

From Soil to Stability and Beyond



Consulting inc.

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NovoCrete®



EcoCEM Consulting Inc. is proud to represent the award-winning **NovoCrete®** technology

NovoCrete® is an alternative to conventional road and civil engineering construction. This binding agent revolutionizes the renovation and new construction of infrastructure construction measures, such as roads, farming, railways, logistics and other infrastructure areas through an environmentally friendly and sustainable construction method. The revolution means lower costs, fewer CO2 emissions, lower raw material requirements, shorter construction times and longer durability.



**GERMAN
INNOVATION
AWARD '24
WINNER**

Hydraulically Bound Base Layers for Modern Infrastructure

EcoCEM Consulting inc. represents NovoCrete® an engineered strength through soil stabilization

This advanced soil-cement technology transforms native soils into hydraulically bound base layers by blending in-situ materials with cement and a small addition of NovoCrete®. It eliminates costly excavation, prevents rutting and mud, and delivers durable foundations for roads, reclamation, and infrastructure projects..

NovoCrete® reduces carbon emissions, minimizes waste, and may qualify for CO₂ credits. Stabilized soils achieve higher strength, improved water permeability, and enhanced root penetration while meeting both construction and reclamation standards.

By modifying the cement hydration process, **NovoCrete®** shortens construction timelines, reduces costs, and ensures long-term performance. EcoCEM Consulting inc. provides complete engineering support, including soil analysis, pavement design, reclamation planning, and life-cycle cost evaluations.

All applications are validated by certified laboratory testing and monitored under DIN EN ISO 9001 standards. When executed by licensed partners, projects are backed by a 3-year performance guarantee.

NOTE: Guarantee excludes asphalt pavement.

NovoCrete® Properties:

NovoCrete® is a mineral-based whitish powder composed of alkaline and alkaline earth elements, entirely free of synthetic additives. It accelerates cement hydration and neutralizes harmful fulvic and carbonic acids while improving soil quality through the immobilization of heavy metals and organic contaminants, embedding them into stable crystal structures.

During application, moisture drives the hydration and hardening process. Free water is reduced and converted into crystalline water, filling voids and binding particles together. This lowers permeability, increases resistance to water-driven deterioration, and strengthens the soil's crystalline matrix, enhancing compressive, flexural, and breaking strength.

The design mixes provide high resistance to external forces, temperature extremes, and corrosion from de-icing salts, acids, and bases. When properly compacted, the stabilized layer becomes water-impermeable and fully resistant to freeze-thaw damage.



NovoCrete® combines with cement or pozzolans to bond with virtually any in-situ soil, eliminating the need for import/export materials and significantly reducing construction costs and environmental impact.

Soil stabilization uses include:

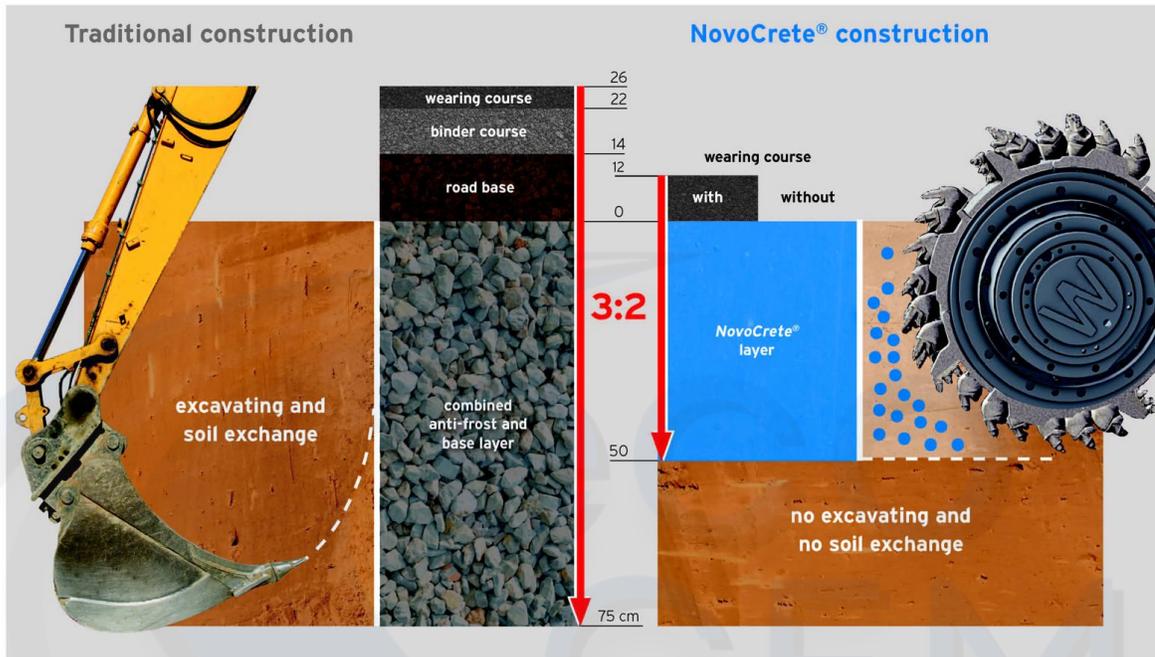
- Roads & Trails: Municipal gravel roads, highways, industrial access routes, agricultural roads, shoulders, and forest trails.
- Special Projects: Railways, airport runways, wind farms, roller-compacted concrete (RCC), dams, banks, and drainage systems.
- Infrastructure & Sites: Harbours, container yards, slopes, car parks, warehouse docks, oil & gas facilities, bio-gas plants, landfill sites, and silage/chaff storage areas.

Each project is supported by a site-specific mix design, with step-by-step guidance provided during construction to ensure proper application.

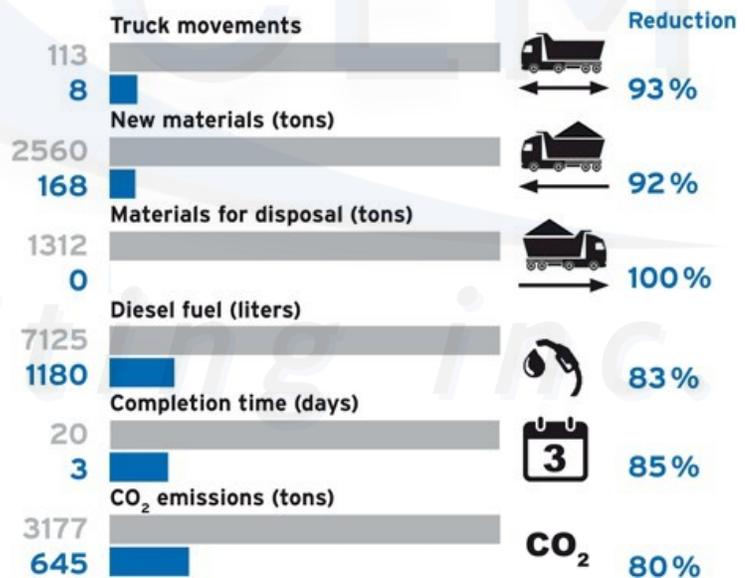


Benefits of the NovoCrete® Method:

- ✓ Utilizes native in-situ soils, eliminating the need for import or export of materials
- ✓ Lowers overall construction costs
- ✓ Reduces environmental impact by minimizing the use of non-renewable aggregates such as gravel
- ✓ Fosters local road building and maintenance capacity through the use of small-scale, local contractors.



- ✓ Improves road safety by eliminating causes of failure (cracking, crushing and carbonation, salt damage, climatic extremes)
- ✓ Extends service life - reducing maintenance costs.



Example road: Length 1km, width 7.5 m



NovoCrete® Mix designs provide:

- Improved workability, with greater flexural strength
- Reduced curing time, allowing quicker use of the road
- A longer, more durable lifespan
- High resistance to thermal shock and thermal linear rising temperatures
- A water impermeable construction, preventing damage in freeze-thawing cycles
- A higher elastic modulus, preventing thermal cracking and resistance to fatiguing.



NovoCrete® Use:

Required Technical Data for Design and Stabilization:

- Bearing strength of the sub-base, dynamic elasticity modulus.
- Chemical composition of the soil.
- Ground structure (upper 2 metres).
- Capillarity of the ground and setting behaviour.
- Soil behaviour during the freeze/thaw cycle.



Traffic Load information:

- Kinds of construction (asphalt, concrete, elements, other).
- Plan for future construction (growth).
- Maximum load and axle loads expected (breaking strength).
- Axle load configurations and axle load repetitions per load (fatigue).
- Desired life span (functional, structural, financial, social).
- Vehicle tire pressure and traffic speed (**NovoCrete®** is a viscous-elastic material like asphalt).

Hydraulically bound base layers using the **NovoCrete®** Technology

Effectiveness

NovoCrete® is added to cement typically at a rate of 2% of the calculated cement content and mixed together with the in-situ soil materials.

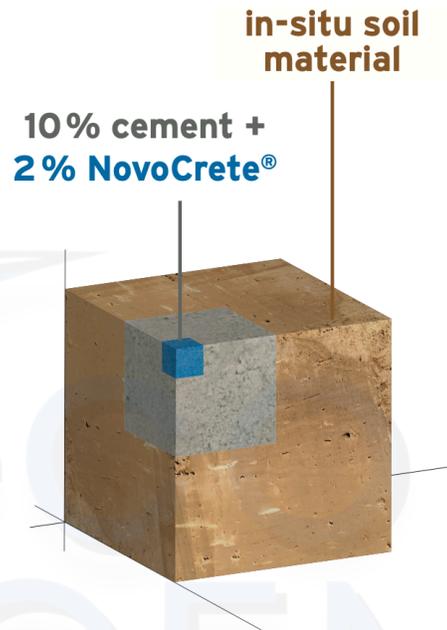
By adding water **NovoCrete®** increases the formation of a crystalline structure during the cement hydration process.

Example:

In-situ material specific weight 1.600 kg/m³

Portland CEM III Cement = 160 kg/m³

NovoCrete® = 3.2kg/m³



Material physical properties (determine layer thicknesses):

- Dynamic elasticity module of future foundation
- Viscosity of the different materials
- Pressure strength and crushing value of the different materials
- Breaking strength of bound materials
- Stiffness value of material to be used
- Fatigue properties and water permeability of the different materials
- **Soil classification and properties (for road construction):**
 - Soil (grain) composition and colour
 - Soil structure and texture
 - Soil chemistry and morphology
 - Consistency (plasticity, stiffness, penetration resistance)
 - Bearing strength and setting behaviour
 - Organic content and ground water level



The properties of modified materials are dependent on the properties of the aggregates present, the amount of cement, **NovoCrete®** and water.

Soil Type	Soil Classification	Group Symbol	Milling Depth	Amount of Binding Agent*	Modulus of Elasticity (Mpa)	Compressive Strength (N/mm ²)	Water Impermeable (m/s)	Load Bearing Capacity MN/m ²	Tensile Strength (Mpa)
Non-cohesive soils	narrow-graded gravel	GE							
	wide-graded gravel-sand mixtures	GW							
	gap-graded gravel-sand	GI	from	from	from	7 to 28 days	from	from	from
	narrow-graded sand	SE	0.25 m to 0.50 m	110 kg/m ³ to 180 kg/m ³	3.000 to 12.500	from	10 ⁻⁶ to 10 ⁻⁹	300 to 500 (and higher)	0.5 to 1.5
	wide-graded sand-gravel mixtures	SW							
	gap-graded sand-gravel mixtures	SI							
Mixed grained soils	gravel-silt mixtures	GU	from	from	from	7 to 28 days	from	from	from
	gravel-clay mixtures	GT	0.30 m to 0.5 m	160 kg/m ³ to 200 kg/m ³	2.000 to 10.000	from	10 ⁻⁶ to 10 ⁻⁹	150 to 300	0.5 to 1.5
	sand-silt mixtures	SU							
	sand-clay mixtures	ST				2.5 to 6.5			
Cohesive soils	silts of low plasticity	UL							
	silts of medium plasticity	UM	from	from	from	7 to 28 days	from		from
	silts of high plasticity	UA	0.30 m to 0.5 m	180 kg/m ³ to 220 kg/m ³	2.000 to 10.000	from	10 ⁻⁸ to 10 ⁻⁹	>150	0.5 to 1.5
	clays of low plasticity	TL	to 0.50 m	to 220 kg/m ³	to 10.000	2.0 to 4.5	< 10 ⁻⁹		
	clays of medium plasticity	TM							
Organic soils	clays of high plasticity	TA							
	silts containing organics	OU							
	clay containing organics	OT							
	coarse-grained soils containing organics	OH							
	Mould	HN							

Depending on the results of the respective suitability tests, the NovoCrete® technology can be applied; however, soil replacement may be required in some cases. The final dosage of binding agent and milling depth must be determined for each project based on traffic volume, climatic conditions, and the results of the relevant suitability testing.

GENERAL ENGINEERING GUIDELINES FOR SOIL GROUPS:

- Coarser materials require less Cement and **NovoCrete®**
- Finer materials require more Cement and **NovoCrete®**
- Higher organic content requires more Cement and **NovoCrete®**
- Higher silt content requires more Cement and **NovoCrete®**
- Higher clay content requires more Cement and **NovoCrete®**

The longer the design life, the higher the dose of Cement and **NovoCrete®**

The higher the wheel load expected, the higher the dose of Cement.

The higher the intensity of expected traffic, the higher the dose of **NovoCrete®**.



NovoCrete® — One Base, Endless Surface Options

Strong. Adaptable. Ready for any Road Condition.

NovoCrete® hydraulic bound base layers support a wide range of surface materials, giving municipalities the freedom to choose finishes based on traffic demand, aesthetics, and maintenance goals.

- **Asphalt — A Direct Bond Strength:** Asphalt can be laid directly on the NovoCrete® base layer, no sealing required except on steep grades or tight curves. Compatible with close-graded Macadam, hot-rolled asphalt, and porous asphalt finishes.
- **Chip and Spray — A Fast, Durable Strength:** Applied in 1 - 3 layers depending on traffic, chip seals should be placed within 24–48 hours after stabilization for best adhesion and longevity.
- **Gravel or Gravel-Slurry — A Built-in Stability:** A 20 - 30 mm gravel layer is spread immediately after compaction, then compacted and cured with water for a dense, skid-resistant finish ideal for rural traffic.
- **Brushed Finish — An Economical Rural Solution:** For low-intensity roads, the stabilized layer can be lightly brushed with a street sweeper a few hours after compaction for a durable, textured surface.
- **Brick or Paving Block — Heavy-Duty or Aesthetic Finish:** A thin sand layer beneath the pavers mixed with NovoCrete® and cement forms a dense, water-impermeable structure, ideal for load-bearing or decorative applications.



Load test after 12 hours (recycling material)



The Technology:

I. Application Environment:

- **Road Construction — Direct from Ground to Grade:** **NovoCrete®** stabilizes native in-situ soils to create a hydraulically bound base layer, eliminating the need for imported aggregates. This process accelerates construction, minimizes excavation and hauling, and significantly reduces carbon and material costs.
- **Weather Conditions — Adaptive Moisture Control:** Work is performed under standard favourable conditions, with on-site adjustments made as needed. In elevated temperatures or strong winds that increase evaporation, additional water is introduced during mixing to maintain proper hydration, compaction, and overall mix integrity.
- **Structural Longevity — Designed for Generations:** The stabilized **NovoCrete®** base forms a dense, water-impermeable matrix that resists cracking, frost heave, and deformation, extending pavement life and greatly reducing long-term maintenance and resurfacing needs.

II. Core Materials:

- **In-situ Soils — Optimized Native Material Use:** Including clay, sand, aggregates determined for formulating the workable design mixture.
- **NovoCrete® — Advanced Soil Stabilization:** A mineral-based powder, typically dosed at 2% of the cement content, that accelerates cement hydration creating a hydraulically bound base course. It forms dense interlocking crystalline bonds that permanently stabilize native soils, increasing compressive and tensile strength while reducing permeability.
- **Portland CEM III Cement — High Performance Durability:** A proven binder known for superior hydration and early strength development, providing long-term resistance to sulphates, freeze-thaw cycles, and chemical exposure.

III. Stabilization Equipment Line-up:

- **Milling & Recycling:** CAT RM600, Wirtgen WR240, or BOMAG RS460 (or equivalent) for precise blending and depth control.
- **Material Spreading:** Calibrated cement/**NovoCrete®** spreaders for even binder distribution.
- **Moisture Management:** Dual water trucks, one integrated with milling unit, one for supply and curing operations.
- **Finishing & Compaction:** Motor grader and steel-drum roller to achieve target density and surface smoothness.

IV. Process Overview:

Ground Preparation — Optional Pre-Treatment: Prior to stabilization, existing road layers can be selectively prepared to improve mixing uniformity. This may include milling up to 100 mm of old asphalt, cracking compacted layers with a grubber, or crushing coarse material to < 50 mm grain size. These optional steps enhance binder penetration and ensure consistent layer performance.





Spreading – Precise Binder Application: **NovoCrete®** is applied first, followed by cement, using machine-controlled or manual spreaders to ensure accurate dosage. In wet or rain-prone conditions, a double-layer “sandwich” method (cement–NovoCrete–cement) may be used. All binder quantities are carefully controlled to maintain uniform distribution and proper hydration for a hydraulically bound base.

Cold Recycling / Milling – Uniform Depth Blending: The specified **NovoCrete®** and cement mix is milled evenly into the in-situ soils to the full design depth (typically 250–500 mm), using a cold recycler to achieve a uniform, cohesive, and hydraulically bound layer based on traffic load and geotechnical design.



Compaction – Density and Surface Levelling: Follow with grade levelling of the surface and compaction using a steel-drum roller, irrigating the base layer during stabilization to maintain proper moisture content. Controlled water curing begins immediately after compaction to ensure uniform hydration and strength gain.



Curing – Hydration and Protection

Once moisture balance is achieved, protective surfacing such as chip seal, micro-surfacing, or asphalt can be applied within 24 hours.



High Performance Cement Chemistry & Sustainable Strength

- **Cement Compatibility & Performance – Built on Proven Chemistry:** **NovoCrete®** performs best with Portland cements containing >70% clinker, ensuring rapid early strength and strong crystalline bonding. Cements with fly ash or slag may be used following laboratory verification to confirm compatibility and early strength of 18–20 N/mm² within 2–3 days)
- **Hydration Acceleration – Fast Strength, Long-Term Stability:** **NovoCrete®** enhances the hydration of Tricalcium and Dicalcium (C₃S & C₂S) silicates, forming dense calcium silicate hydrate (CSH) gels and calcium hydroxide (CH) crystals. This reaction continues for up to 90 days, developing a tightly interlocked crystalline matrix with exceptional compressive strength and durability.
- **Environmental Impact – Smart, Sustainable, Strong:** By optimizing binder efficiency, **NovoCrete®** reduces CO₂ emissions by up to 66 kg/m³ of stabilized material and lowers energy use by over 700–1400% compared to conventional methods.
- **Pollutant Immobilization – Cleaner, Safer Ground:** Heavy metals and organic pollutants are permanently encapsulated within the crystal lattice, improving soil integrity and long-term environmental performance.

Versatile Applications – Beyond Roads

NovoCrete® is engineered for more than road construction. Its high strength, water resistance, and adaptability make it ideal for industrial, commercial, and municipal foundations.



Across all applications, **NovoCrete®** forms a hydraulically bound, durable base that reduces maintenance, extends service life, and outperforms conventional granular layers.



NovoCrete® Storage and Handling:

SUITABLE CONTAINER

Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. NOTE: Bags should be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse. Check that all containers are clearly labelled and free from leaks. Packing as recommended by manufacturer.

STORAGE REQUIREMENTS

- Keep dry.
- Store under cover.
- Protect containers against physical damage.
- Observe manufacturer's storing and handling recommendations.

STORAGE INCOMPATIBILITY

None known.

PROCEDURE FOR HANDLING

- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- When handling DO NOT eat, drink or smoke.
- Always wash hands with soap and water after handling.
- Avoid physical damage to containers.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.

APPEARANCE

Greyish odourless powder; partly soluble in water.

PACKAGING

NovoCrete® is delivered on pallets at 1 ton each.

- 40 x 25 kg bags
- 2 x 500 kg Big Bags
- 1 x 1000 kg Big Bags

RELATED DOCUMENTS

Material Safety Data Sheet for NovoCrete®

according (EG) No. 1907/2006 (REACH)

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