Ø1490]					
		W-1A	W-1B	W-1C	W-2A	W-2B	W-3
Section width	mm	8400	11220	9820	11220	11220	14025
	in	330.709	441.732	386.614	441.732	441.732	552.165
Section depth	mm	1700	2400	3100	3800	3800	5200
	in	66.929	94.488	122.047	149.606	149.606	204.724
Thickness	mm	6	6	6	6	6	6
	in	0.236	0.236	0.236	0.236	0.236	0.236
Cross-section area	cm ²	2368	3533	2950	4157	5125	13395
	in ²	367.041	547.616	457.251	644.336	794.377	2076.229
Section modulus	cm ³ /m	7854	11647	16132	21618	27831	51078
	in ³ /ft	146.08	216.62	300.04	402.08	517.63	950.01
Moment of inertia	cm ⁴ /m	667548	1397684	2500437	4107416	5287835	13280267
	in ⁴ /ft	4888.115	10234.530	18309.430	30076.521	38720.129	97244.648
Allowable Moment	kN-m/m	2750	4075	5645	7565	9740	17880
	lbf-ft/ft	618193	916049	1268981	1700592	2189526	4019376
Ultimate Moment	kN-m/m	5500	8150	11290	15130	19480	35750
	lbf-ft/ft	1236385	1832098	2537962	3401183	4379052	8036504
Ultimate Stiffness	kN-m ² /m	14305	22423	45833	65894	84832	170442
	k-ft ² /ft	10550	16536	33801	48595	62561	125696

DESCRIPTION	SECTION PROPERTIES_12X1000 [Ø1490]			
	Z-1	Z-2	Z-3	Z-4
Section width	8415	8415	14025	8415
	331.299	331.299	552.165	331.299
Section depth	2400	3100	4500	4500
	94.488	122.047	177.165	177.165
Thickness	6	6	6	6
	0.236	0.236	0.236	0.236
Cross-section area	3193	3294	5623	5468
	494.916	510.571	871.567	847.542
Section modulus	12559	14857	21664	36046
	233.59	276.33	402.93	670.42
Moment of inertia	1507111	2302843	4874475	8110453
	11035.808	16862.549	35693.304	59388.727
Allowable Moment	4395	5200	7580	12620
	987984	1168946	1703964	2836942
Ultimate Moment	8790	10400	15165	25230
	1975968	2337892	3409051	5671636
Ultimate Stiffness	32238	49259	62560	173486
	23775	36327	46136	127941

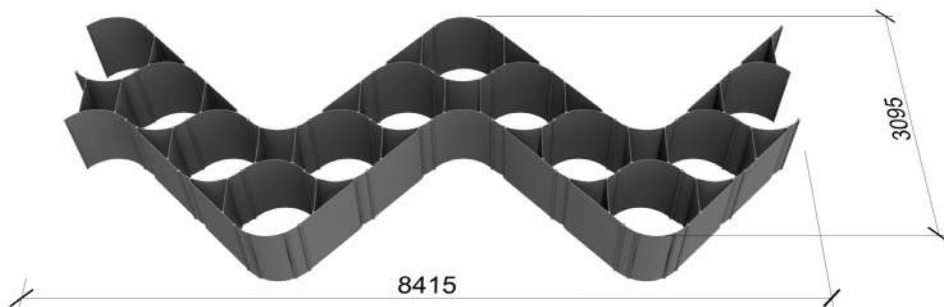
ZIGZAG-1 (Z-1)



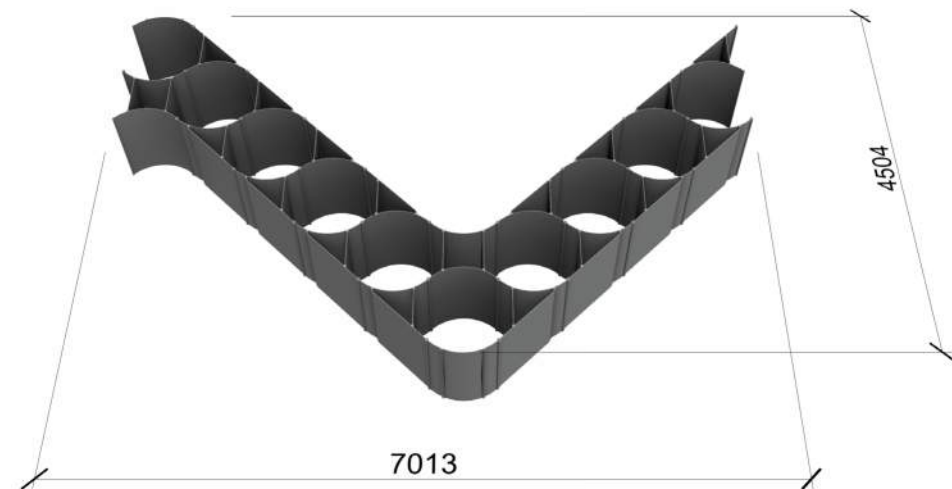
ZIGZAG-3 (Z-3)



ZIGZAG-2 (Z-2)



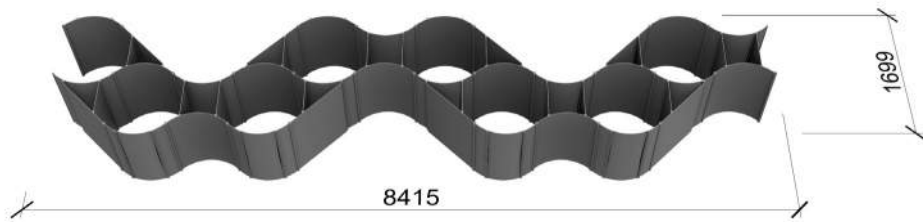
ZIGZAG-4 (Z-4)



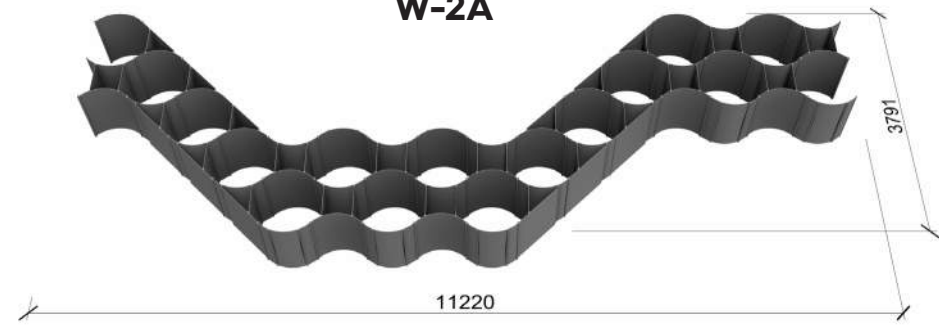
CombiLoc™ Capacities



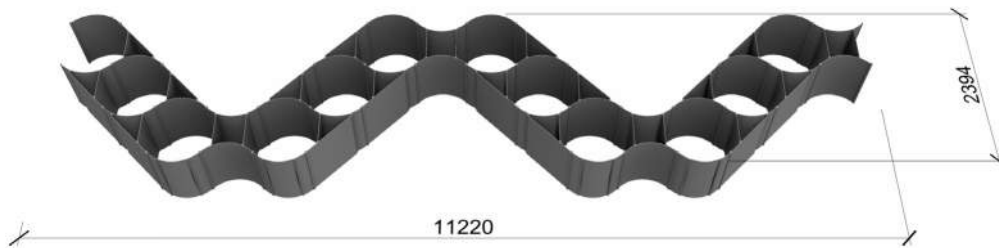
W-1A



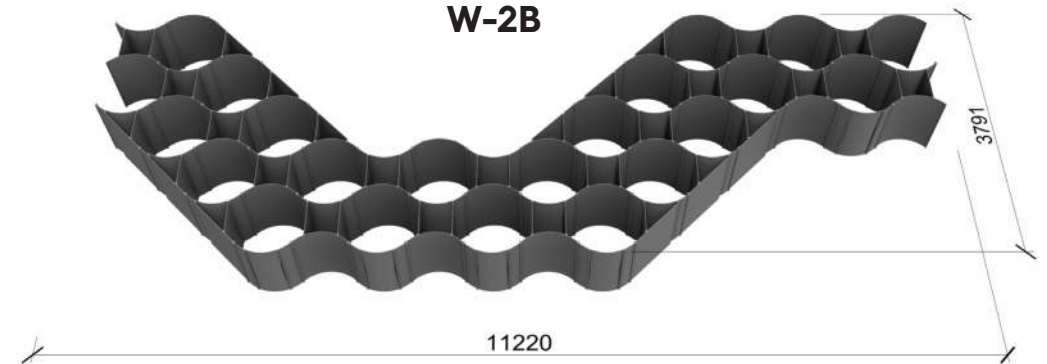
W-2A



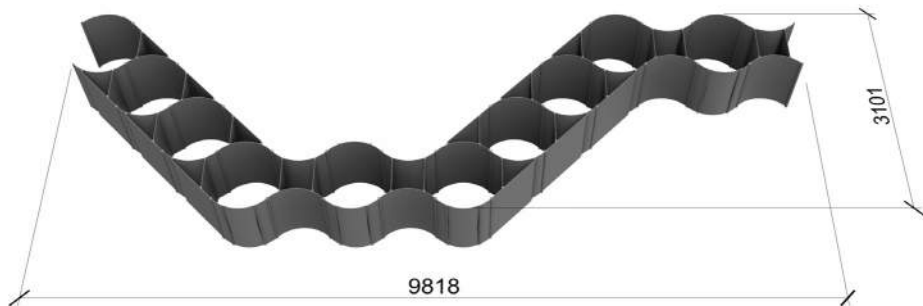
W-1B



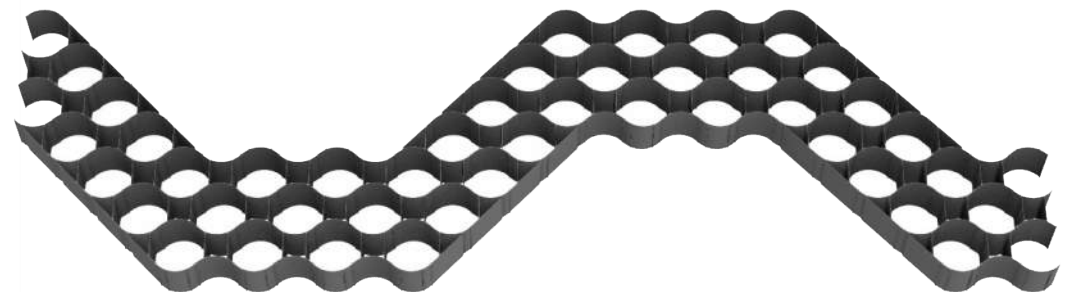
W-2B



W-1C



W-3





CombiLoc™ Specialist Applications

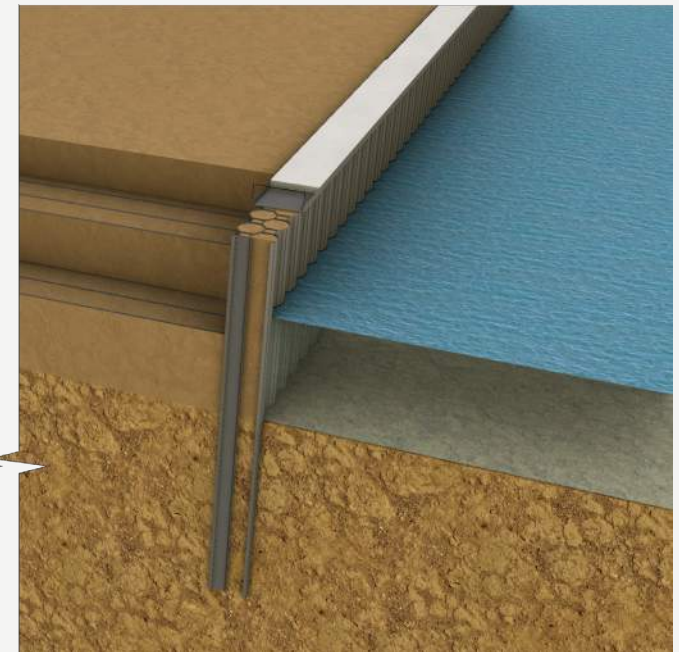
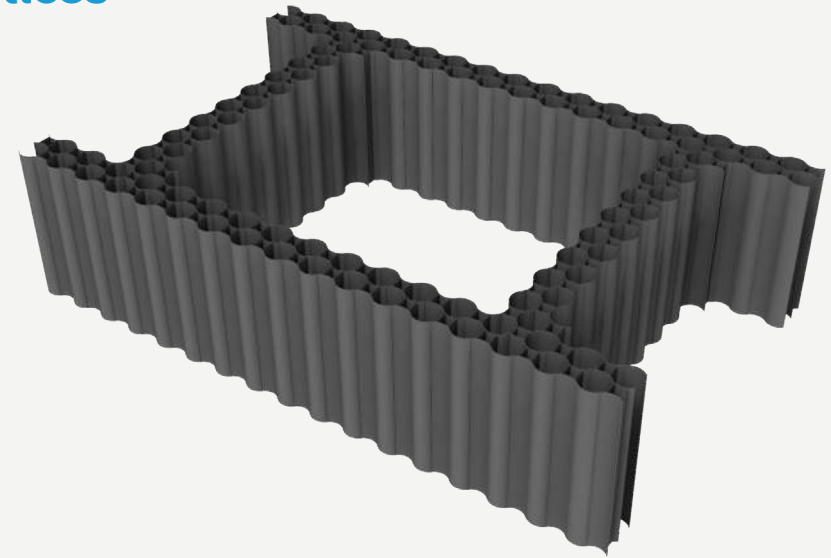
The CombiLoc technology has been adapted to industry wide specialist applications common in heavy industry and marine developments.

CombiLoc's unique geometry can be used in a range of applications applying bespoke installation methods and equipment. Applications include.

- + Subterranean Lattices
- + Caissons
- + Breakwater walls
- + Seawalls
- + Precast Combination waterway wall
- + Bridge Abutments and river scour zone recovery

Subterranean Lattices

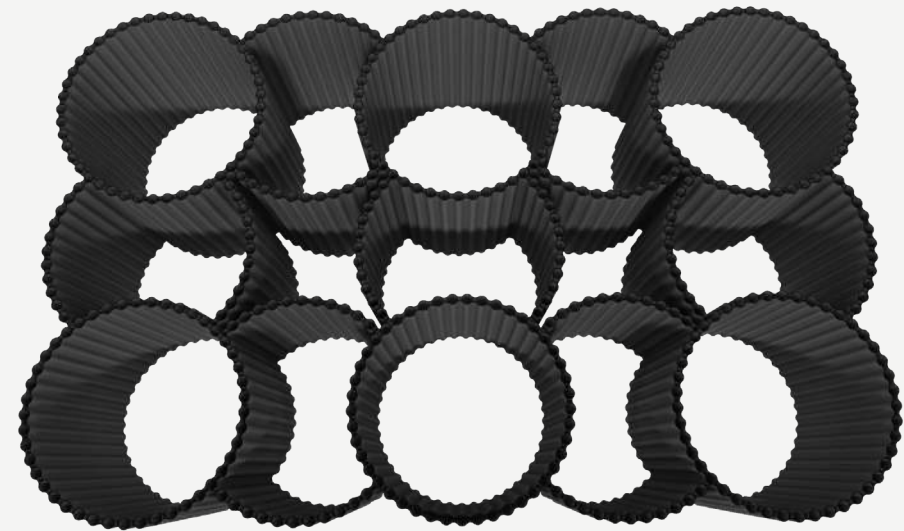
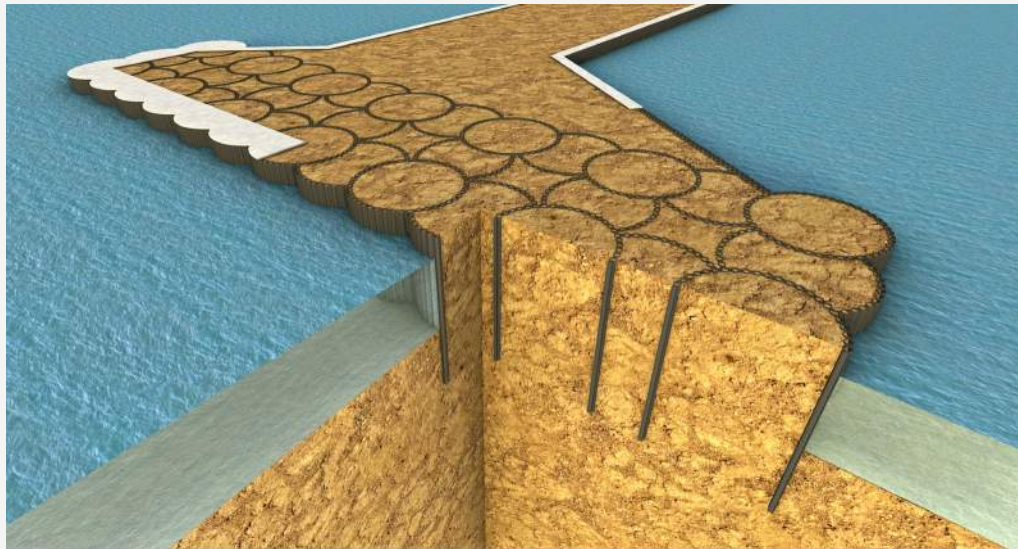
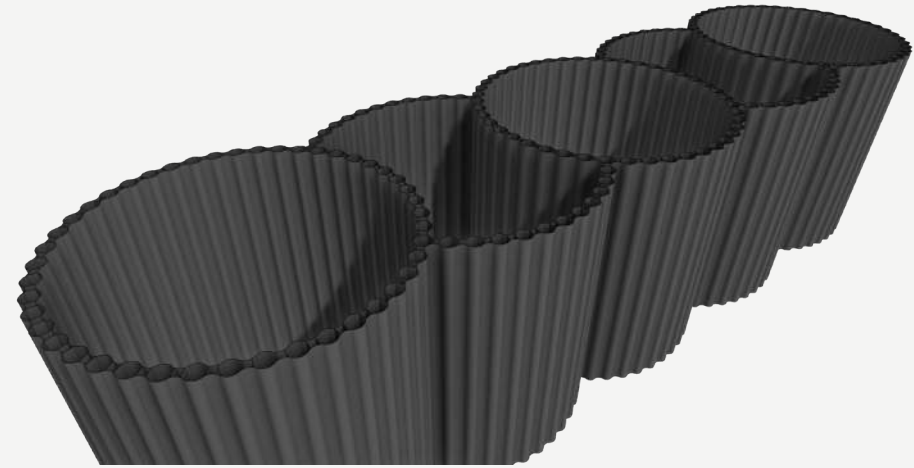
1. Single chamber
2. Multi-chamber
3. Multi-directional chamber
4. Chamber Dimensions from 2m x 2m to 15m x 15m





Caissons

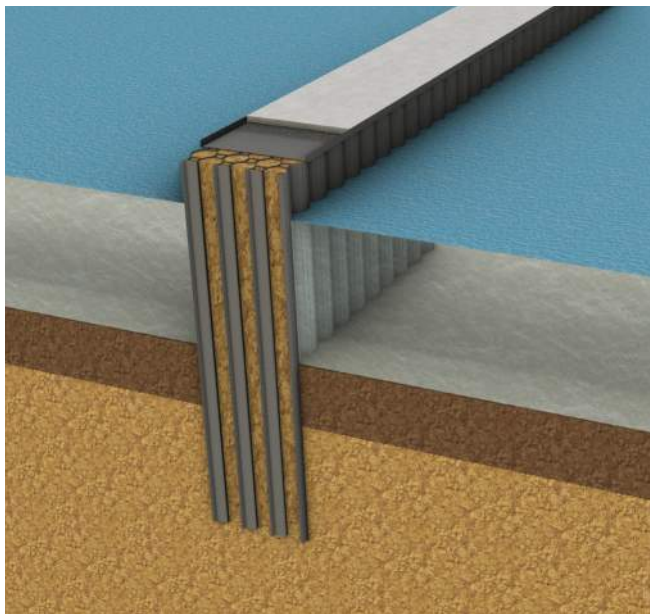
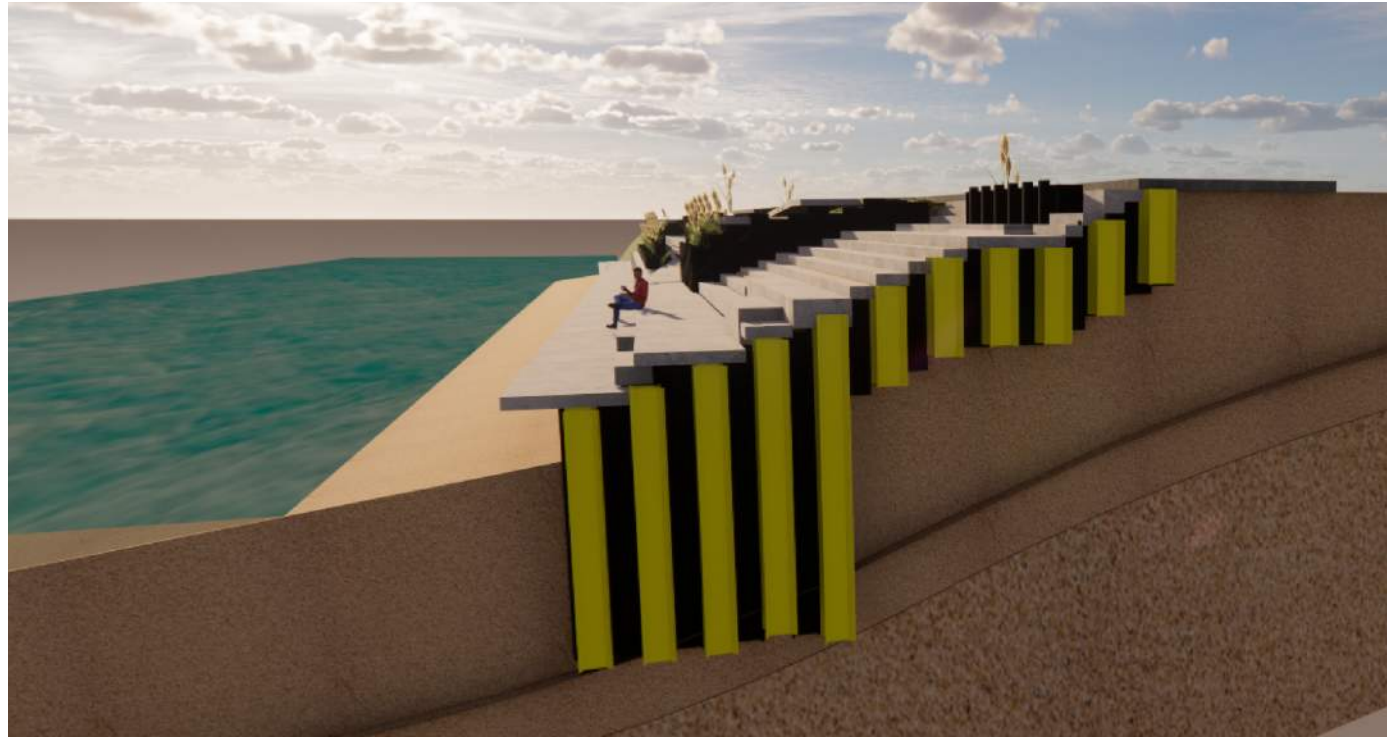
1. Single caisson cell
2. Multi-cell caissons
3. Multi-directional multi-cell caissons
4. Caissons ranging from 10m diameter up to 30m diameter.





Seawalls

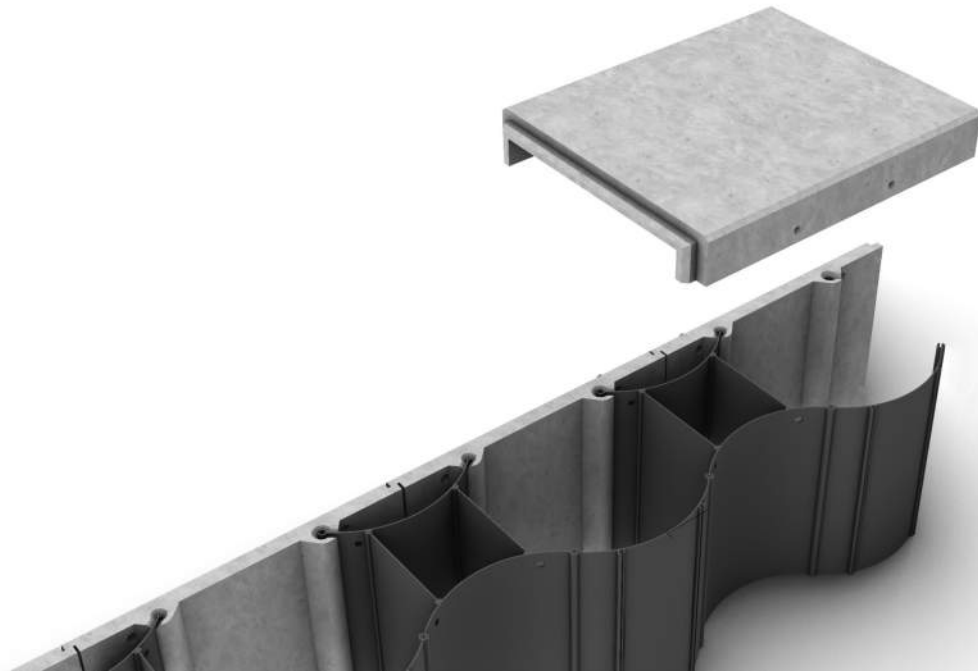
1. Multi-row continuous seawalls
2. Buried Seawalls
3. Terraced Seawalls
4. Precast combination seawalls
5. Eco Seawalls with fauna creations





Precast Combination waterway walls

1. Single and multi-row walls
2. Terraced precast walls
3. Kitset precast facing panels and capping beam.

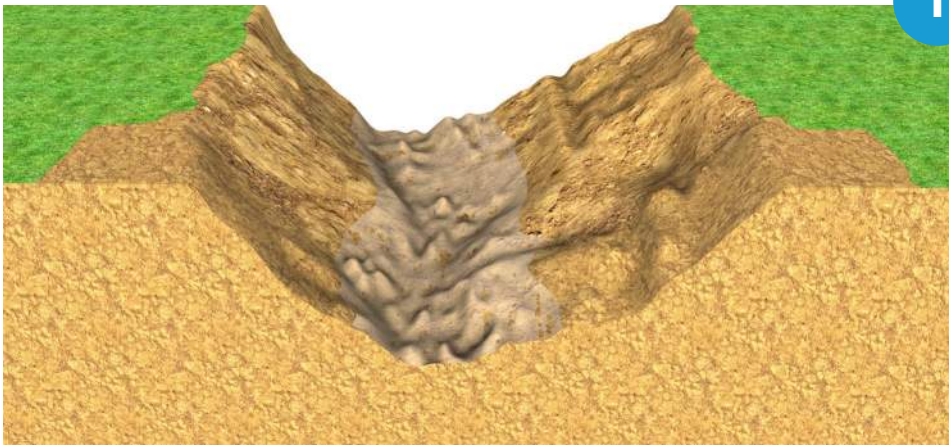




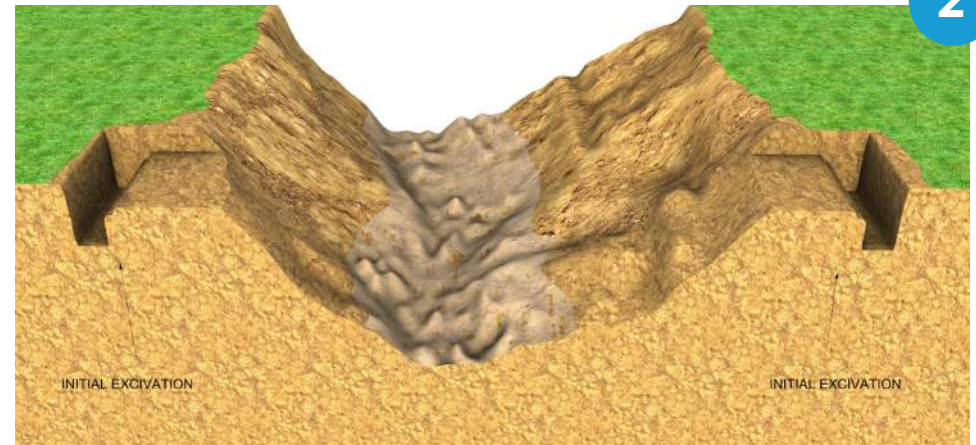
CombiLoc Abutment System

- CombiLoc system can be adapted to Bridge Abutment design.
- Offers include excavator installed designs, or piled installation.
- CombiLoc cells provide necessary opening for bridge piles independent of the approach embankment.

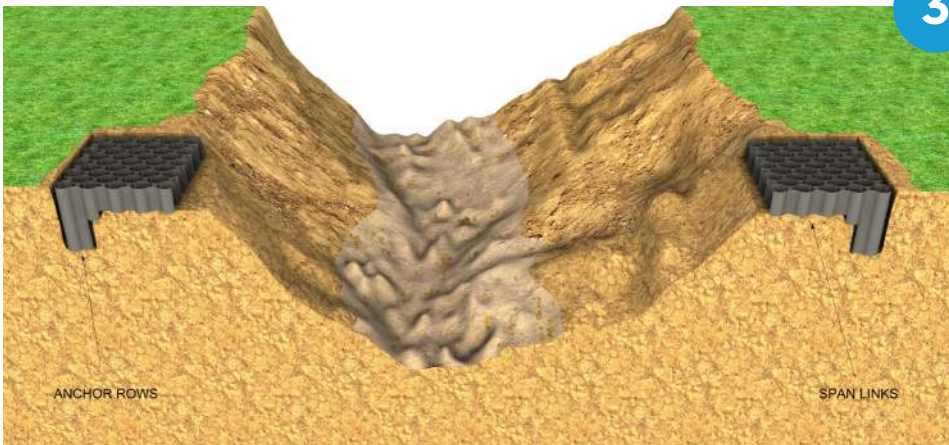
INITIAL SITE



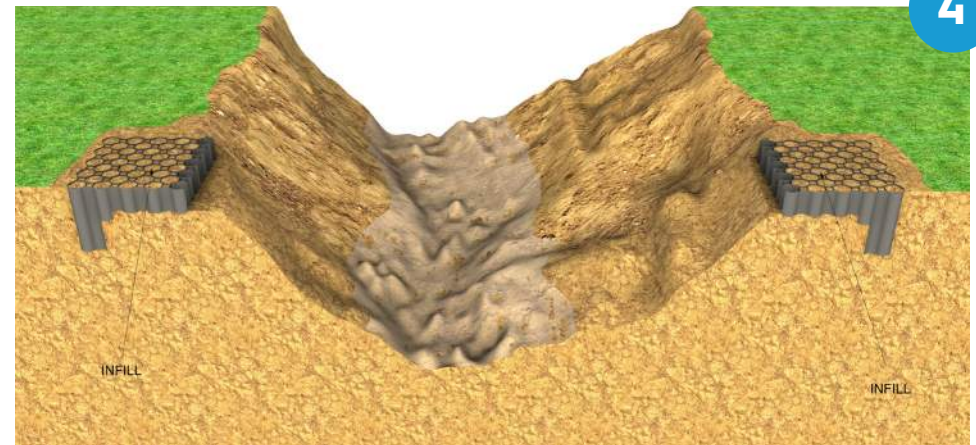
INITIAL EXCAVATION



PLACE ANCHOR ROW + SPAN LINKS

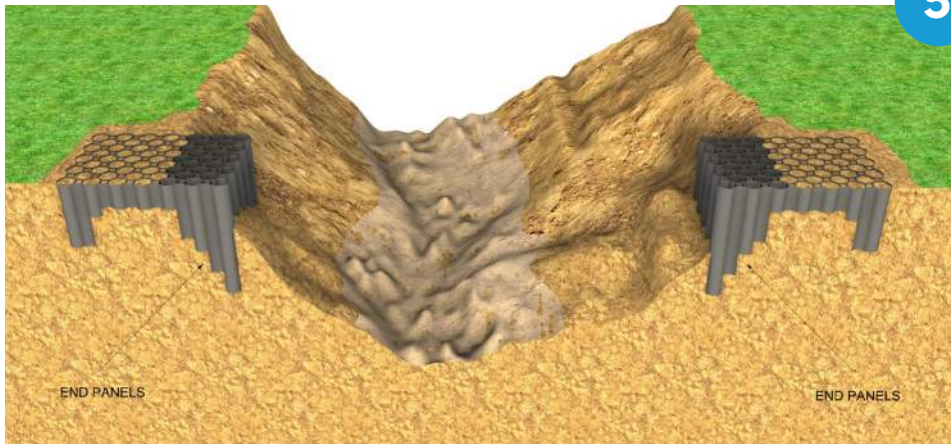


BACKFILL WITH ENGINEERED OR APPROVED FILL



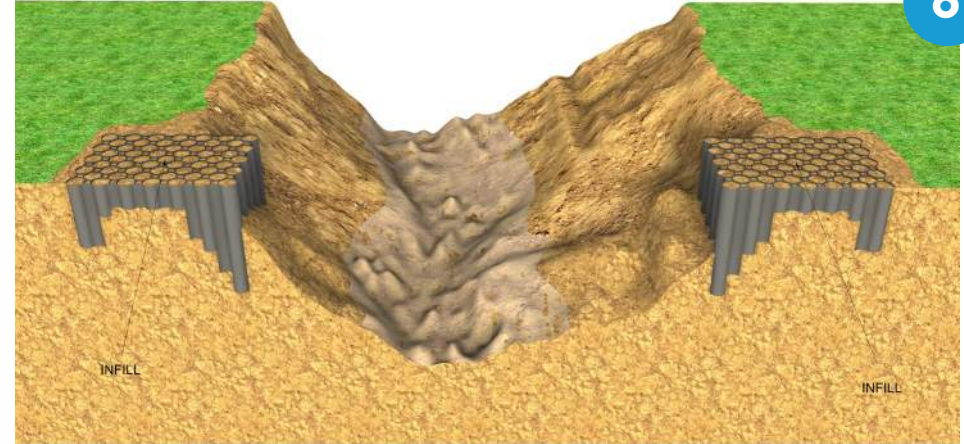
LIFT PANELS INTO PLACE AND PUSH INTO GROUND

5



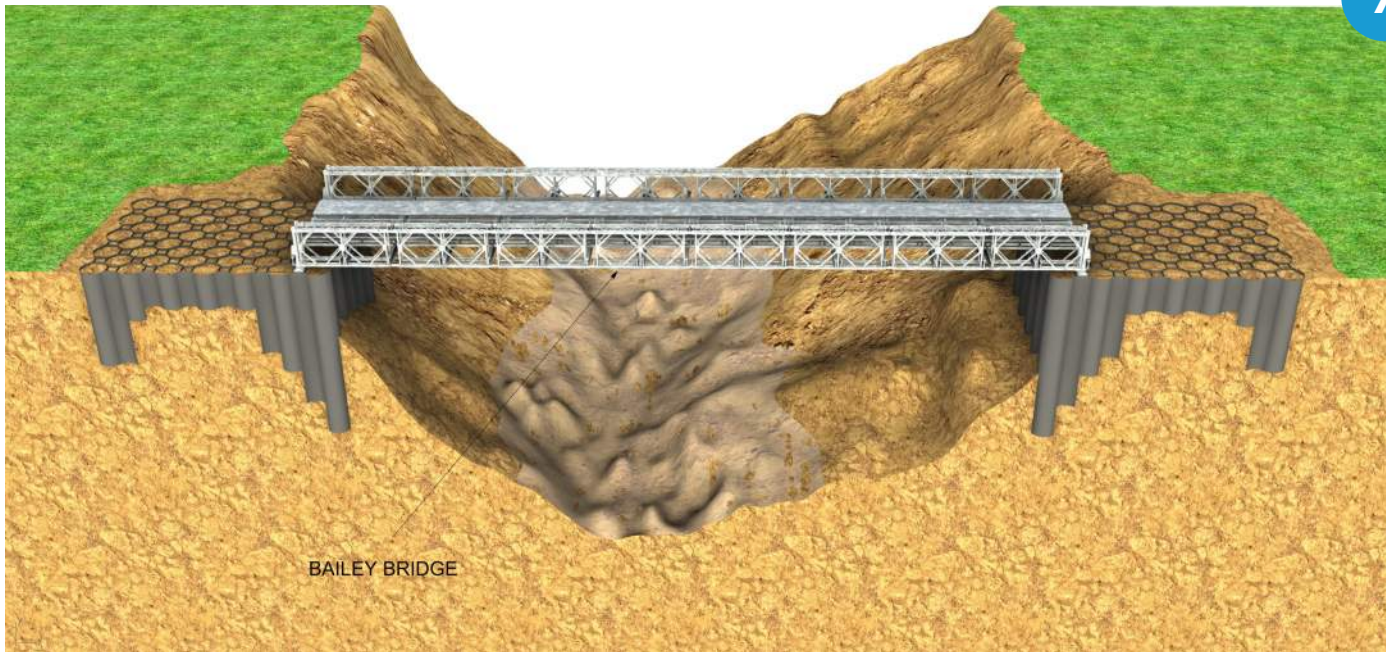
BACKFILL WITH ENGINEERED OR APPROVED FILL

6



BAILEY BRIDGE INSTALLATION

7





CombiLoc International (trading as)
Oceania Steel Ltd
Level 1, 103 Carlton Gore Road,
Newmarket, Auckland
New Zealand 1023.

email: craig@oceaniasteel.com
Phone: +6421811143

www.combiloc.com