PROJECT MATERIAL



ROCK BAG FILTER UNITS



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Rock Bag Filter Units (RBFUs), also referred to as Rock Bag Armour Units, Sac Gabions, Stone-Filled Nets, or Rock Bags, are a modern engineered solution originally developed to secure deep-sea power transmission cables.

Over the past decade, their application has expanded significantly across the civil and marine engineering sectors, particularly in coastal protection, scour mitigation, erosion control, and infrastructure stabilisation.

This evolution has been underpinned by extensive research and development to optimise unit geometry, material performance, and installation methodology for a wide range of site conditions. Project Material has played a key role in advancing this technology - including conducting the world's first full-scale stability trial of RBFUs, validating their hydraulic stability and load-bearing performance in real-world scenarios.

Technical Highlights

Global Scale Manufacturing - Project Material is the second largest RBFU manufacturer globally, ensuring consistent supply capability for major infrastructure and coastal projects.
Controlled Production - All units are manufactured under license to strict engineering specifications, ensuring uniform quality and traceability.
Material Certification - All products are tested to harmonised geosynthetic standards in a NATA-certified laboratory, confirming strength, durability, and compliance with international performance benchmarks.
Structural Assurance - Every batch undergoes in-house testing to a 3.5:1 Factor of Safety (FoS) on bags and lift rings, verifying lifting integrity under extreme load scenarios.
Regulatory Compliance - RBFUs are CE-certified, supporting their use in regulated infrastructure and marine projects across multiple jurisdictions.
Size Range - Available in 1, 2, 4, 6, 8, 10, and 12-tonne capacities, produced in PET and HDPE mesh configurations to suit a variety of environmental and hydraulic conditions.



Sustainability, Life Cycle Assessment & Environmental Responsibility

Rock Bag Filter Units are manufactured from polyolefins derived from petrochemicals. The question therefore arises: how can a petrochemical-based product be considered sustainable?

Sustainability is not defined by origin alone — it is defined by life cycle performance.

The World Commission on Environment and Development (WCED, 1987) defines sustainable development as meeting present needs without compromising future generations. When assessed under Life Cycle Assessment (LCA) principles, durability, longevity, carbon intensity, and maintenance frequency become decisive factors.

A resource can be consumed in hours — or engineered to perform for decades. Burning timber provides temporary heat. Using timber to build a bridge creates long-term value. The same logic applies to hydrocarbons. When refined into fuel, oil is consumed immediately. When engineered into high-performance polymers such as HDPE, it becomes a durable structural material capable of functioning for decades with minimal environmental interaction.

Polyolefins used in Rock Bag Filter Units are not single-use plastics. They are high-strength structural fibres designed for extreme hydraulic environments. In stable conditions, these polymer chains remain intact for decades, significantly extending asset life and reducing replacement cycles.

Geosynthetics, when properly specified, extend infrastructure service life and reduce the need for repeated quarrying, transport, heavy machinery deployment, and reconstruction. Sustainability in civil infrastructure is measured in avoided intervention.

Comparative Environmental Performance

- Reduced Rock Volume: Rock Bag Filter Units achieve near-vertical angles of repose (~95°), compared to 35–45° for unrestrained riprap. This reduces quarry extraction and transport requirements.
- Extended Service Life vs Gabions: Galvanised gabion cages in marine environments may deteriorate within 1–2 years. Rock Bag Filter Units routinely exceed this lifespan by 25–50 times, significantly lowering lifecycle carbon and maintenance exposure.
- Lower Carbon Than Concrete: While performance is comparable, concrete revetments carry substantially higher embodied carbon and cost, and still require geosynthetic filtration layers.
- Material Efficiency vs Sandbags: Fully geosynthetic sandbags contain up to 400 times more synthetic material per cubic metre than Rock Bag Filter Units and offer limited ecological integration.
- Habitat Integration: Rock Bag Filter Units encapsulate natural quarried rock, riverstone, coral, or shell, enabling marine habitat formation and biodiversity enhancement rather than full isolation of natural media.
- Scour & Sediment Control: Stabilising revetments reduces sediment translocation, protects seagrass beds, limits siltation, and preserves dissolved oxygen levels in aquatic systems.

Position Statement

When evaluated under Life Cycle Assessment principles and WCED sustainability criteria, Rock Bag Filter Units represent an environmentally sound infrastructure solution. Though derived from petrochemicals, their durability, material efficiency, and extended service life result in significantly lower long-term environmental impact compared to loose rock, galvanised steel cages, concrete revetments, and high-volume synthetic sandbags.

> **Sustainability in infrastructure is not the absence of materials — it is the intelligent use of materials to reduce intervention over time.**







Material Integrity & Environmental Durability

Not all Rock Bag Filter Units are manufactured to the same material standard.

Long-term durability in marine and riverine environments is governed by polymer integrity, UV stabilisation, and resistance to environmental degradation over time. High-energy hydraulic conditions subject materials to continuous ultraviolet radiation, abrasion from angular rock interfaces, salt exposure, and cyclic loading. Over decades, these forces determine whether a product remains structurally intact — or begins to fragment.

Project Material manufactures Rock Bag Filter Units exclusively from virgin polymer feedstock to ensure material consistency and predictable long-term performance. Recycled polymer streams, sometimes described in the market as “PET-like” or “PE-derived,” can vary in composition due to prior processing history and mixed feed sources. This variability may affect molecular chain integrity and long-term environmental resilience.

Where HDPE provides measurable advantage is in lifecycle durability. Its dense, linear molecular structure offers enhanced resistance to surface abrasion when in constant contact with rock, reducing fibre fraying and maintaining confinement integrity over extended service periods.

Ultraviolet exposure remains the primary driver of polyolefin degradation. For this reason, stabilisation methodology is critical. Carbon Black, when uniformly dispersed within HDPE, absorbs UV radiation before it initiates polymer chain breakdown. Unlike dye-based stabilisers, Carbon Black remains chemically stable and does not fade, leach, or lose effectiveness under prolonged exposure.

Fibre integrity directly influences microplastic release risk. Fragmentation is the precursor to microplastic generation. By combining virgin HDPE with Carbon Black stabilisation, fibre degradation is significantly reduced. Independent testing indicates up to 88% less microplastic release compared to alternative PE and recycled formulations.

Material selection is therefore not cosmetic — it defines service life, structural reliability, and environmental performance.

For exposed hydraulic infrastructure, longevity is sustainability.



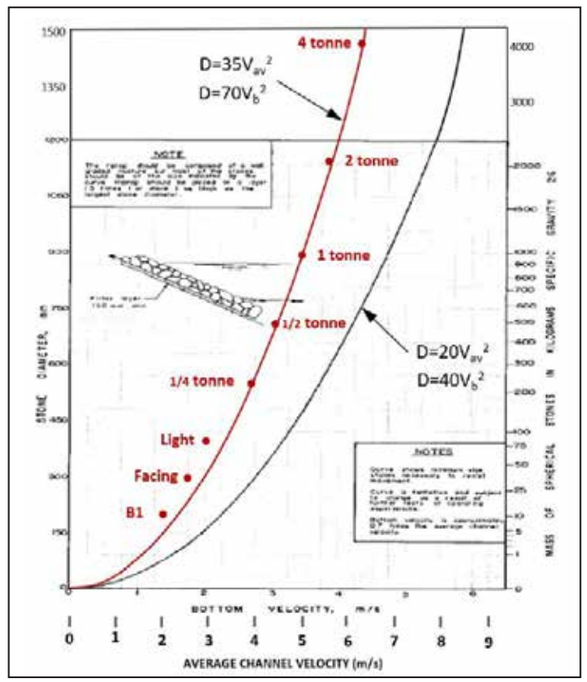


How Are Our Rock Bag Filter Units Made?

The Rock Bag Filter Unit manufacturing process utilises “Warp” knits exclusively manufactured on a Chain Loom, with each warp controlled by a separate needle. Warp Knits produce run-resistant, closer, flatter, and less elastic knits. Common Warp Knits are Tricot, Milanese, and Raschel. Project Material are Joint Venture partners with the manufacturer, producing bags to strict specifications utilising “Raschel Warp Knits”. Our joint venture enables the complete chain of custody and Quality Management Systems.

How Do Rock Bag Filter Units Work?

When we think of armour units for erosion control and revetments in general; one of the primary factors is the ability for the mass of a unit to resist overturning moments against wave attack or high water velocities. The conventional protection approach is to deploy items with a high mass to area attribute (riprap) or other singular mass armours. (image on right Comparison of riprap sizing in Austroads Part 5 (2013a) and Part 5B (2013b), (Price. K. 2021) Following these guidelines if we were to overcome velocities of 6m/s or greater one would need rocks at 1500mm in diameter or greater.



Rock Bag Filter Units are a Rock, Bag, Composite; creating a single mass by encapsulating smaller rocks into a high strength synthetic bag. The Rock Bag Filter Unit keeps the rock under tension substantially restricting movement of the media within the bag while maintaining flexibility during placement. When placed, Rock Bag Filter Units tightly mould to their environment, with subsequent placements tightly moulding and interlocking with the previous. Initial settling of the bag will occur which only serves to consolidate the entire structure.

For the composite to work correctly Rock Bag Filter Units are filled by volume not weight. The term “ton” to describe the size is merely an identifier that on average the finished product will be within that weight range. When filled correctly, Rock Bag Filter Units will not allow rocks to move liberally, though mobilisation of some fines will migrate to the centre without effecting performance. To-date scale modelling has failed to replicate the composite attributes of Rock Bag Filter Units.



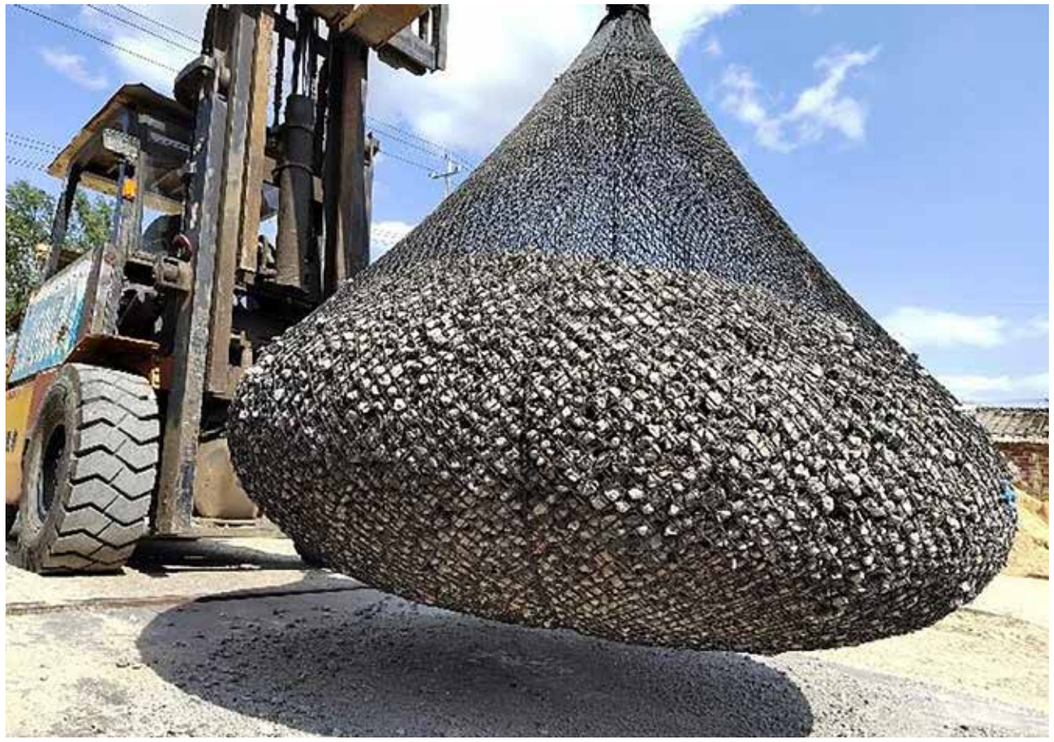




What Sizes Do Rock Bag Filter Units Come In?

Rock Bag Filter Units in a standard offer come in 1, 2, 4, 6, and 8 t configurations in either Polyethylene (PE) or High Density Polyethylene (HDPE). However, Rock Bag Filter Units can be supplied up to 12 t, and dependant on the quantity other sizes are available.

The table below is a guide only; rock grading may vary the bag sizes by +/- 10%					
Average Weight (T)	**Rock Grading (mm)**	**Average Height (mm)**	**Average Diameter (mm)**	**Volume (m^3)**	**Rock Density (T/m^3)**
1	50 - 100	400–500	1700–1900	0.63	1.6
2	75 - 150	500–600	1900–2100	1.25	1.6
4	75 - 150	700–800	2400–2700	2.5	1.6
6	100 - 200	800–900	2700–3000	3.75	1.6
8	150 - 250	1000–1100	3100–3400	5.0	1.6
10	200–300	1150–1250	3450–3750	6.25	1.6
12	200–300	1250–1350	3800–4100	7.5	1.6



What Tests Do Rock Bag Filter Units Go Through?

Rock Bag Filter Units as with all Geosynthetics used in the built environment are subject to a series of internationally recognised tests. Rock Bag Filter Units are not only subject to these tests but as part of our internal quality control measures Rock Bag Filter Units are subjected to a suspension test where the bags are filled to capacity and suspended for 30 minutes and inspected for degradation.

The test are done in house under the supervision of a certified testing authority; further Rock Bag Filter Units only use stamped load rated lift rings ensuring operator safety.

Standard Testing Inputs	**Applied Standard**
Tensile strength MD	EN ISO 10319
Elongation at Maximum load, MD	EN ISO 10319
Mass/ unit area, Minimum	ISO 9864
Static Puncture strength (CBR)	EN ISO 12236
Vertical permeability	EN ISO 11058
Resistance to hydrolysis test NF	EN 12447
Resistance to chemical degradation Sulfuric acid	ISO TR 12960
Resistance to chemical degradation calcium hydroxide	ISO TR 12960
Resistance to weathering test	EN 12224





How Long Do Rock Bag Filter Units Last?

Degradation of polyolefins is a complex chemical process and equally complex to measure. Literature on plastics degradation under environmental conditions is scant at best. Questions of “How quickly do plastics degrade in the environment? What are the degradation pathways? and, What are the factors affecting the degradation processes?” (Chamas, A. et.al 2020, 3504) are often answered with widely varying ranges. The weathering test under EN 12224 do provide benchmarks of performance to compare like for like; however, these results have little correlation to actual degradation under environmental conditions. Tests to establish first half-life, or the time in which the material loss equals 50% of its original mass, on a flat surface compared to a spherical surface of equal area resulted in a variance of 200 to 600 years. (Chamas, A. et.al 2020)

There is however, consensus on two significant factors impacting plastics degradation; UV exposure and impurities within the polyolefin strands. **Rock Bag Filter Units use Carbon Black as a UV Blocker and only use the purest of virgin feed material to produce a most durable product, with life expectancies between 25 to over 100 years dependant on application.**

Where Can Rock Bag Filter Units Be Utilised In Coastal And Marine Applications?

Rock Bag Filter Units can be utilised in almost any application for erosion control in coastal or marine applications. Rock Bag Filter Units have been successfully deployed to prevent erosion of coastlines globally. In fact the uptake of Rock Bag Filter Units for the protection of coastlines, ports, harbours and rivers with many is now in the many tens of thousands.

Rock Bag Filter Units can be utilised for permanent and temporary works in costal protection and construction applications. Rock Bag Filter Units have been successfully implemented for temporary applications including protection of decaying infrastructure and wave breaks to protect civil construction and working platforms.

Ships’ Bow Thrusters can severely scour birthing pockets; some port operators are limiting the use of bow thrusters within the pocket because of the damage caused. The logistical challenges of conducting real life testing has resulted in only scale modelling of Rock Bag Filter Units against bow thrusters.

In 2022 Project Material conducted a world first full scale stability trial of Rock Bag Filter Units against bow thrusters; monitored and reported by the Australian Maritime College (AMC Search) No movement of the bags were detected under various bag configurations and water velocities. Further, under the protected area of Rock Bag Filter Units no scouring was identified, however, outside of the test area significant scouring occurred.



Can Rock Bag Filter Units Be Utilised In Other Civil Applications?

Yes! Rock Bag Filter Units are successfully used to prevent scour around bridge columns and pile caps, bridge abutments, causeways, and culverts. Rock Bag Filter Units allow for rapid deployment to prevent further damage of existing infrastructure. Rock Bag Filter Units can be utilised where damaged infrastructure prevents access by heavy equipment. Rock Bag Filter Units were selected for the repair of a spillway constructed in 1954 because of their ability to be accurately placed by crane and in the event of further spillway flows the Rock Bag Filter Units would remain in place and prevent further scour. The works were completed in five days.





Rock Bag Filter Units are successfully used in emergency recovery applications such as landslips or washouts from floodwaters overtopping culverts. Rock Bag Filter Units are used to rapidly provide bank stabilisation and can remain in service for many years until significant infrastructure repairs can be carried out. Total time onsite to place the Rock Bag Filter Units can be as little as 14 hours.

Rock Bag Filter Units are successfully used in new bridge construction or existing structures requiring scour protection. For new construction where heavier equipment is available Rock Bag Filter Unit sizes up to 8 ton can be utilised to protect from the most severe flooding. In more remote areas and on aging timber bridges 1 ton Rock Bag Filter Units can be utilised and when overlapped Rock Bag Filter Units nest and interlock to create an integral armour.



Can Rock Bag Filter Units Be Utilised In The Natural Environment?

Yes! Rock Bag Filter Units are safe to use in the environment. Polyolefins polymers are a durable compound which make Polyethylene (PE) and High Density Polyethylene (HDPE) so why have both? Rock Bag Filter Units made from PE are a cost effective durable product that can be used in all applications. However, HDPE possesses greater durability than PE alone. Rock Bag Filter Units made from HDPE can reduce microplastic release into our environment by 88% or more.

Rock Bag Filter Units are safe to use in the environment utilising locally available media like river stone, quarried rock, and even coral. With very little disturbance to embankments or riverbeds during placement Rock Bag Filter Units can be deployed with minimal environmental impact of noise, dust, silt, or clearing. In fact many applications are deployed directly from the back of a trucks, eliminating the need for onsite filling or large laydown areas. Other applications for environmental protections are to fill Rock Bag Filter Units with limestone rock and when placed in watercourses can naturally reduce acidity improving water quality. Rock Bag Filter Units used in conjunction with our Water Restore ECO Velocity Bags which passively remove up to 99% of PHAS and other contaminates from our waterways.







Filling And Lifting Rock Bag Filter Units

1. Place filling station on level ground.
   - The filling station is tapered with lifting points top at each end.
   - If you want to extract bags from filling station the large end is to the top
   - You can pin the filling station to the ground by driving pins through the lower lift points.
   - If you are to lift the fill station off the bag, then the small end is to the top.
2. Position bag into the filling station so the tied off end is central to the base.
3. Fold the open end of bag over the walls of the filling station as even as practical.
4. Fill the station a little above the top.
5. Draw the top rope evenly into hitching loops.
   - 1, 2 and 4 ton: 4 loops
   - 6 ton: 6 loops
   - 8 ton: 8 loops
6. Place loops over lifting hook Gently lift the bag to settle rocks to the bottom.
   - NOTE if you are lifting the filling station off the bag, ensure you do not lift the filling station off the ground, you only need to settle the rock gently.
7. Take the tension off the bag and using the lower cord, choke the top of the bag and tie off.
8. Fit the lift ring by collecting all the lifting loops and feed them through the lift ring.
9. Feed the lift ring through the rope loops and pull tight; You are ready to either lift fill station away OR lift bag from fill station dependent on your filling choice.
10. Regularly check all lifting gear for wear and tear.
    - If damaged DO NOT USE and replace where required.









Rock Bag Filter Units® Patch Repair

Rock Bag Filter Units® possess excellent strength and durability; however, as with all materials handling, damage of the bag can occur. Rock Bag Filter Units®, Raschel Warp Knits are run-resistant, closer, flatter, and a less elastic net, meaning, If damage does occur the area directly adjacent will remain intact and not spread further maintaining the bags' integrity. However, a damaged bag may risk liberation of the rock, reducing the bag effectiveness and falling rocks may cause damage or injury to property or persons. If damage does occur an evaluation by a competent person shall determine the best course of action for remedy.

The three determinations shall be:

1. Penetration by a singular rock where much of the rock resides within the bag:
   - No further action is required.
2. Vertical and or horizontal tear of the bag allowing rocks to be liberated but not exceeding 10% of bag volume:
   - Repair by applying a patch over the opening and fasten around the perimeter of the patch.
3. Vertical and or horizontal tear greater than 10% of the bag volume:
   - DO NOT USE, the undamaged part of the bag can be repurposed to create further patches.

Field experience has shown the difficulty in trying to close a hole with tons of rock in it, therefore the purpose of our repair methodology is two fold:

A. To retain the rocks within the rock bag

B. Distribute the load around the damaged area maintaining bag integrity

For these reasons our approved Rock Bag Filter Units® repair methodology is to overlay a patch of the same bag material, lashed around the patch's perimeter with a 200Kg UV stable cord.

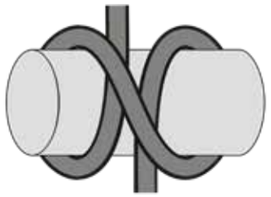
Repaired bag



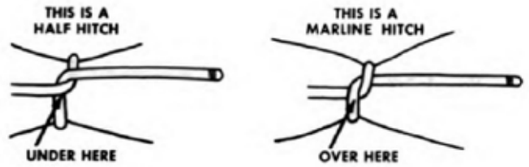
Patch Repair Steps

1. Identify the damaged area to determine if repair is needed and if yes, is the area less than 10% of bag area?
2. Place the patch piece over the tear aligning as close as practical the weave aperture,and completely covering the tear.
   - NOTE: The patch needs not to be placed perfectly.
3. Start the repair by tying one corner of the patch to the rock bag using a Clove Hitch.
4. Starting from the Clove Hitch, and working around the perimeter of the patch lash the patch and bag together.
   - The simplest methods to use are either: Half Hitch, Marline Hitch, OR, Munter Hitch
5. Finish with a Double Clove Hitch
6. Your Rock Bag Filter Unit is securely repaired and ready for use.

Clove Hitch



Half and Marline Hitch



Patch in progress



Double Clove Hitch



Autonomous Release Hook (ARH) User Manual

Project Material's Autonomous Release Hook, complies to AS 3990-1993 Mechanical equipment - Steelwork, AS 4991-2004 Lifting devices, and proof load tested in accordance with AS 4991 Section 12.2. to a W.L.L of 8 ton and marked in accordance with AS 4991 Section 13. Please follow the instruction enclosed for safe operation.



Hook weight 14.5Kg without lifting ring

SAFETY FIRST SAFETY ALWAYS

Always wear appropriate Personal Protection Equipment

DO NOT STAND UNDER FILLED ROCK BAG FILTER UNITS

Operation Steps:

1. Place pin through the clasp and sling or other rated lifting equipment
2. Fit washer and nut and hand tighten **Do Not Use Tools To Tighten**
3. Place lynch pin fully through hole and ensure spring clip rests fully home
4. Ensuring there is some weight on the lift ring, place the ring into the hook towards the root






5. With hand placed on the counterweight swing the hook to its closed position
6. You are ready to lift
   - At this point you can release your grip from the counterweight and it will remain in place during lift and placement.
7. Sidewards pressure can be placed on the hook ensuring the accumulative drag and Rock Bag Filter Unit does not exceed 8000Kg
8. To release, lower the hook until there is no load. The hook will rotate to release the lift ring.






FULL-SCALE VALIDATION OF ROCK BAG ARMOUR UNITS

Independent Testing by AMC Search (Australian Maritime College)



Overview

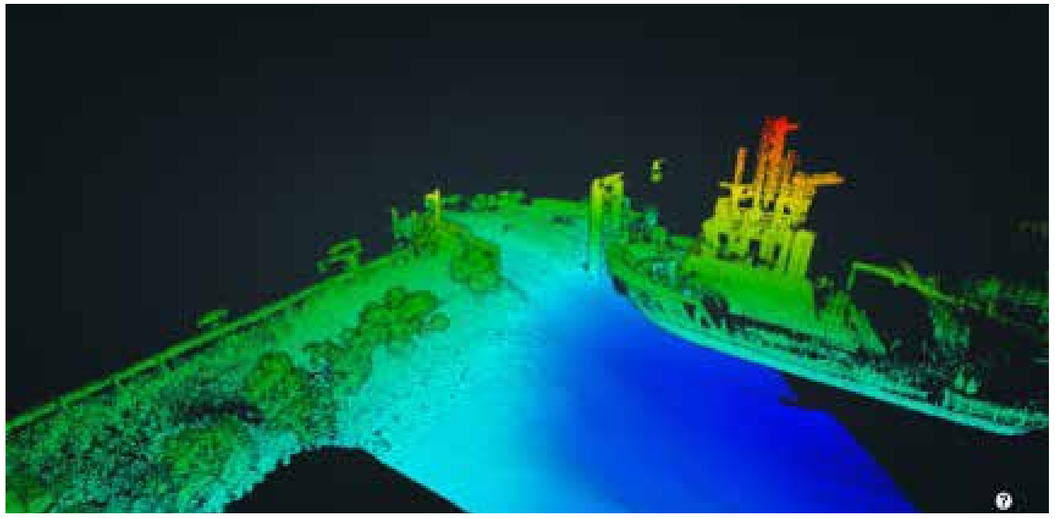
Project Material Pty Ltd commissioned independent full-scale field testing of its Rock Bag Armour Units to assess their performance as scour protection under vessel-generated propulsion wash. The testing was undertaken by AMC Search, the commercial research and consultancy division of the Australian Maritime College, in October 2022.

The purpose of the trial was to validate, at full scale, the stability of Rock Bag Armour Units when subjected to bow and stern thruster wash from a working tug vessel, and to benchmark performance against earlier laboratory-scale testing undertaken at the University of NSW Water Research Laboratory.

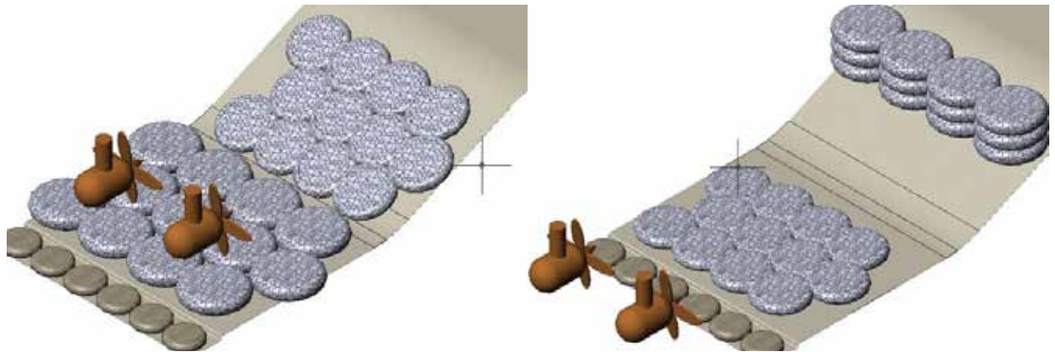
The results demonstrated high stability and minimal movement of Rock Bag Armour Units under sustained wash conditions, supporting their suitability for use on revetments, berth pockets, quay walls, and around piles where vessel propulsion wash is present.

Background and Context

Rock Bag Armour Units are promoted as an alternative to conventional loose rock armour for marine and riverine scour protection. Typical applications include protection of revetments and quay wall toes, scour control around piles and marine structures, and berth pockets exposed to bow and stern thruster wash.



Prior to this study, performance data for Rock Bags under propulsion wash was largely derived from scaled physical modelling, including the Super Cruise Vessel vs Rock Bags study presented at the Australasian Coasts and Ports Conference in 2019. That study demonstrated stability of interlocked Rock Bag systems under design thruster velocities, with displacement occurring only under extreme, off-design conditions.



Test Location and Setup

The testing was conducted on 7 October 2022 at Pacific Tug's Brisbane Marine Base, using the tug Cape Mac. The site included an existing sloped riverbank and a permanently moored barge suitable for controlled installation and testing.



The test setup incorporated a natural riverbank slope comparable to typical revetment geometries, on-site filling and installation of Rock Bag units, bathymetric and topographic surveys before and after testing, and diver-assisted placement using crane operations. No major civil works were required, allowing the test to reflect real-world installation conditions rather than idealised laboratory geometry.



Rock Bag Configurations

Three Rock Bag sizes were installed and observed during testing. Small Rock Bags of approximately 2 tonnes were used for toe protection, ground preparation, and scour mitigation around piles and adjacent areas. Medium Rock Bags of approximately 4 tonnes were installed on revetment slopes and exposed directly to propulsion wash. Large Rock Bags of approximately 8 tonnes were installed at the base and stacked in freestanding wall configurations.

All bags were filled on site using purpose-built jigs to ensure consistent geometry and prevent overfilling. Installation was carried out using a mobile crane and divers, replicating standard marine construction practice.



Test Methodology

The tug Cape Mac is a twin-azimuth stern drive vessel with a maximum bollard pull of approximately 42 tonnes. During testing, both azimuth units were operated simultaneously and oriented toward the Rock Bag installations. Engine RPM was progressively increased to near-maximum safe operating levels. Water velocities were measured using an Acoustic Doppler Velocimeter at a fixed monitoring location within the propulsion-wash field.

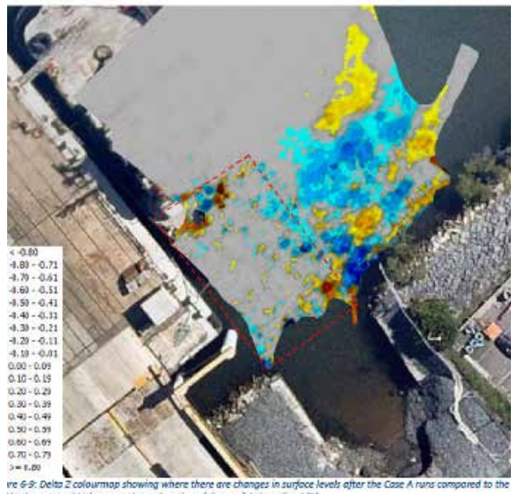
Three primary configurations were assessed: (A) 4 tonne bags on the revetment and 8 tonne bags on the base with the tug positioned directly over the installation; (B) the same bag arrangement with the tug positioned approximately 8 metres from the revetment; and (C) 8 tonne bags stacked as a freestanding wall with 4 tonne bags at the base. Bathymetric surveys were conducted after each test sequence to detect any movement of bags or surrounding sediments.

Results and Observations

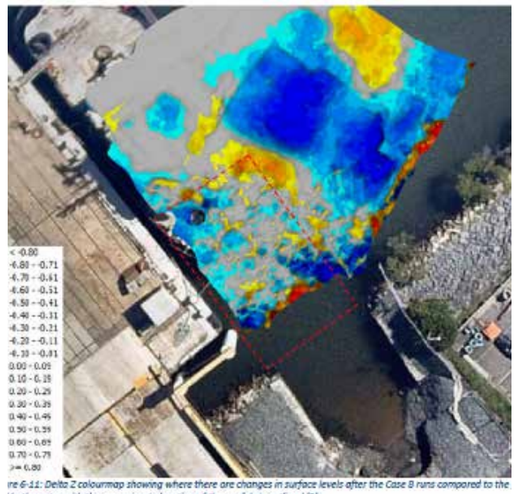
Across all test configurations, minimal movement of medium and large Rock Bag units was observed under sustained propulsion wash. No collapse or displacement of stacked 8 tonne Rock Bag wall configurations occurred. Small Rock Bags at the toe and around piles remained stable despite localised scour in adjacent unprotected areas.



Measured water velocities at the monitoring location reached approximately 5.3 m/s, representing the highest reliably recorded values during testing. Bathymetric surveys confirmed that changes detected in some areas were primarily associated with sediment movement rather than displacement of Rock Bag units.



re 6-9: Delta Z colourmap showing where there are changes in surface levels after the Case A runs compared to the bathymetry with the approximate location of the geofabric outlined [3]



re 6-11: Delta Z colourmap showing where there are changes in surface levels after the Case B runs compared to the bathymetry with the approximate location of the geofabric outlined [3]

Additional Observations on Comparative Performance and Velocity Measurement

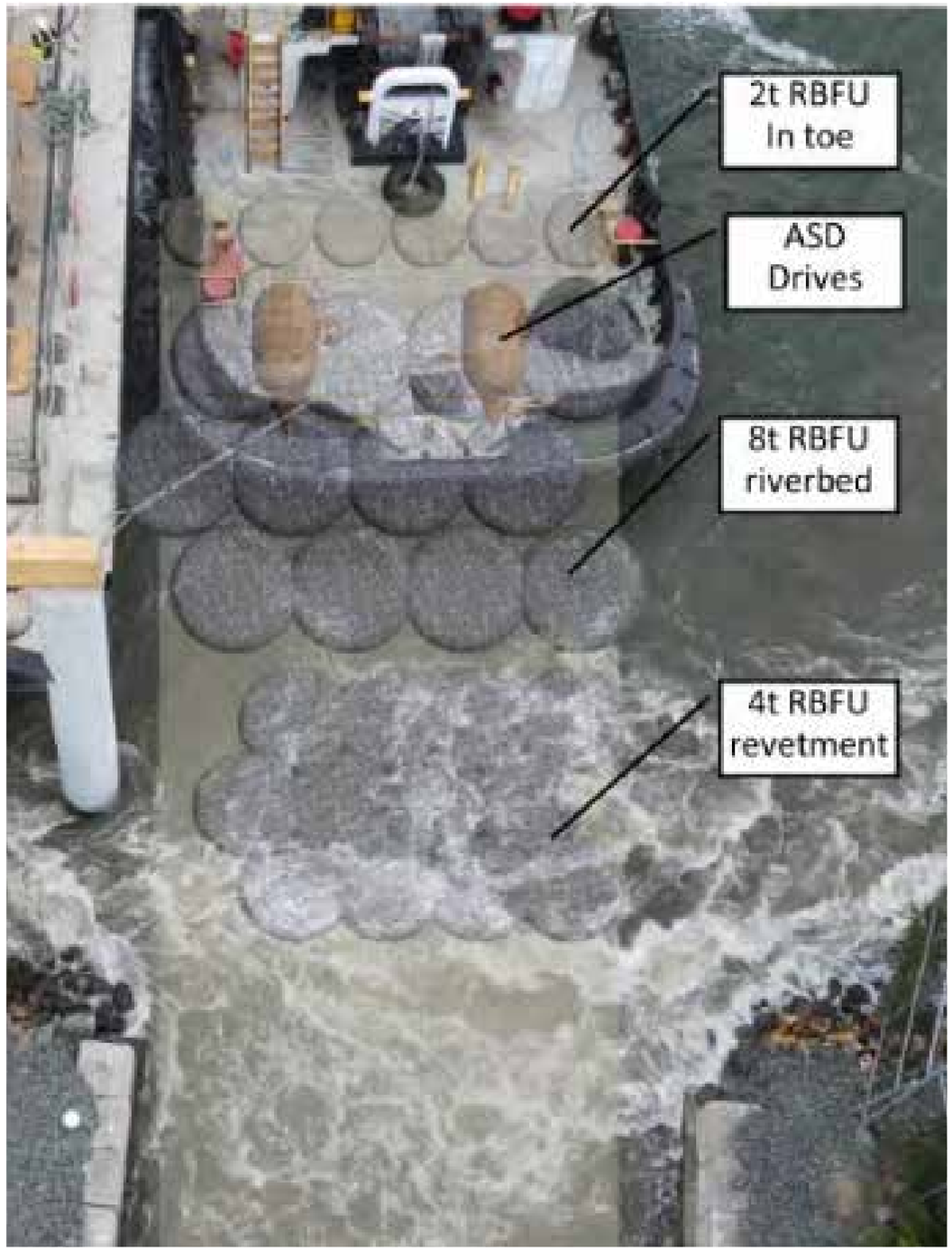
Earlier laboratory-scale testing undertaken by Messiter et al. at the University of NSW Water Research Laboratory assessed only 4 tonne and 8 tonne Rock Bag units. That study demonstrated stability of interlocked 4 tonne units at the design bow thruster exit velocity of 6 m/s, with displacement occurring only under extreme, off-design testing at 8 m/s and at lowest astronomical tide. No testing was undertaken on 2 tonne units.

In the AMC Search full-scale field trials, water velocities were recorded at a fixed monitoring location. While the reported velocity of approximately 5.3 m/s represents the highest reliably measured value at that location, propulsion wash is inherently turbulent and spatially non-uniform, with localised velocity maxima potentially occurring elsewhere in the flow field. This behaviour is well documented in propeller-wash literature and PIANC guidance.



Notwithstanding these considerations, Rock Bag installations across all test configurations exhibited no measurable movement under the applied thrust conditions. This included extensive use of smaller approximately 2 tonne Rock Bag units, which were exposed to the same propulsion-wash environment as the larger bags and remained stable throughout testing. These observations support the conclusion that system interaction and installation configuration are key contributors to hydraulic stability.

Case A Overlay Diagram



Case B Overlay Diagram



Conclusions and Practical Implications

The independent full-scale testing demonstrated that Rock Bag Armour Units remain stable under sustained vessel propulsion wash within the tested operational envelope. The results support their use for revetments, berth pockets, and scour protection around marine structures, and confirm that interconnected Rock Bag systems provide robust performance under real-world installation and operating conditions.

Testing and reporting were undertaken independently by AMC Search (Australian Maritime College), Reference No. 22-G-37, October 2022.

> ***"Rock Bag Armour Units remain stable under sustained vessel propulsion wash."***

Project Material Pty Ltd

Project Material supplies specialist environmental and civil construction materials both nationally and internationally. Our streamlined logistics network ensures fast, reliable delivery to support project timelines and budgets.

Delivery options include direct site delivery and depot-to-depot transport services nationally and internationally.

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