



SUSTAINABLE WATER MANAGEMENT IN CIVIL ENGINEERING STRUCTURES

Date June 6, 2023

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10' Water management in civil engineering structures

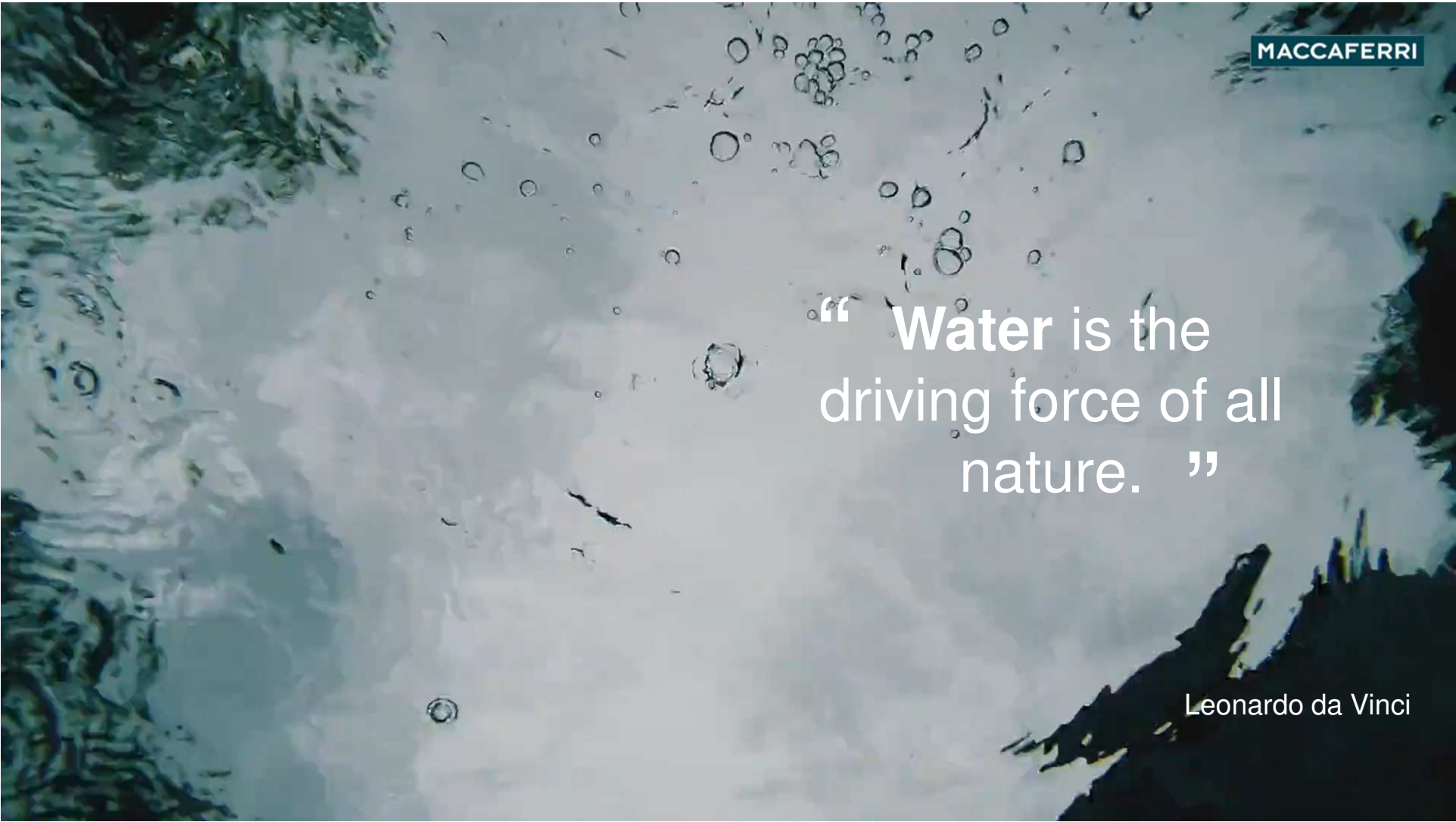
20' MacDrain W

10' Our projects around the world

Q&A Session

Speaker: Marianna Lucia Ferrara

GSY Business Unit - Business Development



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“ Water is the
driving force of all
nature. ”

Leonardo da Vinci

Water management is
crucial for the **long-term**
performance of structures.

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Drainage in infrastructure



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Sand and gravel have
been utilized as
drainage solutions
throughout History.





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But the most **efficient**
solutions aren't
always the ones
steeped in **tradition.**



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How can designers
achieve **efficiency** without
compromising
affordability,
sustainability, and other
critical factors?

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**Maccaferri has the
response**



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MacDrain™

EFFECTIVE WATER MANAGEMENT



DRAINAGE GEOCOMPOSITE

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Definition & Functions

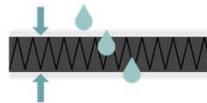
Maccaferri draining geocomposites are called **MacDrain**.

MacDrain geocomposites are made from a polymeric drainage core thermally bonded to a geotextile on one or both sides or to a waterproofing layer on one side. They provide several **main functions**:

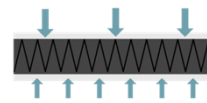
Drainage



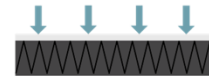
Filtration



Separation



Protection



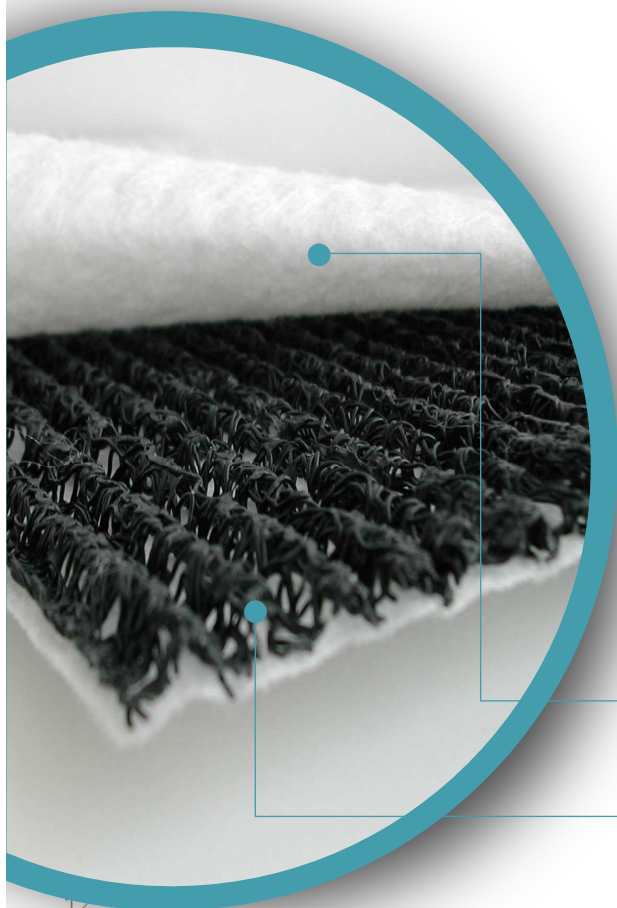
MacDrain geocomposites can fulfill additional functions based on project requirements and specific site conditions.

MacDrain

The core structure is flexible, with thickness ranging from 4 to 10 mm, a very high void ratio, and medium-high compressive resistance; due to the channel pattern, the flow capacity is much higher in the longitudinal direction than in the transversal direction.

NON-WOVEN GEOTEXTILE FILTER

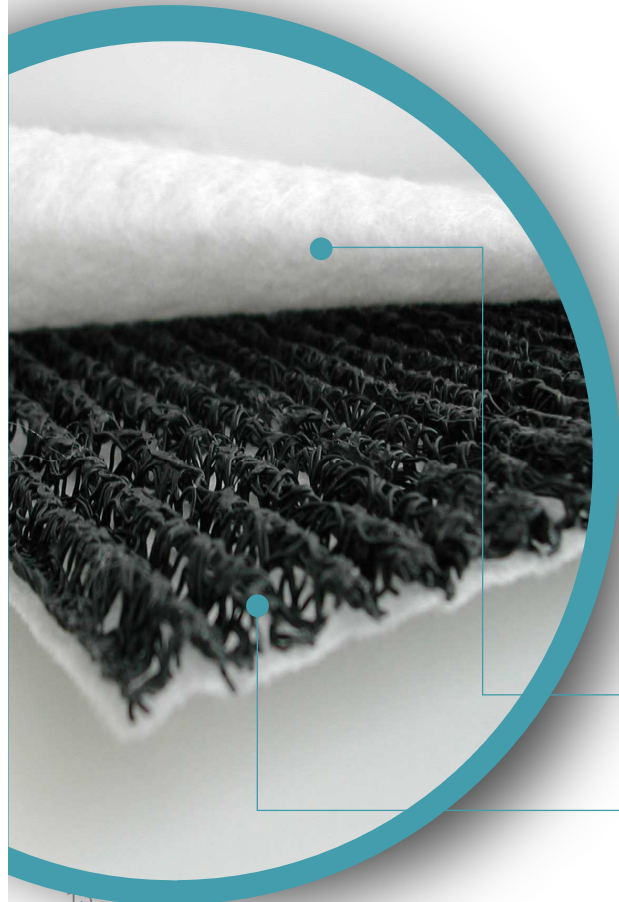
GEOMAT WITH W-SHAPED



OUR PRODUCT

MACCAFERRI

MacDrain



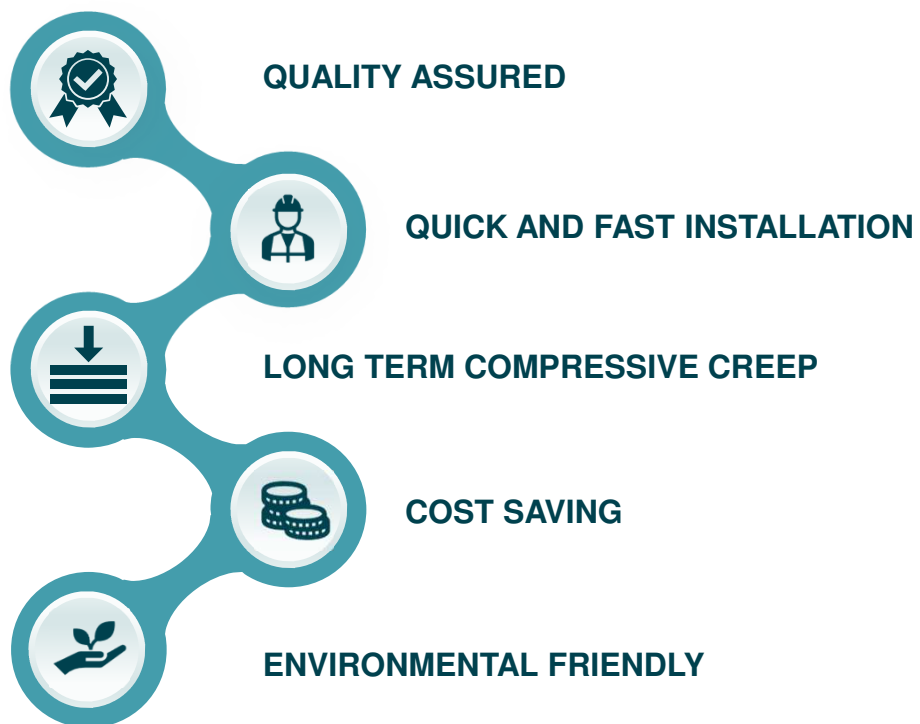
FILTER - Water and gas can pass through it - Soil is retained

DRAINAGE CORE - It drains water and gas

ADVANTAGES

MACCAFERRI

MacDrain



ADVANTAGES

MACCAFERRI

Quality assured

MacDrain



QUALITY ASSURED

MacDrain W is designed to be highly durable, with a range of chemical and UV-resistant materials that ensure long-term performance and protection. The product is subject to continuous quality control and testing.

ADVANTAGES

Quality Assured

MACCAFERRI



ASTM D4716/D4716M-22

Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head



ASTM D7931/D7931M-21a

Standard Guide for Specifying Drainage Geocomposites



ISO/TR 18228-4

Design using geosynthetics - Part 4: Drainage



ADVANTAGES

Quality Assured - ASTM D4716

MACCAFERRI



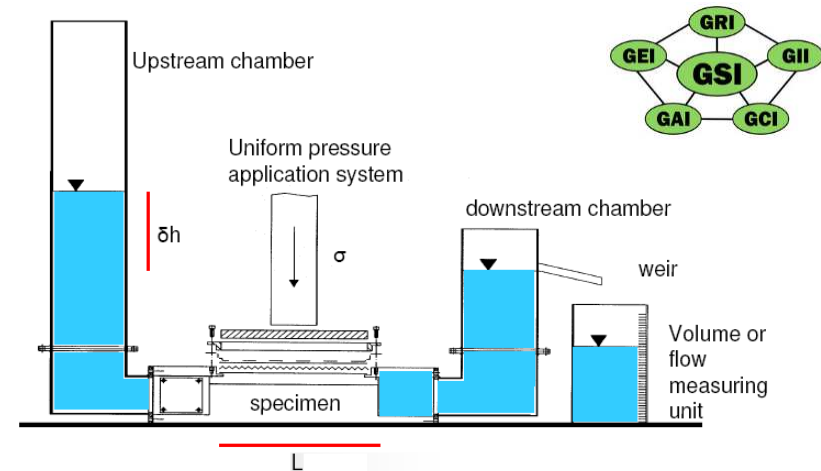
ASTM INTERNATIONAL

Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head



SCOPE

Determine the **flow rate per unit width** within the manufactured plane of geosynthetics under **varying perpendicular compressive stresses** and a constant head.



ADVANTAGES

Quality Assured

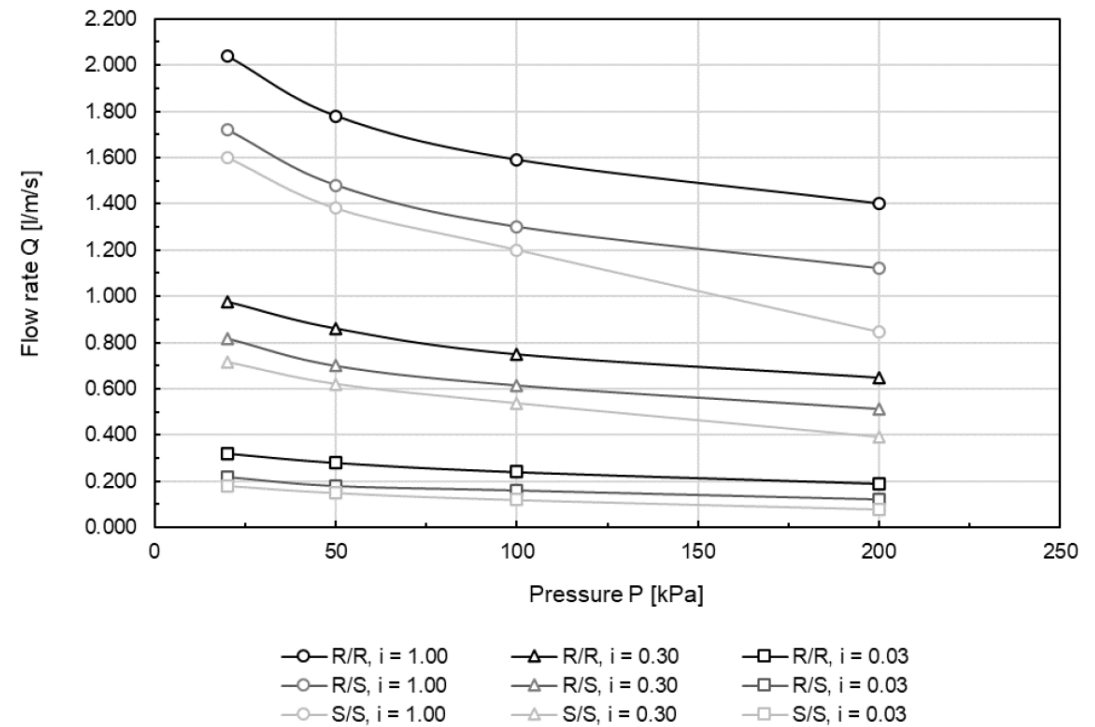


ASTM D4716/D4716M-22

Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

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MacDrain W 1061 - Flow rate Q



ADVANTAGES

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Quick and fast installation

MacDrain



QUICK AND FAST INSTALLATION

The product is also quick and easy to install, with a range of connection and anchoring systems that enable quick and efficient implementation, ensuring that it meets or exceeds the required performance.

ADVANTAGES

Quick and fast installation

MACCAFERRI

Quick and **easy**
unrolling system



ADVANTAGES

Quick and fast installation

MACCAFERRI

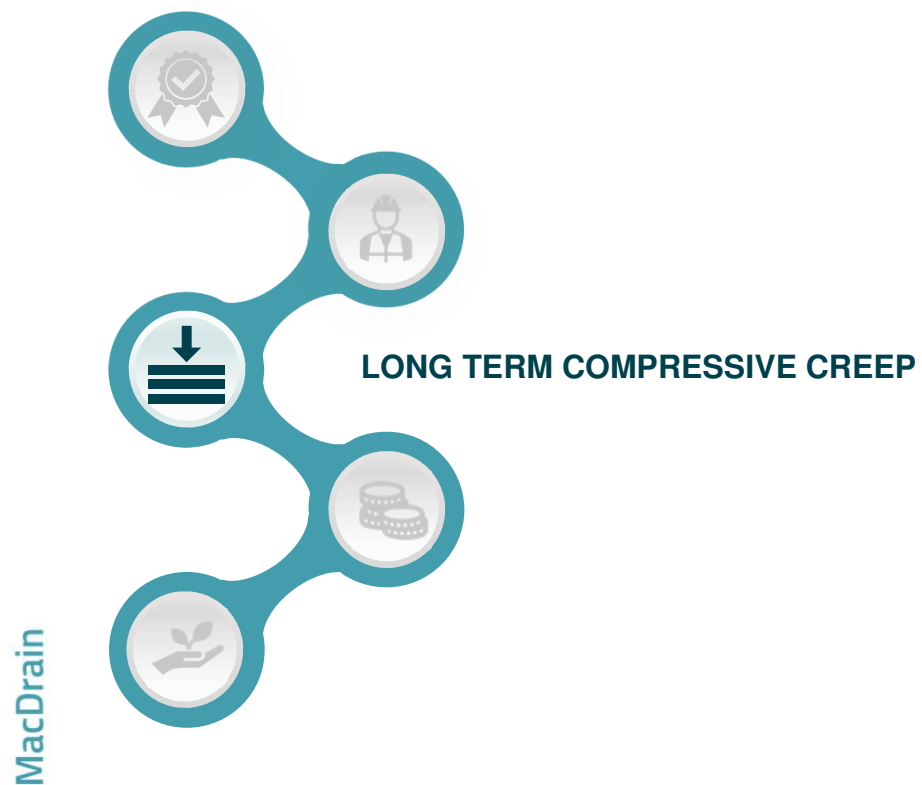
For a number of
**different
applications**



ADVANTAGES

MACCAFERRI

Long term compressive creep



One of the main advantages of MacDrain W is its compressive strength. It provides significant drainage characteristics with high resistance to compressive loads, minimizing compressive creep.

ADVANTAGES

MACCAFERRI

Long term compressive creep



ASTM D7406-20

Standard Test Method for Time Dependent (Creep) Deformation Under constant Pressure for Geosynthetic Drainage Products.



ASTM D 7361-07

Standard Test Method for Accelerated Compressive Creep of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method



ISO 25619-1

Geosynthetics — Determination of compression behaviour — Part 1: Compressive creep properties

LONG TERM
TESTED
COMPRESSIVE CREEP

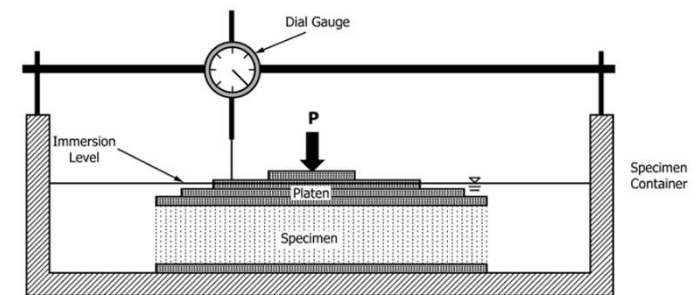
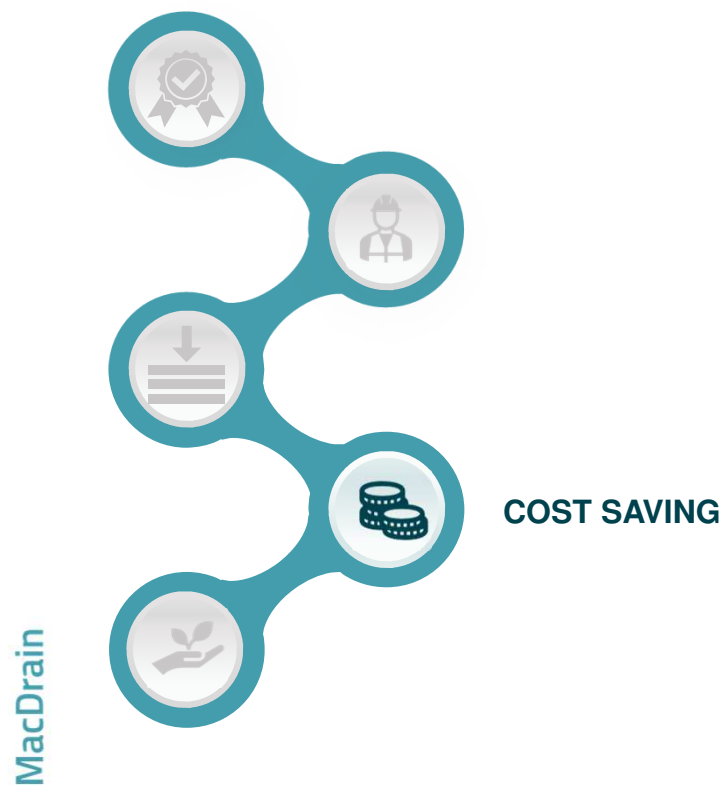


FIG. 1 Conceptual Apparatus Cross Section

ADVANTAGES

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Cost saving



The use of MacDrain instead of a traditional solution with mineral fills (gravels, sand) results in significant cost reductions, such as material cost, transportation, and overall efficiency.

ADVANTAGES

Cost saving

MACCAFERRI

MACDRAIN W

VS

MINERAL SOLUTION



ADVANTAGES

Cost saving

MACCAFERRI



ADVANTAGES

MACCAFERRI

Environmental friendly

MacDrain



ENVIRONMENTAL FRIENDLY

MacDrain W is designed to be highly durable, with a range of chemical and UV-resistant materials that ensure long-term performance and protection. The system is subject to ongoing quality control and testing, ensuring that it meets or exceeds the required performance.

ADVANTAGES

Environmental friendly

MACCAFERRI

MACDRAIN W

MINERAL SOLUTION

GWP GLOBAL WARMING POTENTIAL

2.33 kg/CO₂

2.67 kg/CO₂

TRANSPORTATION



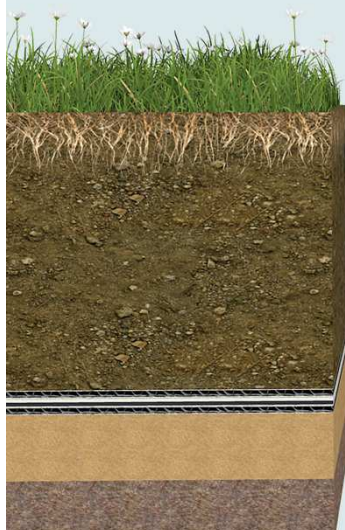
1 Truck of MacDrain W equals approximately 150 Trucks of Sand/Gravel

QUARRYING

0.5 m³

of aggregates saved
per linear meter

NOTES: 1) GWP of gravel is taken from epditaly.it; 2) estimation based on the assumption that a truck (30 t capacity) can carry 5,500 sqm of MacDrain while it can carry 18-20 m³ of aggregates 3) the thickness of the aggregate layer is 50 cm



ADVANTAGES

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Environmental friendly - MacDrain W vs Mineral Solutions

MACDRAIN W

MINERAL SOLUTION

GWP GLOBAL WARMING POTENTIAL

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ADVANTAGES

MACCAFERRI

Environmental friendly

Life Cycle Assessment studies aim at weighing emissions and impacts of a solution, starting from the raw materials to the construction and delivery of the finished system.

We conducted a detailed LCA study on our MacDrain Series to provide reliable and comparable information on the environmental impacts of our solutions, reducing energy and material consumption.



THE INTERNATIONAL EPD® SYSTEM
Certification number S-P-01470

Click on the link to find
more information

[EPD MACDRAIN](#)

or use the QR code!



ADVANTAGES

MACCAFERRI

Environmental friendly

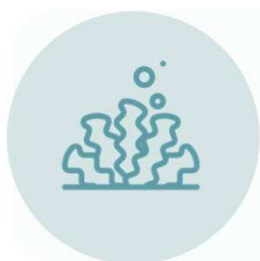
The **environmental performance** is assessed with the following impact category indicators:



Global warming potential (GWP) measures how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon relative to carbon dioxide.



Acidification Potential provides a measure of the decrease in the pH value of rainwater and fog, which has the effect of ecosystem damage.



Eutrophication Potential provides a measure of nutrient enrichment in aquatic or terrestrial environments, which leads to ecosystem damage.



Particulate Matter is defined as a mixture of solid and liquid particles of organic and inorganic substances resulting from human activities and suspended in the atmosphere.

Click on the link to find more information

[EPD MACDRAIN](#)

or use the QR code!



MAIN APPLICATION OF MACDRAIN W

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Retaining wall drainage

Horizontal drainage for transportation sector

Anti capillary layer

Against frost heave

Draining trenches

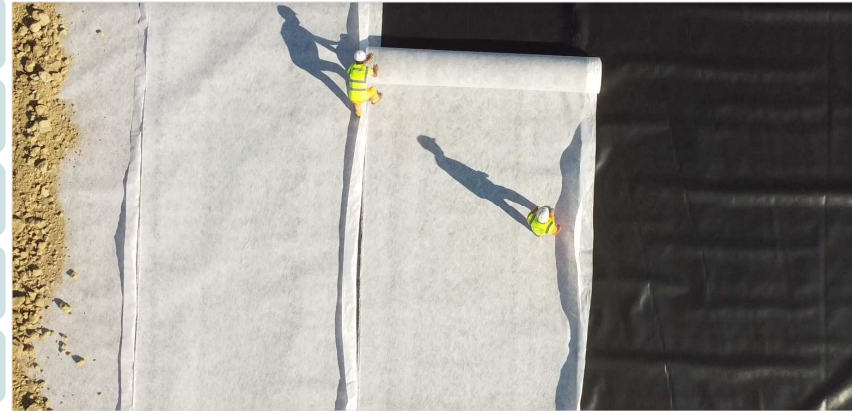
Sport fields

Leachate collection and gas ventilation in landfills

Tunnel applications

Roofing / Noise barrier / Foundation

Vertical walls



OUR BEST PROJECT AROUND THE WORLD

MACCAFERRI

In its

140 years of experience

Maccaferri has carried out thousands of projects around the world.



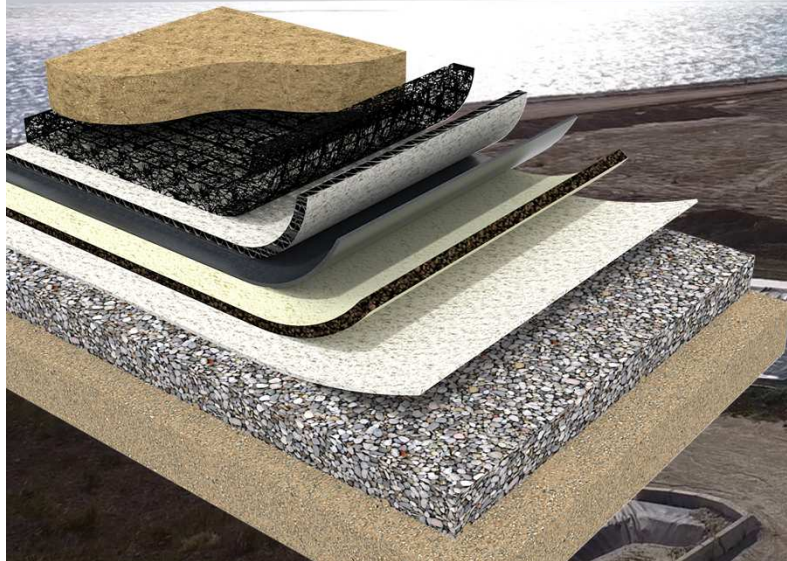


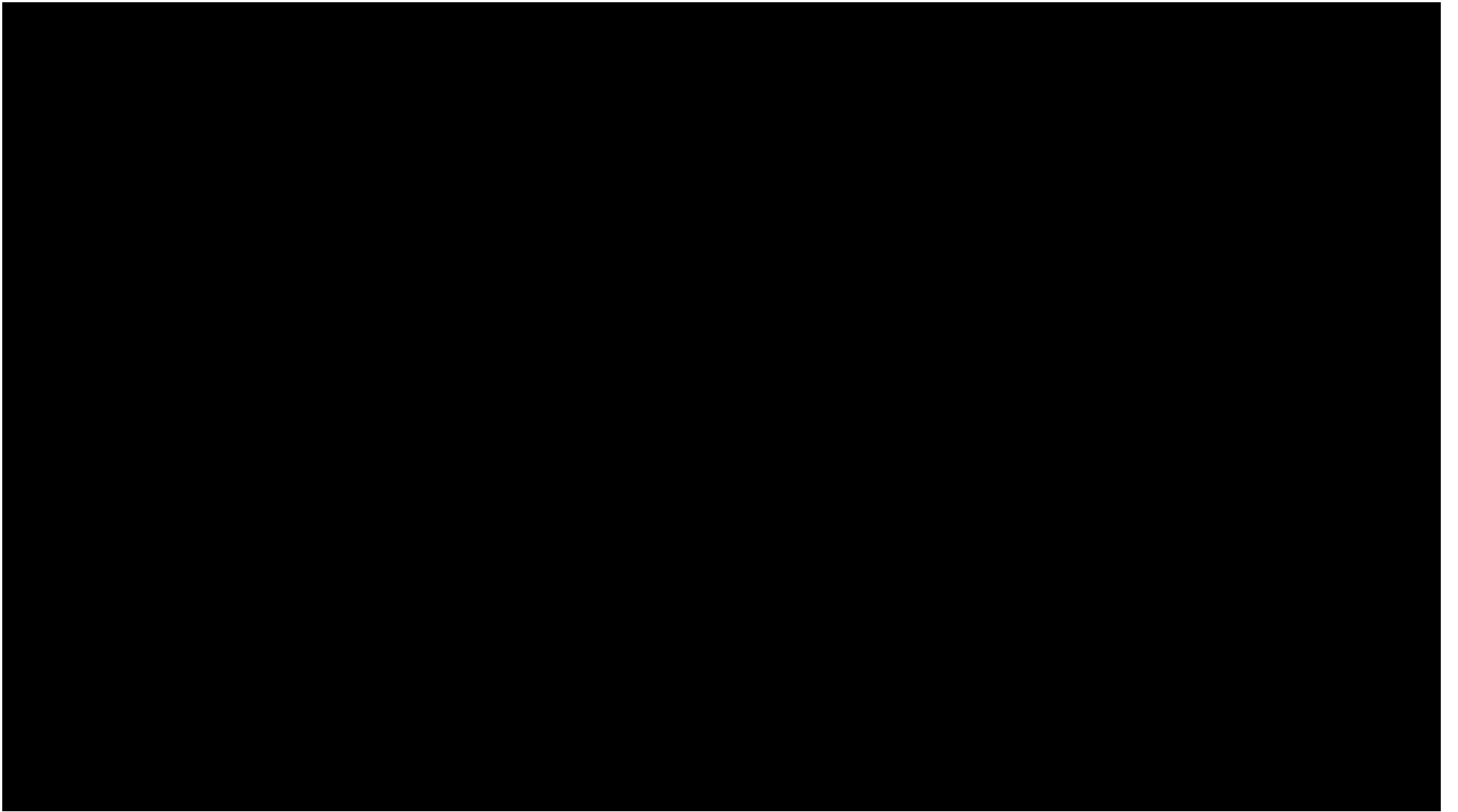
Reclamation intervention of the sin national interest area of Micorosa (*Brindisi, Italy*)





Application: Leachate collection and gas ventilation in landfills

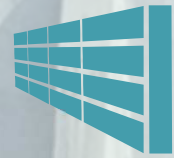






Danxia smelting plant project (*Danxia, China*)





Application: Vertical Walls

IMPERMEABILIZAÇÃO

MACDRAIN®





Securing The Planas Dam (Pujaut, France)





Application:
Anti capillary layer in embankments





Slope Management project of Shaanxi Danfeng Senior Middle School (Shaanxi, China)





Application: Retaining walls drainage



MACDRAIN™ W FOR THE SDGs

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Environmental Sustainability



MATERIAL SAVINGS



OUTSTANDING PERFORMANCE



FASTER INSTALLATION

8 DECENT WORK AND
ECONOMIC GROWTH



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



11 SUSTAINABLE CITIES
AND COMMUNITIES



12 RESPONSIBLE
CONSUMPTION
AND PRODUCTION



13 CLIMATE
ACTION

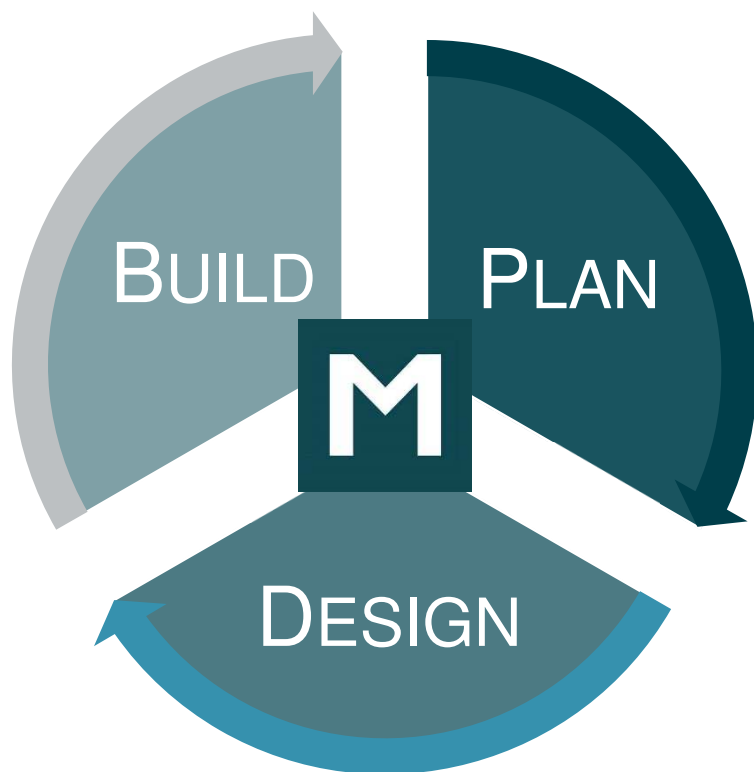


**SUSTAINABLE
DEVELOPMENT GOALS**

360° SUPPORT FOR YOUR PROJECT

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Maccaferri is always side by side with engineers, architects and builders



Our **geotechnical, hydraulic & environmental engineering experts** can support you through all the project phases.



Q&A