




Special sessions on Geosynthetics, ICID Conference in Marrakech, November 25, 2021



Use of Bituminous Geomembrane (BGM) In Water Storage Reservoirs

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Bertrand Breul



In his capacity as the Global Technical Director for Axter Coletanche Inc., Bertrand Breul brings 20 years of Engineering experience with over 13 years in the Geosynthetic industry. He has been instrumental in the development of standards and certifications for Coletanche worldwide.

Overseeing training, research and development and quality control has given Bertrand a unique perspective on how the market perceives and reacts to Coletanche not only in North America but within all regions in which Axter conducts business.

Bertrand was the Managing Director for Canada based in Montreal, QC for over a decade. In this role he was responsible for all technical and sales/marketing functions for Axter Coletanche Inc. This experience affords clients in North America a broad range of industry and market related expertise.

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Water Storage Reservoirs

- * Man-made water storage reservoirs provide a simple and economic way to store large volumes of water.

However

- * Reservoirs have operational challenges that must be addressed, including:
 - * Water losses due to evaporation
 - * Water losses due to infiltration to the soil
 - * Variation of water level in the reservoir
 - * Need for periodical cleanup
 - * Project lifetime

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Selection of a Waterproofing Membrane

To select a membrane to waterproof a reservoir the designer should consider the following:

- * Is it suitable to store water ?
- * What are its mechanical properties (tensile and puncturing strength)
- * Will the membrane be covered or will be left exposed ?
- * How will the water level in the reservoir vary ?
- * What are the installation conditions (temperature, wind) ?

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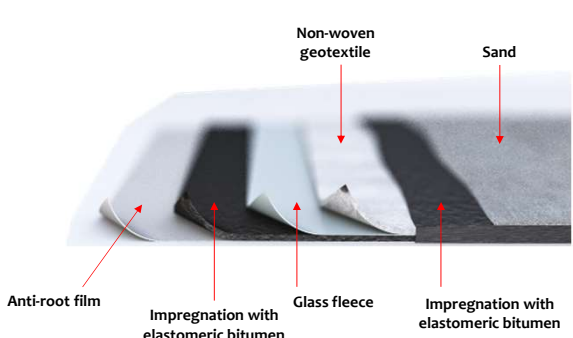
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Description of BGM


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BGM Internal structure

A BGM is a multi-layered composite where each component serves a different purpose

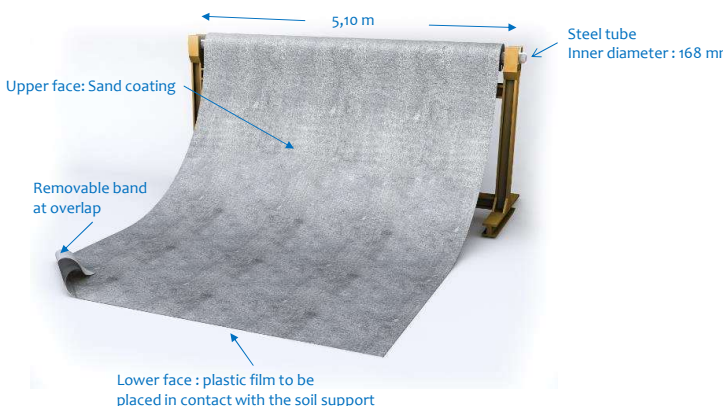


The diagram illustrates the internal structure of a BGM (Biosynthetic Geomembrane) as a multi-layered composite. The layers, from top to bottom, are: Anti-root film, Impregnation with elastomeric bitumen, Glass fleece, Non-woven geotextile, Impregnation with elastomeric bitumen, and Sand. Red arrows point from the labels to the corresponding layers in the cross-section.

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BGM Commercial Presentation



- * Five different thicknesses ranging from 2,2 to 5,6 mm
- * Roll lengths from 140 m to 55 m, depending on membrane thickness

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Key BGM Features for Reservoir Lining

A BGM provides the following features that are of interest for use in waterproofing a water reservoir:

- * Has a high puncture and tensile resistance
- * Has excellent resistance to weathering, particularly to UV radiation.
- * Is durable in both exposed and covered conditions
- * Is easy to install and repair
- * Is certified under ANSI NSF/61 for use in drinking water systems

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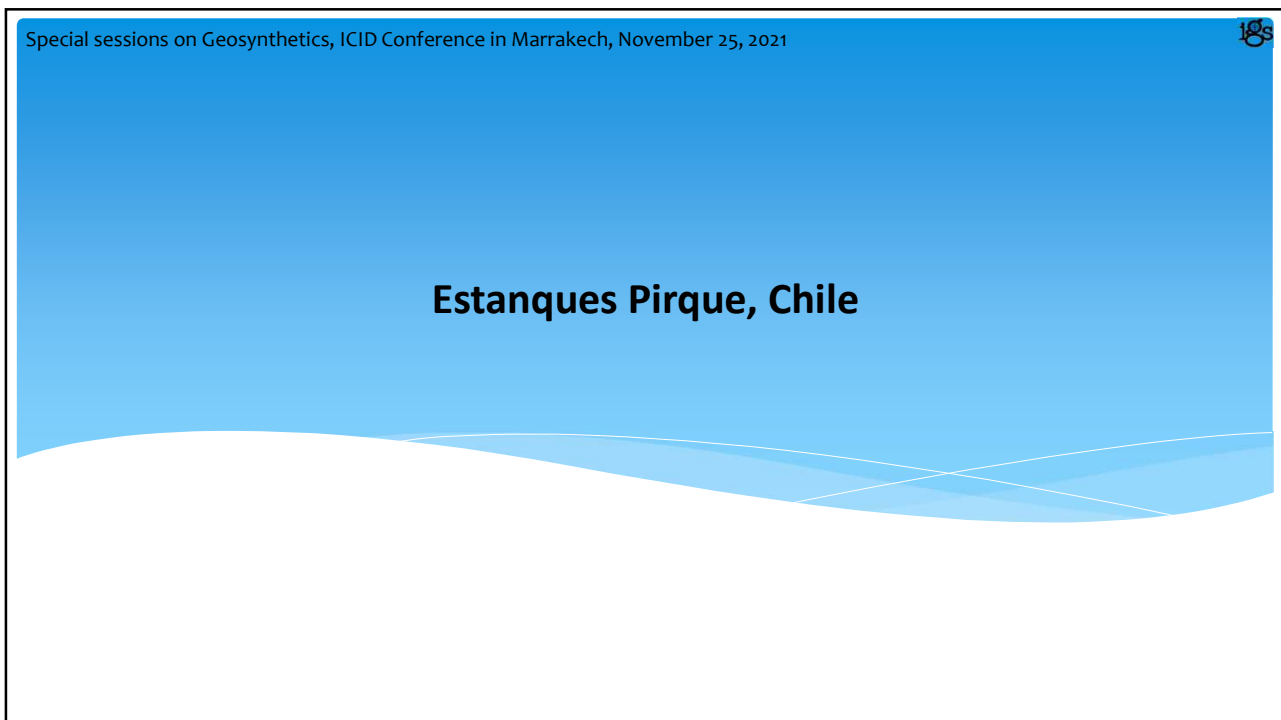
Slide 9 features a blue header with the IGS logo in the top right corner. The main title is "Recent Examples of BGM Application". Below the title, there is a list of three examples, each preceded by an asterisk. At the bottom of the slide, there is a light blue footer containing the text "Special sessions on Geosynthetics, ICID Conference in Marrakech, November 25, 2021".

Recent Examples of BGM Application

- * Estanques Pirque, Pirque, Chile
- * Roza Reservoir, Washington, USA
- * Bel Air Reservoir, Maryland, USA

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Slide 10 features a blue header with the IGS logo in the top right corner. The main title is "Estanques Pirque, Chile". At the bottom of the slide, there is a light blue footer containing the text "Special sessions on Geosynthetics, ICID Conference in Marrakech, November 25, 2021".

Estanques Pirque, Chile

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Key Information

- * **Location:** Pirque, Chile, South America (about 75 km SE of Santiago)
- * **Capacity:** 1.500.000 m³ (397 million gallons) in six ponds
- * **Purpose:** Storage of raw water from the Maipo river.
- * **BGM used:** 480.000 m² of a 4,00 mm-thick membrane
- * **Construction:** Mid 2018 – End of 2019

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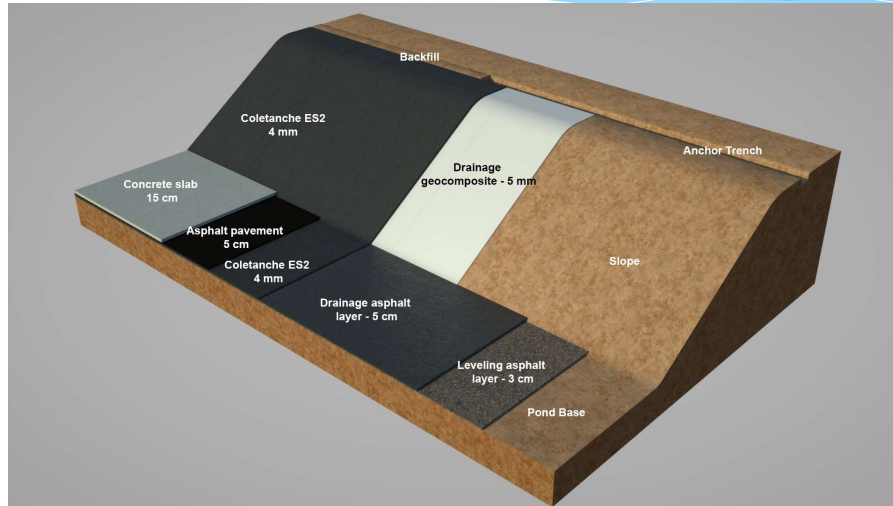
Estanques Pirque – Project Layout



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Estanques Pirque – Lining Scheme



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Estanques Pirque - Slopes



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Estanques Pirque - Bottom



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Estanques Pirque – Aerial View



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Key Information

- * **Location:** Sunnyside, Washington, USA
- * **Capacity:** 1.890.000 m³ (500 million gallons)
- * **Purpose:** Roza is a regulation reservoir for irrigation and human use.
- * **BGM used:** 220.000 m² of a 4,00 mm-thick membrane
- * **Construction:** 2017

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Roza Reservoir – Panel layout

Special 100-m long rolls manufactured for this project.

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Roza Reservoir – Lining completed

Credit : Rotschy, 2017

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Key Information

- * **Location:** Bel Air, Maryland, USA
- * **Capacity:** 340.000 m³ (90 million gallons)
- * **Purpose:** Storage of raw water from the Winters Run river
- * **BGM used:** 67.600 m² of a 5,60 mm-thick, high friction angle membrane
- * **Construction:** 2018

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Bel-Air Reservoir – Embankments



Credit : Hallaton, 2019

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Bel-Air Reservoir – Lining Complete



Credit: Hallaton, 2019

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Bel-Air Reservoir – Filling Process



Credit: Hallaton, 2019

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Bel-Air Reservoir – Aerial view



Credit : Hallaton, 2019

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Conclusions

BGM has proven to be a cost-effective solution to waterproof water storage reservoirs based on:

- * Certification under ANSI NSF61 for Drinking Water Systems Components
- * UV resistance eliminates the need for soil covers or other protections.
- * Ability to receive asphalt pavement or concrete slabs directly on top of the membrane to allow mechanical cleanup of the reservoirs if required.
- * Durability under exposed and covered conditions
- * Easy installation even under adverse weather conditions (-45°C to + 45°C)

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