
PUREPAVE
Technologies
The future is permeable.

WHY PUREPAVE NOW

Two independent studies conducted by NASA have confirmed that groundwater reserves are depleting all over the world. This can result in a global drought in the coming years. (https://nasasearch.nasa.gov/). From USA to China and India and other areas of the globe, groundwater usage is no longer sustainable and more water is being drained than what is restored.

One of the key factors for this imbalance is impervious paving (conventional techniques) that neglect the high impact of these methods on climate on the landscape. The continued use of impervious concrete and asphalt for road construction, parking and landscaping in commercial properties (like interlock pavers) lead to an increase in rainwater evaporation. Only a tiny fraction of this water can drain into the ground and recharge the water table.

Sustainable Infrastructure

PUREPAVE TECHNOLOGIES and it's partners have developed an number of solutions and techniques that are mindful of the environment while supporting the rapid growth of our cities and urbanization. Purepave Pro for example, is an innovative paving concept which uses a polyurethane top layer (paving surface) that is water and air permeable. The winterized permeable surface is made of carefully selected aggregate, stone, glass or recycled rubber to create a material that is strong, durable and ultimately out-perform conventional materials outside of high-speed roadways. The system is water and air permeable by design so that water drains quickly and replenishes aquifers. Purepave has many interconnected voids and has a high degree of porosity. Various sub-base structures act as natural water filters, drainage reservoirs and flood protectors, allowing water to drain effectively. This helps channel rainwater quickly and efficiently to the water-table below. The cavities and the resulting water-permeability make it an ideal choice in paving surfaces of parks, car-parks, driveways and pavements.

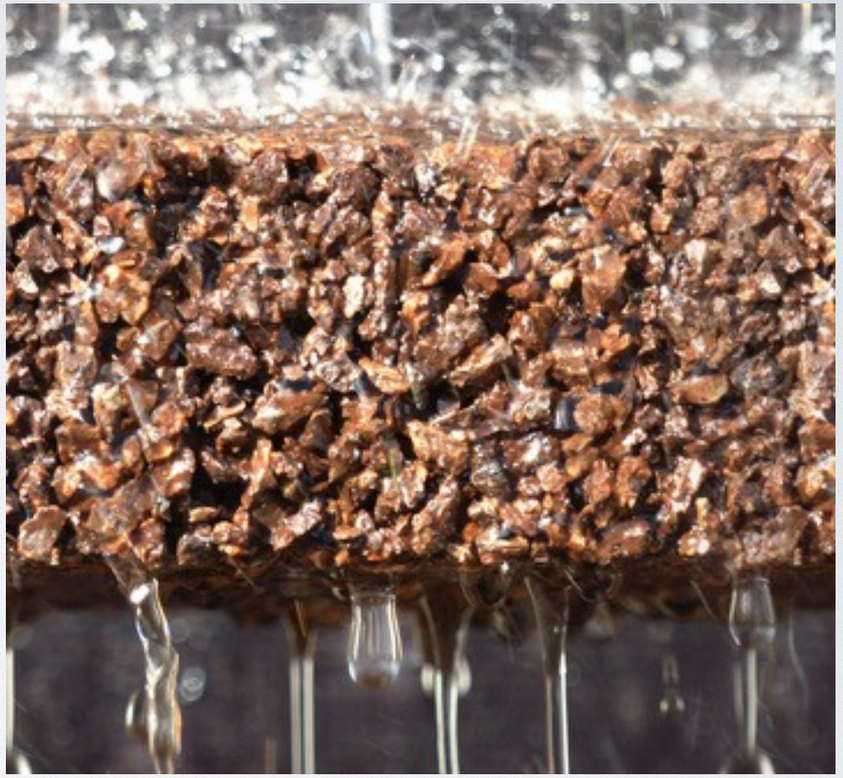
Porosity / Infiltration rates

Purepave Pro can absorb around 3800L of water per hour per square meter.

Purepave Rustic can absorb up to 80,000L of water per hour per square meter!

The porosity of the surface combined with proper geo-structural engineering of the permeable base enables replenishment of ground water, prevention of puddle formation and, in the long run, a greener and cooler environment.

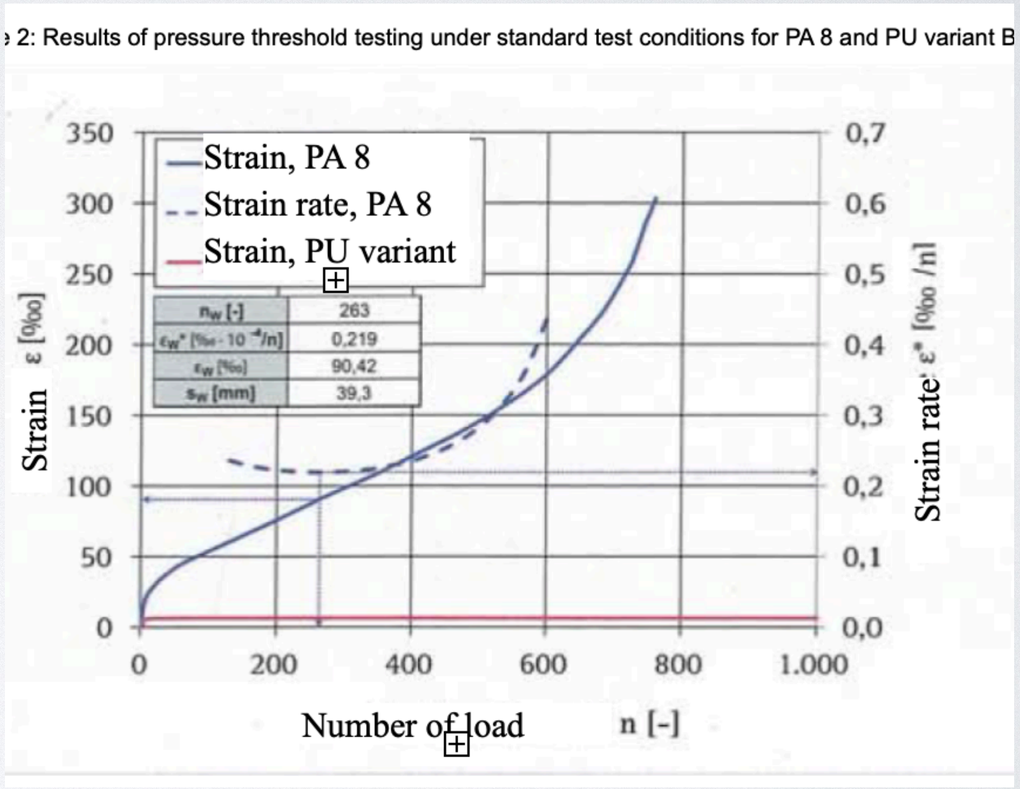
Apart from the natural beauty of a Purepave or Addagrip (UK) surface, the water and air-permeability of the material is also the reason why it is widely used in Europe for transport infrastructure, bridge, parking surfaces, pathways and canals. Usage of climate-appropriate PU permeable surfacing will only increase with time to support the growing critical need to conserve water.



Air void space % can be customized to accommodate the need for higher porosity rates, however, it should be noted this will compromise tensile strength and MPA accordingly.

Long Term Performance Characteristics

- Purepave Rustic samples tested an average of 6.1 MPa with construction at lower temperatures of 0 degrees.
- The slight influence of temperature on the strength behaviour and the material ductility of Purepave is extremely advantageous due to the fact that major material damage due to high residual deformation is not expected, in particular at high temperatures.
- The progressive damage to the PU-bound material is manifested by various characteristic parameters and features, but is much lower compared to asphalt having a conventional composition.
- With a permeable sub-base and proper geo-structural engineering, The PU-bound materials studied (Purepave composition) can mitigate frost/thaw damage typically seen on impervious surfacing in winter climates.
- The elongation at break of the PU asphalt variants tested remains at a virtually constant level over the entire temperature range.



Strain Rate remains unchanged with Purepave VS Porous Asphalt with increased exposure to high number of vehicle load tests.

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- Freeze / Thaw tests by Korean Lab report zero defects after thousands of cycles.
- Based on research results to date (German PU study, UK Addagrip study), it can be stated that the performance of the surfacing of a pavement may be significantly improved by a complete substitution of bitumen with proper polyurethane compounds, as was done with Purepave.
- Although the PU asphalt variants tested show temperature-dependent material behaviour, the resulting effects on the strength behaviour remain relatively small. Purepave is effectively “winterized”.
- The elongation at break of the PU asphalt variants tested remains at a virtually constant level over the entire temperature range. It should be noted that the elongation at break in the positive temperature range is less, and in the negative temperature range is greater, than the elongation at break of the reference variants (porous asphalt).
- Snow-plow resistant and snow melt is 50%-70% faster.
- Resistance to degradation: salt, salt water, oil, Transmission fuluid, hydraulic oil, chlorine, ozone, bromine and muriatic acid.
- Non-toxic: can be installed directly beside bodies of water and acts as a natural water filter (removing phosphates and nitrates by 80%)
- Stone loss on first winterized Purepave concept installed 5 years ago is zero.
- NRC has approved funding for accelerated weathering tests to confirm expected longevity of over 35 years.

PUREPAVE PARTNERS

The National Research Council of Canada switched from specifying their own porous concrete formula to installing 90% Purepave and 10% NRC porous concrete at the Construction Technology HQ building of the NRC.

The Conservation Authority of Ontario (Finch) has installed Purepave Pro at their headquarters to measure water filtration and to recommend its use for Low Impact Development to neighbourhood developers.

The Conservation Authority of Ontario (Toronto) has presented Purepave to GreenP (municipal parking authority GTA) as an alternative to conventional paving. First installation of Pure-Grid is expected to be confirmed in February 2019.

Jaguar Dealerships across Canada have specified TAC Ottawa to install Purepave at their new buildings for its anti-slip properties (safety), design, originality and longevity.

Low Impact neighbourhood-scale Developers, architects and engineers have begun to specify Purepave as a way to eliminate the need for stormwater ponds, saving land, money and the environment.

High-end private golf clubs in USA have been using Purepave to build their own permeable golf-cart pathways, circumventing seasonal flood damage and saving hundreds of thousands per year while increasing their eco-friendly landscape.

APPENDIX

Problem: Surfacing options in 2018

Vast majority of city surfaces are impervious.

- Stormwater runoff taxing city infrastructure.
- Storm ponds waste developer land.
  Drainage systems are expensive.

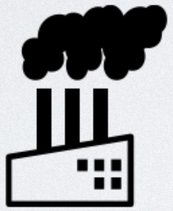
Frost / thaw cycle destroys pavement.

- High cost of maintenance, unattractive broken surfaces.
- High-end surfacing grows weeds, cracks and sinks.

PUREPAVE

Problem: polluted stormwater, floods & frost

Stormwater runoff is polluted and frost destroys expensive pavement



Concrete, asphalt and interlock send pollution into sewers. Costly for government.

Interlock and concrete designs fail prematurely, grow weeds.

Interlock and concrete maintenance is expensive.

Winterized permeable surfacing can:

Eliminate drainage issues, decrease pollution, improve design and maximize longevity.

Existing Permeable Systems Fail

Fail within first winter: Permeable Concrete, Porous Asphalt

- Stone loss, cracking, clogging, spalling after 1 year

Proven effective: Purepave Pro & Purepave Rustic

- 5 winters in Ottawa with zero defects
- 249% elongation; the most flexible pavement in existence
- Stronger than asphalt: Flexural Strength (ASTM standards) testing at 7.4 Mpa

Solution: Purepave Technologies

Earth Conscious Surfacing

- Eliminate the need for costly, polluted drainage solutions
- Market: Developers, Home Owners, Cities
- A drainage, design and ecological solution that maximizes longevity

- Latest materials science, engineering and paving technology
- Mitigate frost / thaw damage & cracking
- Eliminate drainage issues and hazardous stormwater runoff: sustainable infrastructure
- The “Tesla of permeable surfacing”

How it works: Technology and Market

Purepave permeable surfacing

Designed for Canadian climate,
we control the water by design,
rather than go to war with it.

High PSI and flexible
surfacing.

Eco-friendly and long lasting (unlike traditional surfacing)

Lab-tested, time-tested
system and materials.
Home owners and cities can solve
many practical issues and
enjoy superior design.

Developers add value, environment is happy, Home owners benefit

No cracks, loose stone, ugly appearance,
costly maintenance or flooding,
since water instantly filters
back down to soil.

Technology Continued

How pavement deteriorates in Canada:

1- Sun oxidizes binders out quickly, decreasing elongation % and more vulnerable to cracks

2- Cracks or surrounding areas let water infiltrate the base, build up, soften the base.

3- Frost / thaw cycles cause the base to expand / contract repeatedly, further breaking asphalt.

4- Salt and chemicals further erode surface.

5- Heavy weight causes a soft / wet base to sink.

1- Purepave is UV-resistant, never oxidizes.

2- Water drains through entire base instantly.

3- Frost / Thaw damage mitigated.

4- Purepave is 100% Salt resistant, proven in lab.

5- Pure-grid load support holds 250 tons, Purepave has 1500-11,000 PSI, 80-249% elongation.

Key Differentiators:

- Chemistry and pavement structure - binder systems & aggregate blends optimized for Canada
- Advanced Technology - innovation from 30 years of European resin paving
- Geo-structural Engineering - eliminate frost damage & flood
- Load support system - maximize durability & longevity
- Natural aggregates - stunning appearance and unlimited design
- Safety Surfacing - less ice-build up, fast snow melt; better grip, anti-slip
- Patents Pending - new systems & materials to endlessly renew Purepave
- Eco-friendly - load support made of 100% recycled plastic, surface contains recycled rubber and plastic, no stormwater runoff, zero VOC emission, decrease heat-island effect

Patents Pending:

- Cold climate, winterized permeable paving system with recycled materials

RockLock Spray system:

- Scientific Research
  Credit from CRA scientific audit.

- Allows us to endlessly renew / strengthen the surface of Purepave surfaces.

- Decrease cost of coloured stone surfaces

- Allows us to create new surfaces without any specialized equipment ($140 spray canister)

- Allows us to ship a full DIY system (e-commerce)

Government Partnerships

Ontario Conservation Authority
Ottawa region HQ

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National Research Council
Construction Technology Building

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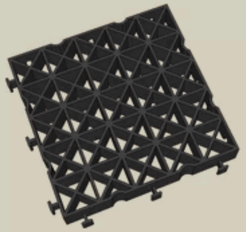
Municipal

- Consider 35 year lifetime cost of concrete and interlock for public spaces, Purepave superior
- SUDS, LEED compliant and #1 specified Low Impact Development solution (permeable surfacing)

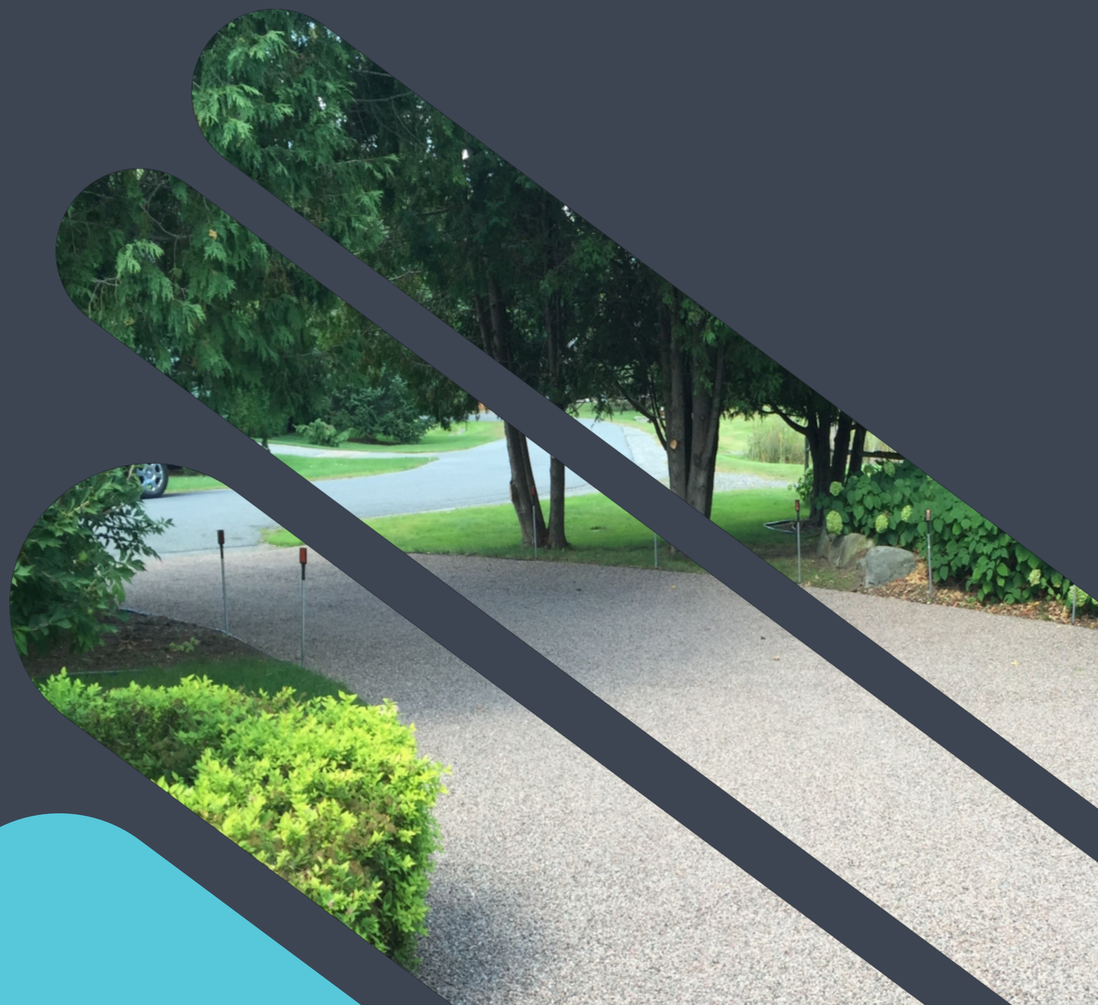
- Urban planners, architects: specify Purepave for LID projects

- Conservation Ontario is testing Purepave at their headquarters in Finch Ontario (will recommend to developers)



Home Developers

- Build 10% MORE HOMES on land and add Millions in profit by eliminating the need for stormwater ponds.
- Brand Alignment: High-end, forward thinking Developers will begin to offer same for driveways / walkways
- Purepave is incomparable to asphalt, the perceived value is huge for home buyers (retail $20-25 / SF)
- The true value of Purepave incomparable to asphalt. Home owners will appreciate the difference year over year
- Great “green branding” opportunity for developers
- Home buyers could have opportunity to choose from a number of unique architectural designs that match their custom Home
- Viral marketing by design. A purple cow. Home buyers will talk about the new eco-friendly Home Builder



Technology

Korean lab test frost / thaw simulation report zero defects

3rd party lab test on material binders for up to 11,000 PSI and 249% elongation

Conservation Ontario testing Purepave as Natural Water Filter for LID systems

NRC to perform accelerated aging tests March 2019.

- Layered 3x resin & load support construction process for optimal durability, strength, better economy

- Patent pending indefinite longevity: spray resin

- Patent Pending system design

Overall permeable Market:

Global permeable paving

$12.13 B → **$22.17 B**

2015 — Anticipated growth (market&markets.com) — 2026

North America holds 40% global market share

Decorative Concrete Market:

Global high-end concrete paving

$8.77 B → **$12.78 B**

2016 — Anticipated growth (market&markets.com) — 2022

North America holds 25% global market share

Focus:

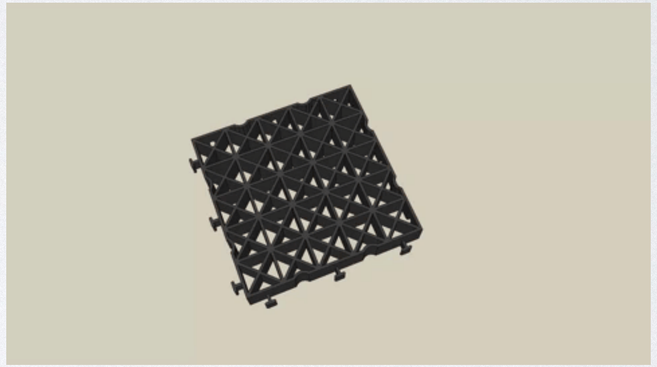
Transition from construction company…
…to distribution, licensing, marketing.

When it comes to high-end surfacing, choosing Purepave is a no-brainer.

When it comes to high-traffic parking lots Pure-Grid is most logical solution.

PUREPAVE

PURE-GRID



Focus industrial parking