THE FUNCTIONAL LIGHTWEIGHT AGGREGATE
FROM POST-CONSUMER RECYCLED GLASS
PORAVER® EXPANDED GLASS

The lightweight aggregate from post-consumer recycled glass

The world is changing. Every day. Manufacturers striving to be the best in their industry tomorrow, need a powerful partner with a strong product today. Poraver®, our unique lightweight aggregate made of recycled glass, was developed more than 30 years ago.

Consistently tailored to your products, Poraver® supports the decisive market advantage for customers all over the world – in ecological and economic terms. As a world market leader ourselves we wanted to strengthen our North American presence so a new plant was built near Toronto, Ontario in Canada.

Since Hans Veit Dennert acquired this plant at the beginning of 2011, North American operations are now repositioned technologically and strategically to strengthen our leading advantage. After extensive investment in research, development and production facilities, only one goal remains: to become our customers’ best partner – for quality, technology and innovation. For us, customer service is paramount.

Welcome to Poraver®!
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The functional lightweight aggregate

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Numerous companies from a wide range of industries rely on the advantageous properties of Poraver® for adding value to their top-quality products. We are the people to ask if you are looking for a solution to make your product more lightweight, more productive, more environment-friendly or simply better. Poraver® strives to support innovative companies in the process of improving or expanding their market position.
ECOLOGY
The widely available raw material for Poraver® is post-consumer recycled glass, which for technical reasons is not used by the glass industry to manufacture new products. Poraver® utilizes this cullet and closes a gap in the recycling process. By using Poraver® you are making an active contribution to the environment and at the same time protecting natural resources.

RAW MATERIAL
More than 7,000 years ago, man discovered glass. Today glass is a high-tech, industrially manufactured product. No other material is coincidentally so versatile in processing, stable and spotlessly clean. Glass can also be recycled without losing any of its striking properties. It will always remain glass.

PORAVER® AND LEED®
The LEED (Leadership in Energy and Environmental Design) Green Building Rating System is an international benchmark for developing high-performance, sustainable or “green” buildings. Products with Poraver® can help to contribute valuable points toward LEED-certified projects.

ISO 9001
Poraver® delivers excellent performance and consistent quality that customers have come to expect from us for 30 years now. Our manufacturing plants are registered to ISO 9001 standards supporting well controlled processes and consistent results.

Six ways that Poraver® can assist you with LEED:
• Poraver® creates sustainable sites
• Poraver® enhances energy performance
• Poraver® is made from post-consumer recycled glass
• Poraver® is manufactured locally
• Poraver® enhances thermal comfort
• Poraver® is innovative
Poraver® expanded glass makes industrial products more lightweight, more productive and easier to apply. Poraver® improves significantly the performance of your products. Poraver® is the lightweight aggregate you can trust. Our packaging and delivery alternatives and intelligent solutions will work seamlessly with your manufacturing process. Seize the Poraver® advantage.

**MANUFACTURING**

Poraver® expanded glass beads are manufactured using a special self-developed process. 30 years ago our company was the first producer to manufacture industrially expanded glass granulate from post-consumer recycled glass. The cullet is finely ground, mixed and formed to granules. After this the raw grain is getting sintered and foamed (expanded) in the rotary kiln to create lightweight spheres with a fine closed cellular pore structure.
PROPERTIES AT A GLANCE

LOW DENSITY AND HIGH COMPRESSIVE STRENGTH
THERMAL-INSULATING PROPERTIES
SOUND ABSORPTION PROPERTIES
ECOLOGICAL, MADE FROM POST-CONSUMER RECYCLED GLASS

PURELY MINERAL
NON-COMBUSTIBLE
LONG-TERM STABILITY
IMPROVED PERFORMANCE AND WORKABILITY OF YOUR PRODUCT THANKS TO SPHERICAL GRANULES
AMPHICOUS GLASS STRUCTURE PREVENTS DANGER OF SILICOSIS
COLOR CREAMY WHITE

GRAIN SIZES
The Poraver® granulates are expanded in a rotary kiln at approximately 1450 °F. This process generates a fine-pored, creamy white, lightweight and spherical granulate that is sieved and sorted into different grain sizes.
Poraver® is available in five standard grain sizes and three special grain sizes starting from 0.04 mm up to 4 mm.

Thanks to the multicellular structure the spheres are very lightweight and provide high compressive strength and thermal insulating properties.
DRY MORTAR AND CONSTRUCTION CHEMICAL PRODUCTS

Lighter, better, faster...

...attributes which any product loves to claim. For this reason, Poraver®, as the preferred lightweight aggregate, excels in dry mortar and construction chemical products. Thanks to its beneficial properties this innovative lightweight filler meets even the most demanding product requirements. Poraver® is perfectly suited for the combination with lime, cement and other binders. Its spherical grain shape and very low density optimize both the formulation and the performance of your product.

PLASTERS AND STUCCOS

Poraver® facilitates higher yield, higher layer thicknesses and better spreading behaviour. Plasters and stuccos with Poraver® excel also by superb thermal insulation and sound absorption properties, Class A fire safety rating and resistance to UV radiation and micro-organisms.

CEMENTITIOUS ADHESIVES

Poraver® supports the most important features of advanced tile adhesives. The spherical shape of its granules improves the spreading behaviour. While its low density increases coverage up to 60%, Poraver® reduces the E-modulus and its creamy white color is also suitable for the production of white adhesive for marble applications.
BASE COATS FOR EIFS
Poraver® scores with the roundness of its granules and high strength. The resulting ball-bearing effect offers significant advantages in terms of spreading behavior and application properties. The low density of Poraver® results in substantially higher area coverage, good thermal insulation properties as well as reduction in material weight.

UNDERLAYMENTS / CONCRETE REPAIR PRODUCTS
Poraver® supports the spreading behavior by the spherical shape of its granules. Its low density results in up to 35% higher yield with a simultaneous reduction of the weight, which is advantageous especially for meeting engineering requirements on restoration and renovation projects. E-modulus (modulus of Elasticity) can also be reduced without sacrificing strength.
Poraver® is the preferred lightweight aggregate for a wide range of panels and boards. Their low weight, high rigidity and easy processing have made decorative wall and ceiling panels, acoustic panels and facade carrier boards with Poraver® very popular.

Additional distinctive advantages include the insensitivity of Poraver® to heat and cold and the positive moisture-regulating properties.

ACOUSTIC AND COOLING / HEATING PANELS

The porous structure of acoustic panels with Poraver® offers excellent sound absorption. Normally no extra sound absorber is required. In addition this allows smooth and jointless surfaces because no sound apertures are required as with conventional systems. The panels combine sound insulation, air conditioning, non-combustible properties and a seamless appearance. Applications include offices, conference rooms, schools exhibition and concert halls.

CARRIER BOARDS FOR FACADE SYSTEMS

Due to its resistance to heat, cold and humidity Poraver® expanded glass is also ideal for carrier boards in lightweight, ventilated rainscreen cladding systems. These carrier boards with Poraver® are suitable for glass, stone or render finishes and provide excellent weather protection, impact resistance and can even be used to form tight curves. Such systems allow renovation and redesign with ease.
**FIRE RESISTANT BOARDS**

Poraver® is pure glass and therefore non-combustible and releases no harmful gases when heat is applied. Poraver® is ideal for mineral bonded fire resistant boards for wall, ceiling and facade construction. The advantage of fire safety, high flexural strength and high wear resistance in combination with weight reduction opens up a wide spectrum of opportunities for fire resistant applications.

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**LIGHTWEIGHT BOARDS**

Poraver® expanded glass provides high compressive strength, resistance to cold and humidity and is non-combustible. Consequently, Poraver® is used in lightweight boards for both commercial and residential interiors. Thanks to their low weight, optimized stability and easy handling, lightweight boards with Poraver® are popular among craftsmen. The boards are comfortable to handle and easy to cut and fasten like wood.
Poraver® is completely safe and easy to handle. Poraver® combines an environmentally compatible material with sustainable characteristics when used for fills. It is also very light and still resistant to pressure, possesses long-term stability, is recyclable and offers no host for pests, rodents, nor mold growth. Poraver® fills are used as loose fills for thermal insulation with non pressure load requirements or as cement or resin-bound fills for pressure load requirements.

**LOOSE FILLS**

Poraver® has great free-flowing properties due to its spherical shape and easily fills every void in beamed ceilings, floors and walls for thermal insulation. It is also very easy to cover pipes and cable ducts. Facing formwork for vertical interior insulation can be easily back-filled too. The environmentally friendly Poraver® fill is very light, non-combustible, moisture-resistant and provides long-term stability.

**CEMENT-BOUND FILLS**

Poraver® cement-bound fills combine structural and thermal performance. It can be used as lightweight screed to adjust the height of floors or as levelling fill over cables and pipelines. Thanks to its low weight and moisture resistance, it can also be used on vaulted and trapezoidal steel ceilings and as a non-combustible pipe duct insulation. The easy handling reduces man hours spent on the construction project.
RESIN-BOUND FILLS

Poraver® is ideal as a lightweight, resin-bound drainage screed for roof terraces and balconies. As a cement-free and water-permeable system, problems such as efflorescence and frost damage can so be effectively avoided. Poraver®, as a resin-bound fill, is also ideally suited as thermally insulating slope screed on flat roofs or as a lightweight marine screed.

HEAT STORAGE

Because of its very low thermal conductivity, its high grain strength and the resistance to heat, moisture and rodents, Poraver® is ideal as an insulation material for all kinds of heat storage systems. The ease of use and the fact that it can be conveyed by air from bulk silo trucks are further advantages.
LIGHTWEIGHT CONCRETE

Weight reduction and thermal insulation.

Poraver® expanded glass is an ideal lightweight aggregate for concrete applications as it offers a lower density while increasing the overall yield. For precast applications, lightweight concrete also provides cost savings for handling and transportation. In addition, lightweight concrete is non-combustible, sound absorbing and very economical. With Poraver® expanded glass, lightweight concrete is a pure mineral and ecological building product that can be easily recycled when required.

LIGHTWEIGHT CONCRETE

For weight reduction Poraver® replaces solid, heavy aggregates for lightweight concrete applications such as architectural concrete, precast construction elements or cast stone products like wall trims or pier caps. Depending on the formulation the strength of normal concrete can be achieved. The reduced weight allows easier installation and freight cost savings.

THERMALLY INSULATING LIGHTWEIGHT CONCRETE

Best thermal insulation properties, low weight, good mechanical strength and optimum sound insulation characterize lightweight concrete blocks as well as monolithic or clamshell prefab wall systems with Poraver®. The lower weight allows comfortable handling and shorter construction times.
SPECIALIZED CONCRETE

Specialized concretes with Poraver® persuade with low weight, frost resistance, water resistance and durability. Especially the combination of low density and high grain compressive strength makes Poraver® the ideal lightweight aggregate for architectural concrete, fiber reinforced concrete or laminate/textile concrete.

STONE VENEER / WALL CLADDING

With modern molding techniques and formulations natural looking veneer stones are made from lightweight concrete (LWC). Poraver® supports optimum results through its consistent quality and ease of processing. The low weight of LWC veneer stones saves both freight costs and installation time.
Mineral casting is a highly filled resin system consisting of mineral fillers (about 70 - 90 % by weight) as quartz gravel, quartz sand and rock flour and a small proportion binder (about 10 - 30 % by weight). The material is mixed and poured cold or warm, depending on the manufacturing method, as a homogeneous mass. The material is also known under the name of polymer concrete or reaction resin polymer concrete.

**SOLID SURFACES CULTURED MARBLE**

Solid surfaces and cultured marble with Poraver® are used for kitchen counter tops and vanity tops. Poraver® is a suitable replacement for traditional resin fillers such as calcium carbonate or other engineered mineral filler systems. Poraver®’s various size range gives engineers great flexibility when formulating resin mixtures and slurries.

**WEIGHT REDUCTION**

Due to its high density (> 125 lb/ft³) mineral casting and polymer concrete components are often difficult to handle. Products with Poraver® are up to 70 % lighter compared to those with conventional fillers such as calcium carbonate. In most cases, reduction of weight also means a reduction in freight costs and hence lower energy consumption.

**APPLICATIONS**

With the slightly rough surface of Poraver® a good adhesion to different resin systems is possible. A surface treatment is in most cases not necessary to guarantee high mechanical properties of the compound.

**MINERAL CASTING**

- Sanitary ware (bathtubs, sinks)
- (Outdoor-) furniture
- Windowsills
- Vanity tops and counter tops

**POLYMER CONCRETE**

- Structural components
- Machine beds
- Tube systems
- Concrete repair
- Artificial stones and veneers
ADVANTAGES WITH PORAVER® IN MINERAL CASTING AT A GLANCE

• COST REDUCTION

• WEIGHT REDUCTION
  Products with Poraver® are up to 70% lighter

• IMPROVED PROPERTIES
  such as thermal insulation, noise reduction, fire resistance

• PROCESSING ADVANTAGE
  because of its spherical grain Poraver® provides easy dosage and improves the workability of the casting material

• REDUCED THERMAL STRESS
  therefore reducing or eliminating tension in the components

• EASY TOOLING OF CURED PARTS

• NEW DESIGN POSSIBILITIES
  weight reduction and thermal insulation enable new application areas for molded mineral in façades elements and decorative systems

• ECOLOGY
  Poraver® is pure mineral, made from post-consumer recycled glass. With Poraver® you are using an environmentally friendly raw material and saving natural resources

• MAKE YOUR PRODUCTS LEED-COMPLIANT
  Products with Poraver® can help to contribute valuable points toward LEED-certified projects
MORE APPLICATIONS

with Poraver® expanded glass.

Poraver® offers many opportunities for optimising products to make them lighter, more pressure-resistant, more productive, easier to use or more environmentally friendly. Poraver® has entered into new areas of application next to building materials. We build on experience and innovation to offer you even more applications in future. The basis for this is our search for new technologies, new applications and new markets as well as the continuous optimization of our processes and procedures.

PAINTS & WALLPAPERS

Modern wall designs with an individual character are becoming increasingly popular. Poraver® gives wall paints a grainy structure and makes it easy to apply because of the spherical grain shape. Wallpapers can also be refined with white or colored Poraver® grains to produce striking surfaces. Poraver® is VOC-free and delivered in a quality that contains no broken grains.

AUTOMOTIVE

Lightweight construction is an omnipresent theme in automotive technology. Low weight and high strength, as well as defined and adjustable deformation characteristics are required. Innovative composite materials from Poraver® in a plastic or metal matrix meet these requirements, and are used as a support core in hybrid crash absorber structures or in lightweight chassis.
NEW INNOVATIONS
Whether as a lightweight aggregate in model construction, as a decorative material, as horticulture granulate or for soil improvement, as fire extinguishing medium, as water filter medium, abrasive medium, as prefabricated sanitary components or as a demineralization compress for historic masonry, Poraver® optimizes products in many different ways.

WWW.EXTOVER.COM

MORE APPLICATIONS
Applications with Poraver®

Just tell us what you are looking for.
Poraver® has its own technical center with grinder, mixer and rotary kiln at the production site in Postbauer-Heng. The modern pilot plant is used for research and product development purposes. Our customers’ and our own engineering processes are tested, optimized and transferred to production scale.

New standards. New trends. New technologies. Don’t wait for the future. Shape it yourself – with Poraver®. We are a powerful development partner with extensive know-how backed by modern laboratories and test facilities. Our experienced team provides support for optimizing your existing products and developing new innovations. Our services range from application engineering support and testing to marketing. Whatever you need, together we’ll find the best solution to ensure your success in the market.

What can we do for you?
CONTACT
Are you looking for a formulation for a new application? Do you need samples as quickly as possible? Poraver® has the right person to contact for all your questions.

TECHNICAL WORKSHOP
Take advantage of our one day free of charge workshop to learn how to enhance your products with Poraver expanded glass. Get in touch with us to set a date at our state of the art plant in Innisfil.

PRODUCT DEVELOPMENT SUPPORT
- Determination of compressive and flexural strength of lightweight concrete, plaster, stucco and mortar
- Determination of bonding strength according to various storage conditions
- Determination of color
- Wet chemical analysis
- Determination of E-modulus
- Testing of fresh mortar properties

- Measurement of thermal conductivity of building materials
- Laser granulometer to determine the grain size distribution (1 – 1,000 µm)
- Light-microscopic recordings to 60-fold
- SEM recordings to 10,000-fold
- Radiological examination
- IR Reflection measurement

TOPICS
- Comparison of Lightweight Aggregates
- SLU’s & CTA’s
- Cast Resins
- Glass Fiber Reinforced Concrete (GFRC)
- Water Treatment
- Panels/ Boards
- Plaster

For additional information on Workshop and for registration please contact Shahram Astor:
Phone (705) 431-3304, E-mail sastor@poraver.com
Poraver® expanded glass is available in six standard and two special grain sizes. With this wide variety of grain sizes from 0.04 mm to 4 mm, Poraver® expanded glass granulate offers a suitable lightweight aggregate solution for every field of application.
### PROPERTIES

<table>
<thead>
<tr>
<th></th>
<th>STANDARD</th>
<th>PORAVER® STANDARD GRAIN SIZES</th>
<th>PORAVER® SPECIAL GRAIN SIZES</th>
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</thead>
<tbody>
<tr>
<td>Grain size [mm]</td>
<td>0.04-0.125</td>
<td>0.1-0.3</td>
<td>0.25-0.5</td>
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<tr>
<td>Particle size [mesh #]</td>
<td>140-50</td>
<td>60-35</td>
<td>35-18</td>
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<tr>
<td>Dry loose bulk density [kg/m³]</td>
<td>530 ± 70</td>
<td>400 ± 60</td>
<td>340 ± 30</td>
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<td>33.1 ± 4.4</td>
<td>25 ± 3.8</td>
<td>21.2 ± 3.2</td>
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<td>Apparent density [kg/m³]</td>
<td>1,400 ± 300</td>
<td>950 ± 150</td>
<td>700 ± 80</td>
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<td></td>
<td>87.4 ± 18.7</td>
<td>59.3 ± 9.4</td>
<td>43.7 ± 5.0</td>
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<td>Water absorption by mass [Mass. %]</td>
<td>-</td>
<td>35</td>
<td>21</td>
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<tr>
<td>Water absorption by volume [Vol. %]</td>
<td>-</td>
<td>33</td>
<td>15</td>
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<tr>
<td>Compressive strength [MPa]</td>
<td>on request</td>
<td>≥ 4.5</td>
<td>≥ 2.6</td>
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<td>Moisture content on delivery %</td>
<td>≤ 0.5</td>
<td>≤ 1% by mass</td>
<td>≤ 15% by mass</td>
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<tr>
<td>Water conductivity [W/m·K]</td>
<td>DIN EN 4102-A1</td>
<td>0.094</td>
<td>0.090</td>
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<tr>
<td></td>
<td>-</td>
<td>0.652</td>
<td>0.625</td>
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The strength grades may vary within the tolerance range of bulk densities. The availability and delivery conditions for special grain sizes will be agreed on an individual basis.

1) Test according to DIN V 18004, calculation of apparent (relative) density please see method DIN EN 1097-6
2) Apparent (relative) density according to EN 1097-6
3) Minimal measurements due to fineness of the material
4) % absorption is determined after five minutes submersion in tap water at 20 ± 2°C
5) Calculated values DIBt according to Approval Z 23.11-114 (Thermal insulating material, non combustible according to construction material class DIN 4102-A1)
PORAVER® IN PRACTICE

The innovative lightweight aggregate for advanced products

Its numerous benefits make Poraver® expanded glass a proven lightweight aggregate in advanced products for the building products and construction chemical industry. Among others, it serves as a lightweight aggregate in dry mortar and construction chemical products, panels and boards, lightweight concrete, thermal insulation fills and mineral casting. Poraver® offers many possibilities for product optimization. Ask our experienced team, describing your specific requirements.
# Recommended PoraVer® Grain Size in MM

<table>
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<tr>
<th>APPLICATIONS</th>
<th>RECOMMENDED PORAVER®</th>
<th>ADVANTAGES</th>
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<tr>
<td></td>
<td>0.04-0.125</td>
<td>0.1-0.3</td>
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<td>Plaster / Stucco / Render</td>
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<td>Tile Adhesives / Cementitious Adhesives</td>
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<td>Base Coats for ETICS*</td>
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<td>Self Leveling Underlayment</td>
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<td>Concrete Repair Products</td>
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<td>Panels / Boards</td>
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<td>Lightweight Concrete / Concrete Blocks /</td>
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<tr>
<td>Stone Veneer</td>
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<td>Fills for Thermal Insulation and Leveling</td>
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<td>Mineral Casting / Solid Surface / Cultured</td>
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<td>Marble</td>
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*Exterior Thermal Insulation Composite Systems
Our distribution partners

Poraver North America directly serves customers in Canada, USA, Mexico and Brasil. Our North American Team provides technical expertise and is committed to assisting your efforts. To provide the best international customer support Poraver® has also in numerous countries official sales agencies. Please refer to the list on our website for the contacts. If your country is not listed, please don’t hesitate to contact us directly.

DISTRIBUTION PARTNERS USA & CANADA

As the world leader in expanded glass granulate, we are continually working towards adding new distribution partners to better serve our north american customers. Please refer also to the list on our website for the contacts. If you have any questions, feel free to contact us directly.