

LINING SYSTEMS

GEOMEMBRANES FOR
PROTECTING STRUCTURES
AND THE ENVIRONMENT





The Plastics Experts.

The AGRU success story already spans seven decades. Founded in 1948 by Alois Gruber sen., the company is now counted among the most important comprehensive suppliers for piping systems, semi-finished products, protective liners for concrete and geomembranes made of engineering plastics. The fact that we provide everything as a single source supplier distinguishes us from many competitors. We process exclusively high-quality thermoplastic materials. And when it comes to problem-solving expertise for material selection and installation, we are your best partner.

More than 30 years ago, AGRU was already setting new standards by starting to manufacture calendered geomembranes with a width of 5 m. Since then, the company has constantly developed its product range and now offers an economical and safe solution for almost every application. AGRU Kunststofftechnik GmbH's state-of-the-art production facilities enable coextruded geomembranes to be manufactured, reinforcing elements to be integrated, and the laminating of non-wovens, in addition to the production of smooth and structured geomembranes. Geomembranes with widths of up to 7 m and thicknesses of between 0.5 mm and 4.0 mm are offered. The materials available include HDPE (high-density polyethylene), LLDPE (linear low-density polyethylene), VLDPE (very low-density polyethylene) and FPP (flexible polypropylene).



Quality

At AGRU, customer satisfaction comes first. Technical consultations, training courses, welding instruction and expert supervision on-site are essential for this. The AGRU quality assurance system is compliant with ISO 9001:2015 and its environmental management system fulfils ISO 14001:2015. This in turn ensures that the products comply with international norms, as monitored and evaluated on an ongoing basis by independent testing agencies.

The start-to-finish attention to quality ensures that the products meet the strictest technical requirements.



LINING SYSTEMS

Universally deployable

AGRU Lining Systems offer the right solution for every application through an array of products made of many different combinations of surfaces and materials while being supported by an extensive range of accessories. AGRU Lining Systems are found wherever geomembranes are used, such as in landfill and hydraulic engineering, groundwater protection, and building and tunnel sealing.

Soil and groundwater protection

with geomembranes for mining, hydraulic and landfill engineering, and liquid manure and retention basins

AGRU LINING SYSTEMS offer solutions for every requirement

- available in the materials HDPE, LLDPE, VLDPE and FPP
- availability of different surface structures (smooth, anti-slip or structured)
- signal layers enable visual control of the sealing system

Efficient corrosion protection in tunnels

AGRUFLEX protects the inner concrete shell

AGRUFLEX made of VLDPE is the optimum solution

- for bored and cut-and-cover tunnels
- provides protection from aggressive mountain water
- perfectly matches the tunnel shape thanks to high flexibility

Excellent product properties

thanks to the use of the chemically resistant materials PE and PP

AGRU LINING SYSTEMS will last decades

- plasticiser-free plastics guarantee long-term performance
- high tensile strength, elasticity and flexibility
- excellent static puncture resistance

Economic installation

simple and permanent welding technologies

Suitable for any application

- physiological safe welding
- innovative installation methods (e.g. induction welding)
- the membranes are easy to install thanks to excellent elongation and flexibility

One stop shopping

Liner, water stop profiles, discs and drainage pipes

A complete system for the perfect watertight sealing

- welding rods, waterstop profiles and cleaner
- drainage systems in PE and PP for area and strip drainage
- compatible with concrete protective liners, semi-finished products and piping systems made by AGRU



Excellent product properties

Chemical and mechanical resistance

Lining material attributes are produced to meet the specific requirements of each application. Various types of PE and PP are available. AGRU application engineers with many years of experience will be happy to advise you on finding the solution that meets your needs.



High-density polyethylene (HDPE)

The ongoing development of HDPE molding compounds in the recent years has improved the performance of HDPE geomembranes significantly. AGRU HDPE geomembranes meet sealing technology requirements, providing best-in-class flexibility, good strength, and good elongation behavior. Additionally, the liner offers high chemical resistance and proven long-term durability. This state-of-the-art lining material is able to meet the project requirements of a variety of applications.



Linear-low density PE (LLDPE)

LLDPE has a higher proportion of comonomers than HDPE, which means a higher degree of branching in the main chain. As a result, the crystalline content and the density are lower than those of HDPE. Plastic geomembranes made of LLDPE are more flexible than HDPE membranes and have a higher elongation at break under biaxial stresses. Plastic geomembranes made of LLDPE are used in hydraulic engineering and also for applications that are sensitive to setting, such as the surface sealing of landfill sites.

Very low-density PE (VLDPE)

The PE product line is complemented by the AGRUFLEX VLDPE geomembranes. These combine the advantages of a HDPE geomembrane with a high degree of flexibility. Due to its excellent chemical, physical and biological properties, this product is suitable for a wide range of applications. Its main applications are in tunnel and pond construction.



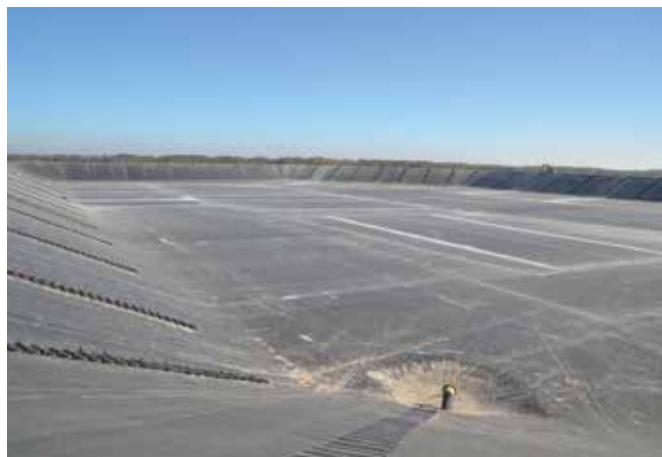
High-temperature-resistant PE (HTRPE)

The maximum continuous operating temperature of HDPE geomembranes has been limited to a temperature of 60° C until now. At higher temperatures, thermo-oxidative degradation occurs, resulting in a relatively short service life. AGRU has many years of experience in piping for hot water and has now incorporated this knowledge into the development of the HTRPE membrane, which is able to cope with continuous operating temperatures of up to 100 °C and has excellent long-term stability.



Flexible polypropylene (FPP)

FPP is the latest polyolefin material and was only introduced at the end of the last millennium. Because FPP does not need to be manufactured with plasticizers, it is completely homogenous with very low crystallinity, high strength, and maximum flexibility. In addition, FPP has a lower coefficient of thermal expansion than PE-based materials. Thanks to these properties, AGRUFLEX FPP membranes adapt to the substrate perfectly and are therefore ideally suited to pond construction.





Soil, groundwater and corrosion protection with AGRU LINING SYSTEMS

AGRU LINING SYSTEMS are suitable for virtually any application. Chemical-, root-, rodent- and UV-resistant, these tear-proof and extensible geomembranes are designed to last a long time.



Temperature resistant up to 100° C

High-temperature-resistant geomembranes made of HTR-PE by AGRU can be used at temperatures of up to 100 °C because of their special molecular structures. Areas of application include solar thermal systems, hot-water storage tanks, bioreactors, cooling basins and many others. Their installation and welding is carried out using the same technology as that used for conventional geomembranes made of PE.



Corrosion protection

Waterproofing ground-contact constructions involve the protection of buildings from moisture/water. For example, the foundation slab can be protected from damp/water rising from the ground by means of a horizontal seal with AGRU geomembranes. This durable material is root- and rodent-resistant, resistant to aggressive groundwater, and suitable for use in the supply of drinking water.

Water reservoirs

Protecting the most important resource for our future

Water reservoirs with steep embankments are reliably and permanently sealed with plasticiser-free, textured geomembranes from AGRU. Thanks to their excellent UV resistance and resistance to root penetration and rodents, these geomembranes are destined for a long service life.

AGRU geomembranes have been used in snowmaking ponds in alpine terrain to help ensure water supply for artificial ski slopes, an essential factor in drawing people for skiing holidays – and not just in Austria.



Hydraulic engineering with MICROSPIKE

AGRU MICROSPIKE High Grip has more than 20,000 studs/m², which makes it the ideal solution for steep slopes when combined with protection or drainage membranes. A stud-free welding area makes it easier to install.





Landfill engineering

Effective groundwater protection

Landfill lining systems are chosen depending on the materials expected to be stored on site. In some cases, a second layer of HDPE or LLDPE geomembranes is installed alongside other geosynthetics. In every case, however, the geomembrane is always the primary lining element at a landfill to prevent rainwater penetration when the surface of the cell is being lined, and to prevent groundwater from being contaminated via the landfill cell's base liner.



Landfill capping

A landfill body consists of highly contaminated waste that should be prevented from leaching into groundwater and the surrounding environment. To keep rainwater from permeating into the landfill body, the site must be covered promptly after the landfill cell has been closed. Closure can only be postponed where further settling is expected as a result of insufficient compaction. Depending on the degree of contamination of the deposited materials, geosynthetic composite systems are used for the surface closure.



Landfill base sealing

Pollutants must be prevented from leaching out of the landfill cell in order to protect the surrounding soil and groundwater from contamination. Geosynthetic composite systems are also used at the base of the cell, which significantly reduces the work involved and costs compared with traditional systems.

Drainage pipes

The drainage of a landfill body means the material has to meet special resistance requirements during the construction phase, because the drainage pipes are in continuous contact with the aggressive dissolved media. Once the landfill cell has been closed, no water is expected to flow in; the drainage therefore acts as control drainage and the pipes are exposed to concentrated amounts of landfill leaching.



HDPE pipes

The landfill leachate has to be transported from the outlet structures to the treatment units in order to be treated. AGRU HDPE pipes of the highest quality are used here to prevent contamination of the environment.



Pipe penetration

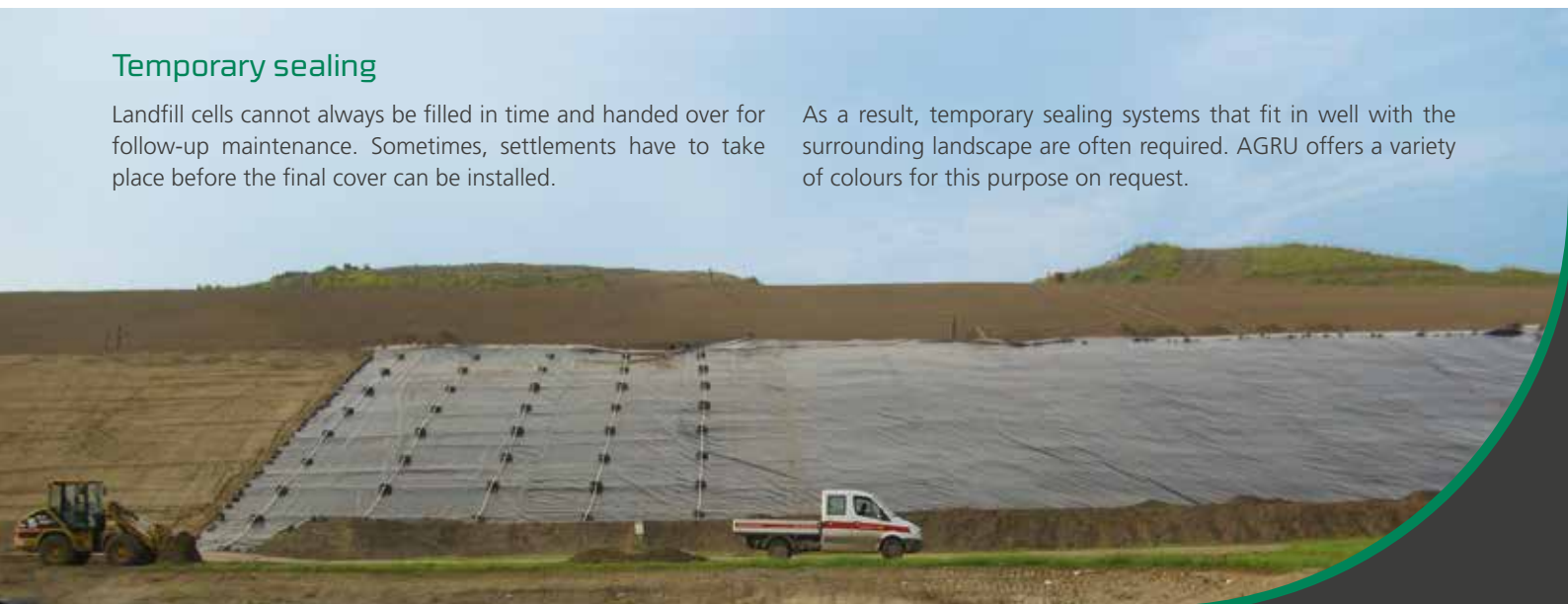
The combination of AGRU pipes, fittings and sheets with our HDPE and LLDPE geomembranes ensures that they all can be welded to the landfill body permanently with stable, leakproof joints. As a one-stop system supplier, AGRU is able match the various components optimally in terms of welding capability.



Temporary sealing

Landfill cells cannot always be filled in time and handed over for follow-up maintenance. Sometimes, settlements have to take place before the final cover can be installed.

As a result, temporary sealing systems that fit in well with the surrounding landscape are often required. AGRU offers a variety of colours for this purpose on request.



AGRUFLEX tunnel liners

Efficient corrosion protection for tunnel constructions

Tunnels are intended to be used for a very long time. For this reason, the sealing system requirements set by authorities are very strict. AGRUFLEX tunnel liners are made of highly flexible VLDPE with thicknesses ranging from 1.2 mm to 4.2 mm and widths between 2 m and 5 m and can also be laminated with non-woven textiles if required. This tunnel liner possesses excellent flexibility, high chemical resistance, and is suitable for drinking water applications. With its superb light-reflecting properties, the white signal layer not only enhances safety in a tunnel, but also offers an easy visual inspection to identify and remedy damage.



New Austrian Tunnel method

With the boring approach, the rock is secured with rock bolts, steel arches or other construction elements after excavation. These are then covered with shotcrete and the tunnel shape is created. The seal carrier, which is a „finely graded“ shotcrete, forms the surface for the interior construction work. To protect the liner and for drainage purposes, non-wovens are often installed between the shotcrete and the liner.



Cut-and-cover approach

With the cut-and-cover method, either a HDPE geomembrane or the flexible VLDPE tunnel membrane is used, depending on the project requirements. In most cases, the liner can simply be spread over the tunnel without being attached, but in certain cases, it is fixed to the outer wall of the tunnel. Fastening by means of water stop profiles is a cheap and technically sophisticated option in such cases.

Standard installation

The protection and drainage non-woven is fastened to the wall of the tunnel using mounting discs anchored to the seal carrier in a specified pattern. Following this, the liner is attached to the mounting discs using the penetration-free hot-air welding method. The VLDPE tunnel membranes are joined using hot-wedge welding. The white signal layer reliably indicates any damage that occurs during the installation. The tunnel can be segmented by partitioning off the block joints using the AGRU water stop profile.



Installation using EASYFIX

AGRUFLEX EASYFIX tunnel membranes are manufactured with a protective non-woven layer. This protects the tunnel membrane against point loads and damage, and is quickly and easily installed using hook-and-loop discs.



Installation using Induktofix

The AGRU Induktofix system was developed so that thermoplastic linings could be fastened to concrete structures using electromagnetic induction without the lining system being penetrated. In a tunnel, this enables wider membranes to be installed, which in turn offers speed benefits and increased system safety during installation by reducing the number of welds required.



Welding

The membranes are normally welded using hot-wedge welding. In case of penetration, defects that have to be repaired or difficult geometrics, extrusion welding is also possible. Subsequent pressure testing of the hot-wedge welds using a test channel is carried out in accordance with the national requirements or the sealing solution.





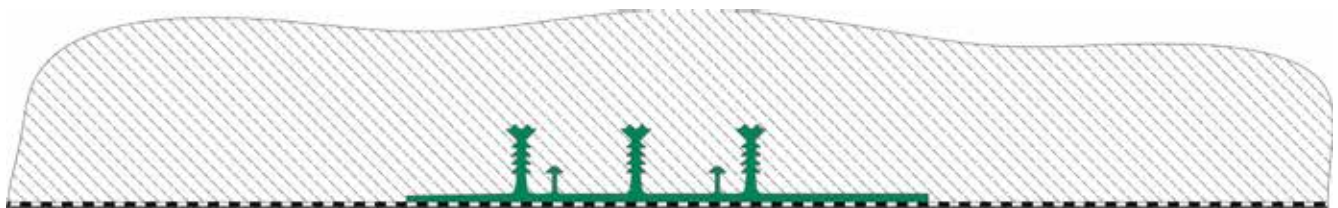
Water stop profiles

Tunnel construction and concrete structure connection accessories.

To supplement its geomembranes, AGRU also offers external water stop profiles. These are made of specially selected, highly flexible VLDPE materials. The arrangement of the anchor studs allows them to be anchored optimally in concrete. The main application for water stop profiles is sealing construction joints and block joints in concrete structures.

Advantages of AGRU water stop profiles

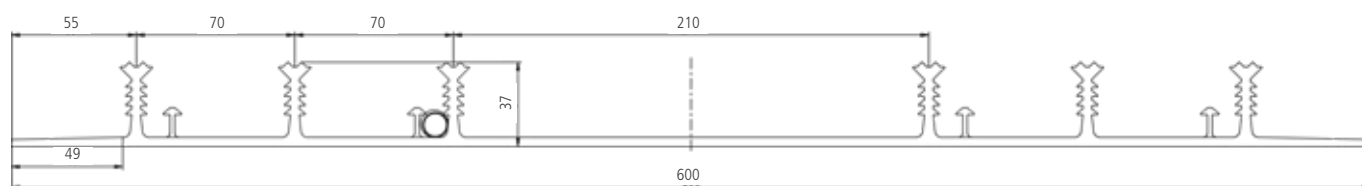
- Comply with DIN V 18197:2005 and DIN E 1854103:2005
- Certified according the ZTV-Ing (Germany) and ÖBV directive (Austria)
- Contain no plasticisers or halogens
- Integrated support for injection hoses
- Excellent flexibility



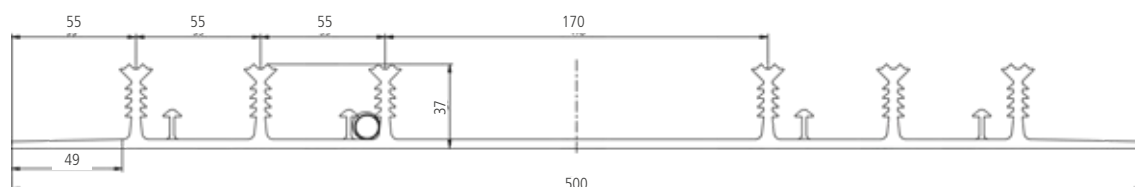
Product range

(mm)

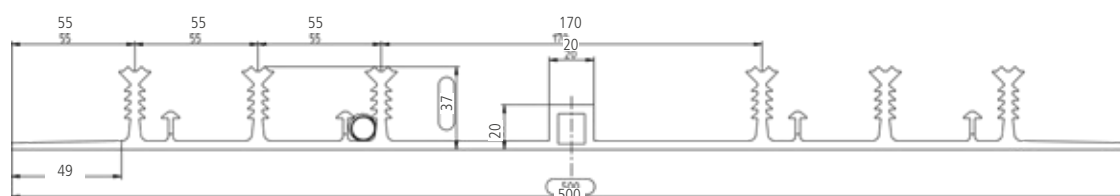
SAA 600/6



SAA 500/6



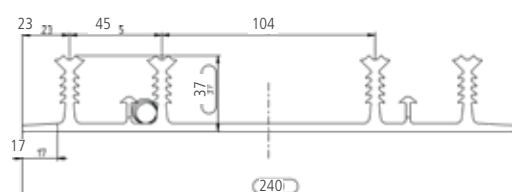
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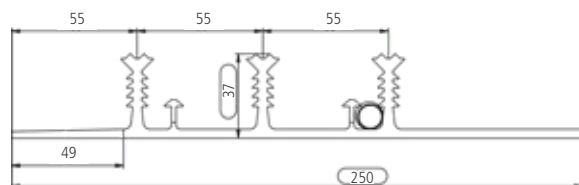
SAA 500/3



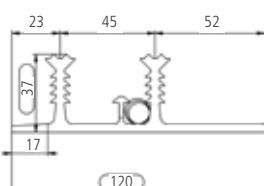
SAA 240/4



SAA 250/3



SAA 120/2





AGRUFLEX pond liners



AGRUFLEX pond liners made of FPP and VLDPE meet the highest ecological sustainability standards. This applies to their production, installation and throughout their service life.

As a one-stop system supplier, AGRU offers accessories for every challenge. Thanks to AGRU's wide product portfolio, we are able to provide for large public projects membrane widths of up to 5 m, but we can also make your own private dream of a swimming pond in your back garden at home come true just as easily.

All our geomembranes are free of diffusing plasticisers and therefore allow you to enjoy a swim without any worries.



Product range

A liner thickness of 1.5 mm is recommended for pond liners.
We offer the following products:

VLDPE

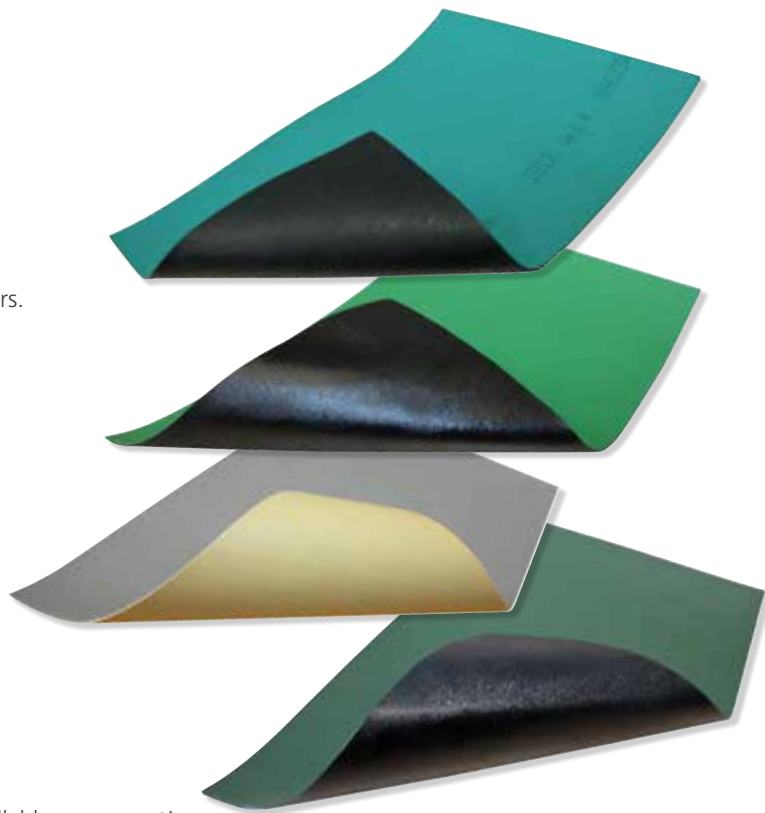
- Roll size: 5 m x 100 m - colour: black
- Roll size: 2 m x 25 m - colour: turquoise
(turquoise signal layer on black base membrane)

FPP

- Roll size: 5 m x 100 m - colour: black
- Roll size: 2 m x 25 m - colour: emerald green*
- Roll size: 2 m x 25 m - colour: chromium oxide green*
- Roll size: 2 m x 25 m - colour: grey/beige*
(Grey/beige only available in 1.2 mm)

Other thicknesses, widths, roll lengths and colours are available on request!

* Signal layer on black base membrane with glass-fibre fabric for optimal dimensional stability.



Welding

Installation is essential for permanently leakproof swimming ponds. The following methods are used for welding:

- Hot-wedge welding
- Hot-air welding
- Extrusion welding

Accessories

- Colaminated steel sheets
- Welding rod
- Drainage pipes
- Homogeneous membranes with a non-slip surface and a width of 2.0 m available in FPP and VLDPE



Geomembranes and accessories from a single source

Whether you need welding accessories, drainage pipes, water stop profiles, or interlocking profiles, AGRU provides all the components you need to install permanently leak-proof AGRU Lining Systems quickly.



Drainage pipes

Drainage is especially essential in tunnel and landfill cell construction. Our piping system does not only consist of full pipes, we can also offer perforated or slotted pipes made of PE or PP. Dimensioning is project-specific. You can choose bright, inspection-friendly interior surface if you wish. For reproducible welding results, AGRULINE E-fittings round off the range of products here.

AGRULOCK

This vertical sealing system is ideal for the separation off contaminated groundwater. AGRULOCK is also the product of choice for construction sites where the groundwater level must be kept at a certain level. The water-impermeable barrier is easy to install. The profiles can be welded to the geomembrane using conventional welding machines.

Electrically conductive geomembranes

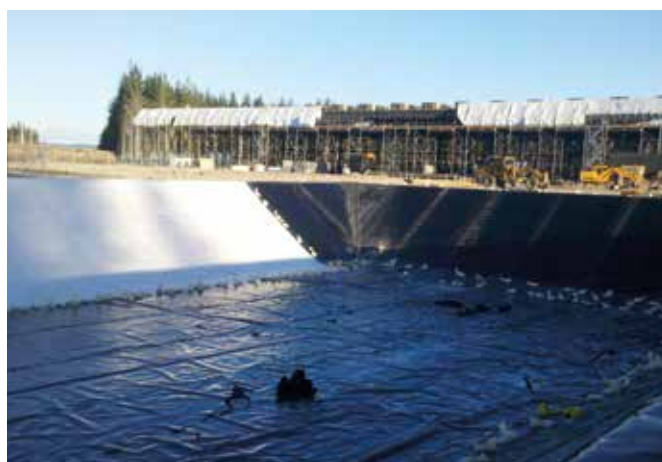
Coextrusion techniques can be used to produce HDPE, LLDPE and VLDPE geomembranes with electrically conductive signal layers. On the one hand, this can help prevent static charging so that the membranes can be used in explosion-protected areas. On the other hand, these membranes are used as part of leakage detection systems.



High-temperature-resistant geomembranes

Due to its improved durability at elevated temperatures, the HTRPE geomembrane has created new possibilities for industry and other applications where processes are carried out at higher temperatures:

- energy production from renewable sources (solar thermal, biomass and geothermal energy)
- hot-water tanks
- bioreactors
- leaching ponds
- oil and gas industry
- industrial water and waste water



Studded Drain Liner

In the case of double seals or controlled drainage, a three-layer system consisting of two smooth geomembranes and a drainage product is typically used. The use of AGRU studded Drain Liner makes it possible to reduce the system to two components, which saves material and installation costs. In addition, the system remains stable at high loads.





LINING SYSTEMS references

Airport seal

Germany's Berlin Brandenburg Airport, commonly known as Willy Brandt Airport, was the largest airport construction site in Europe. AGRU LINING SYSTEMS were used here for various purposes.



HDPE geomembranes act as a seal for central ground filters that collect rain water from flight operation areas with contamination from surface de-icing.



Local ground filters are also being made from HDPE geomembranes to go next to the runways and taxiways. These are being used to treat rainwater with impurities from flight operations and surface de-icing before it is transferred to the central ground filters.



Landfill base liner

AGRU supplied the landfill base seal for a community landfill. More than 50,000 m² of 2.00 mm HDPE geomembranes, both smooth and textured, were installed here.

Landfill capping

HDPE geomembranes with a thickness of 2.5 mm and BAM (Germany's Federal Institute for Materials Research and Testing) approval were used to seal the surface of this landfill.





The Plastics Experts.

Your distributor

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