



Keeping it Green

Environmentally Sound Seamless
Primary and Secondary Containment for Landfill

Pro-SealECCO® Nano Novel Matrix Technology
a Delicate Balance of Nature ...

... Protecting Your Air and Groundwater quality





Technical

Product Description

Pro-SealECCO® is a green, Nano Novel Matrix, basin soil semi to structural soil stabilization and monolithic membrane barrier system. This Pro-Seal-ECCO® System is designed to contain leachates, low level radiation, PFOS, PFAS, methane, radon, and other landfill gases. The completed system manages greywater, other hazardous fluids, and gasses driving them to designed subterranean landfill vapor and drainage management systems. The company may warranty qualified projects, subject to Pro-SealCorp® corporate approval. The Pro-SealECCO System® is designed site soil specific, to integrate gas vapor management, greywater management, and other fluid and leachate management. This allows for longer service life expectations. The system is seamless affording less opportunity for membrane failures due to seam welds or gluing.

Production Rates The Basics

Pro-SealECCO System® for landfill incorporates in situ infusion of semi to structural stabilization of soil with our in situ applied, Nano Novel Matrix, and seamless, elastomeric, monolithic, membrane barrier coating. Flex-System II® membrane is applied directly over the semi to structural stabilization. This is a rapid install process system. A trained, eight-man-crew, with eight pieces of equipment, is able to install Pro-SealECCO System® at a rate of up to one-hundred-seventeen-thousand ft² of surface area per day.

Crews using tank trucks, with pressurized tanks, and proper spreader spray bars, apply hundreds of thousands of ft² of Pro-Seal-ECCO FlexSystem II® seamless, elastomeric, monolithic membrane per day, Rates for both systems are topography dependent.

The Pro-SealECCO System® complete laminated system assembly results as test by Independent laboratories (right, top).

Test Result			
ASCE ASTM	Evaluation	Allowed	Result
E-96-80-L021	Water Vapor Transmission	Perms Max Allowed 1.0	0.004 Passed Exceeds Parameters
E-154-88 Sec. 13	Decay Resistance	%Wieght Gain Max Allowed 10%	0.015 Passed Exceeds Parmeters
D-638 L021	Tension	Lbs. per ft @ Break	33.4 Passed Exceeds Parameters
D-638 L021	Elongation	% Elongation @ Break Mim. Allowed 25%	48.3% Passed Exceeds Parameters
D 903 L021	Shear Sdhesion tp Concrete	Lbs. per ft@ failure min. Allowed 1 ft lbs	5.54 Passed Exceeds Parameters
E-154-88 Section 10	Puncture Resistance	Lbs per ft of Force @ Puncture Min. 40 Lbs.	110.5 (±5) Passed Exceeds Parameters
C-836 L021	Hardness	Depth of Penetration Min. Hardness Allowed 50	52 Passed
D-751 L021	Hydrostatic Pressure Resistance	Pressence of Water @ PSI	No Water Present @ >168 psi
E-1454	Methane permeability	Vapor Transmission Rate ml/day/m ² atmosphere (avg)	No Vapor Detected Passed

All test data is based upon laboratory test results. Actual field results may vary due to site conditions, environmental factors, facilities uses, or other undetermined impacts or factors at the project site.

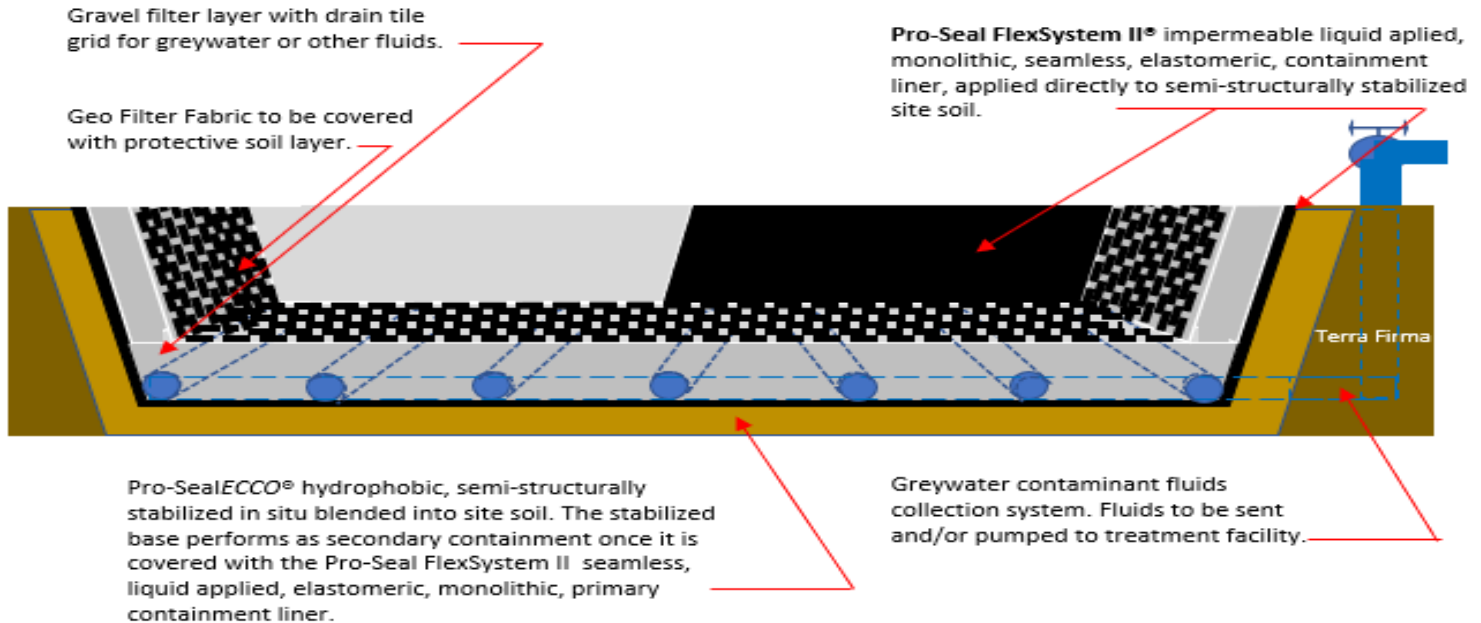
The test results say it all!

Pro-SealECCO's® combined semi to structural stabilization, waterproofing, greywater management, and gas-ses containment system is the most cost effective, efficient install, high quality system on the market today. The System with plumbing controls dangerous methane gas migration, creates waterproofing, stops leaching, and offers greywater management at your site. With up to 35-year warranties available. . Additionally, tremendous labor costs and time are saved due to rapid installation.



Installation Process (not to scale)

Landfill Storage Secondary and Primary Containment Basin Construction



The schematic, above, represents the simplicity of the construction of a Pro-Seal-ECCO® landfill stabilized and lined basin. Using soil in-place with Pro-SealECCO® Nano Novel Matrix additives we create a semi to structural secondary containment basin, that is hydrophobic. The stabilized basin is then sprayed with Pro-Seal Flex-System II® a chemical resistant, monolithic, seamless, elastomeric, membrane, as a primary containment barrier. The drain tile system is then placed and covered with the traditional materials.

Installation (typical, always contact Pro-Seal technical for your site)

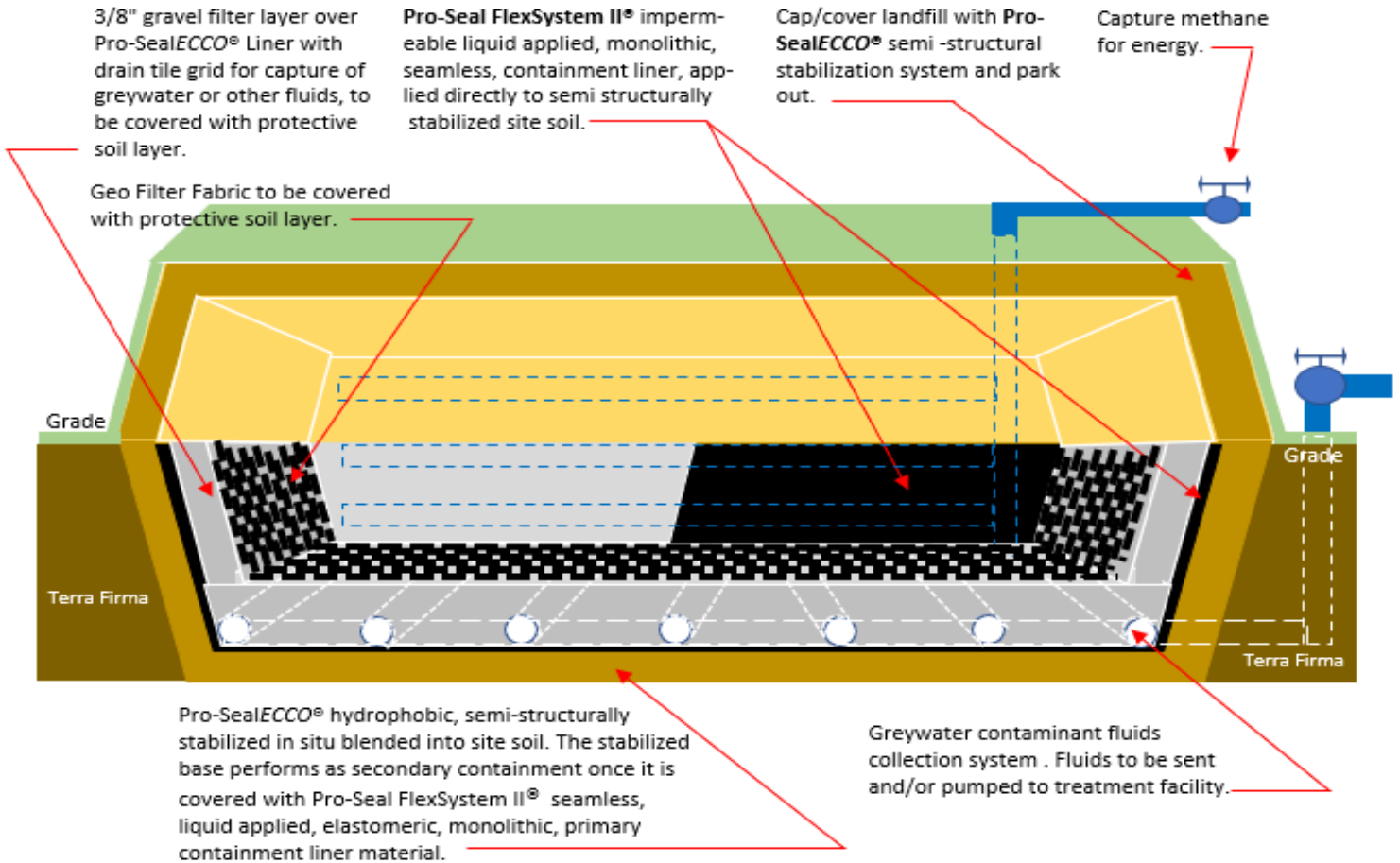
- The Pro-SealECCO® Stabilization additives (NanoCrete, BedR.O.C., and other as required) are placed over the predeveloped exposed basin soil.
- Pro-SealECCO® additives are then mixed-into the site soil (in situ) at the predetermined depth. This process is a high speed placement on the basin floors and slopes.
- followed by back dragging to smooth and mildly compress.
- Followed drum rollers to dynamically compress the soil.
- followed by pneumatic rollers to tightly compress the surfaces of the now stabilized basin soils.
- Simultaneously apply of Pro-SealECCO Top R.O.C., spread by tank truck with a spreader bar. Allow to cure 24 hours.
- Allow complete system to cure 14 days cure minimum.
- Apply Pro-SealECCO FlexSystem II, to 14 day minimum cured basin, with a pressurized tank truck, using a spreader bar. Apply at a coverage rate of 20 ft.² per gallon (typical). Allow minimum to cure 12 hours.

If multiple coats of Pro-SealECCO FlexSystem II are required apply in under 12 hours from previous coat application.



Cover and Park Out (not to scale)

Closing Landfill Storage Secondary and Primary Containment Construction



Above is the Pro-SealECCO® System semistructural cap cover placed over a closed landfill. The system captures greywater, contaminant fluids, and gasses. Methane may be repurposed for energy use as appropriate. The landfill cap is “parked out” at close with a root heavy ground cover, plants, trees, grasses, or others, to be reintroduced as a park or other practical site use function.

System Component Information

The component Pro-SealECCO NanoCrete® general product information is in the table, left. For more in depth information see the Pro-SealECCO NanoCrete® technical tests table following, page 5.

Information	Value
Material	Talcish Powder
Mix Time	In Situ mixed
Appearance	Very light Grey
V.O.C. Content	ZERO
Flash Point	Will Not Flash
Service Temperature	≥ 48°F / 8.89°C
Initial Set	15-20 minutes nominal
Cure Time	14 to 28 days
Weight	105 lbs/f ³ nominal
Spread Rate	Detrmined per site soils
Shelf Life	1 yr stored properly
Packaging	1 ton totes, 2 ton totes



Technical System Component

ASTM	Test	Data (Typical)	
ASTM C 109	5% additive Compressive Strength (psi)	1 day	6,250
		7 days	11,440
		28 Days	12,600
	Tensile (psi)	24 hrs.	390
7 days		780	
28 days		1,280	
ASTM C 266	Set Time	Initial	1 minute
		Final	3 minutes
CSA A 23.2-6B	Tensile Pull (psi)	Final	409
USACE CRD-C621			
Aterberg Limits	Platicity	Passed	
	Fluidity: plastic water content 6 pints flow:100 seconds expansion	3 days	+ 0.02
		14 days	+ 0.01
		28 days	+ 0.01
	24% additive Compressive Strength (psi)	1 day	6,000
		3 days	8,000
		7 days	10,000
		28 Days	11,000
	Fluidity: Flowable water content 7 pints flow: 130 seconds expansion	3 days	+ 0.01
		14 days	+ 0.01
		28 days	+ 0.01
	24% Additive Compressive Strength (psi)	1 day	6,500
		3 days	8,000
		7 days	10,000
28 Days		11,000	
Fluidity: Fluid water content 8.3 pints flow: 30 seconds expansion	3 days	+ 0.01	
	14 days	+ 0.01	
	28 days	+ 0.01	
24% additive Compressive Strength (psi)	1 day	4,500	
	3 days	7,000	
	7 days	8,500	
	28 Days	10,000	
Shrinkage	Zero		
Absorption	Hydrophobic		
24% additive	Strikes	> 20	

Results based on laboratory testing actual field application result may vary.

System Component



Pro-SealECCO® additives NanoCretes and XW-Cretes are blended in situ of the site soils with Pro-Seal-ECCO BedR.O.C.® based upon your site environments.

Pro-SealECCO XWCretes with BedROC mixes are mixed in situ. They are formulated and designed into wet or active water site soils environments.

Pro-SealECCO NanoCretes with BedROC mixes are mixed in situ. They are formulated and designed into dry site soils environments.

These Pro-SealECCO semi to structural stabilization systems contain toxic leachates present in contaminated soils such as, *RCRA 8 metals arsenic, lead, copper, selenium, and much more. Pro-SealECCO Nano Novel Matrix® in situ earthen semi to structural stabilization creates a barrier that contains a variety of other leaching materials such as acid rock, low level radiation, PFOS, PFAS, and Fly ash, stopping potential migration. Pro-Seal-ECCO® contains the soil leachates at levels better than or equal to EPA allowable limits.

The process begins with sending your facilities site soils reports and/or soil samples to Pro-SealCorps® labs. Based on your desired goals and characteristics for soils, Pro-Seal Labs® creates your custom Nano Novel Matrix soil design. Our lab determines what formulation, what additives, what type of mix, will be required to substantially meet the needs and/or goals for your facility site soils. Once formulation is achieved our Pro-Seal® technical department develops a guideline specifications and/or guideline sketches for the application implementation of the stabilization and or semi to structural stabilization system, designed for installation at your facility site.

*Mercury not yet tested; it was not present in test soils.



System Technical



BedR.O.C.® Category:

Landfill soils stabilization, toxic leachate binder is used for site soils to achieve containment and molding of soils mediums; BedR.O.C. used with Pro-SealECCO Nano-Cretes® and/or Pro-SealECCO XW-Cretes® in soils as specified.

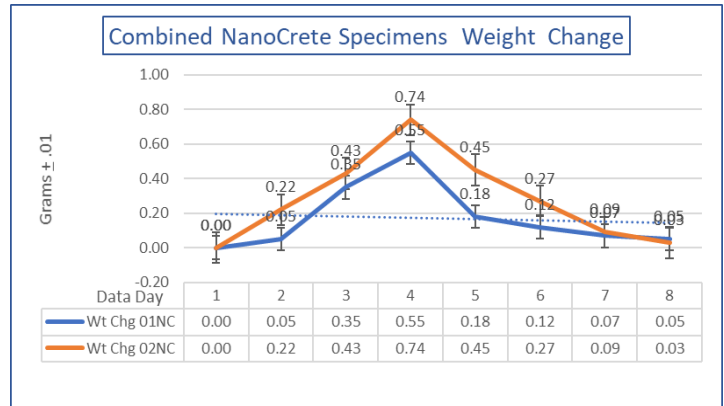
Description: Pro-SealECCO BedR.O.C.® is a semi-solid, vitriform, fluid, placed in situ with NanoCretes Pro-SealECCO's® rapid setting landfill soils stabilization, containment, and soil molding compound. The system forms a high-density mass that is significantly structurally enhanced, stabilized, soil. It maintains slopes, stopping mud, dusting, and leaching. It allows heavy vehicular traffic. The Pro-SealECCO® is custom formulated and designed site soil specific, based upon client site specific needs. Pro-SealECCO Bed-R.O.C.®, when mixed properly with Pro-SealECCO Nano-Cretes® or Pro-Seal-ECCO XWCretes® and your site soil, can bind in toxic soil leachates as previously described, such as silver, lead, and contain contaminants such as PFAS, PFOS, low level radiation, acid rock, and more.

Tailings Specimens, Tested as Follows: (modified tests)		
ASTM	Data	Value
C-67, Section 7	Decreased Absorption	Hydrophobic
C- 67, Section 14	Decreased Suction	Anionic
C-67, Section 7	Leaching Efflorescence	Initial Cure
C-156	Stabilizing, avoiding hairline cracking	Significant >
C-666	Freeze thaw damage	86% improved
C-666 Using 5% NaCl	Salt attack in the presence of moisture	95% improved
ORF Method	Dusting due to abrasion	100% improved

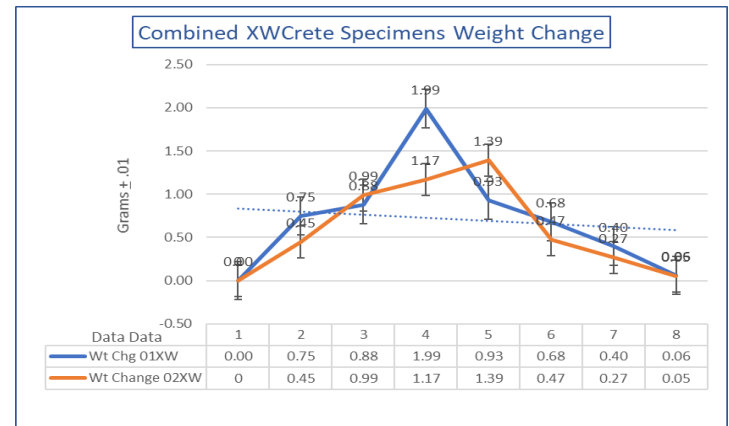
Note: Above results (typical) when mixed with Pro-SealECCO NanoCretes® and Pro-SealECCO XWCretes® and Soils.

Information	Value
Material	1 part
Mix Time	N/A
Appearance	Liquid
Freeze Temp	32°F/0°C
Boiling Point	212°F/ 100°C
V.O.C.	Zero
Enviro Hazard	None Known
Packaging	Bulk as Required

Product: Pro-SealECCO BedR.O.C.® is a Nano Novel Matrix® additive that creates strong cross linking and a hydrophobic /anionic mass when used with Pro-SealECCO NanoCrete® and/or Pro-SealECCO XWCRETE® and Pro-Seal-ECCO Top-R.O.C.®.



Dry Soils Moisture Content (MC) Results:
Water Expulsion = Hydrophobic/Anionic



Wet Soils Moisture content (MC) Results:
Water Expulsion = Hydrophobic/Anionic

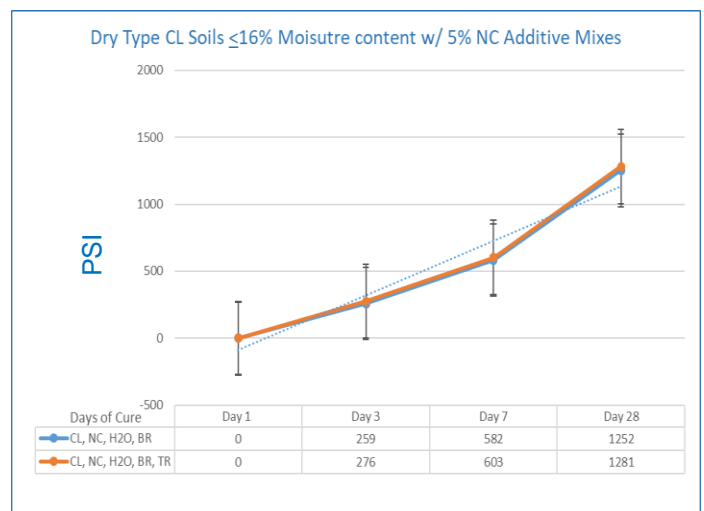
All results in this document are based on laboratory testing actual field application result may vary.



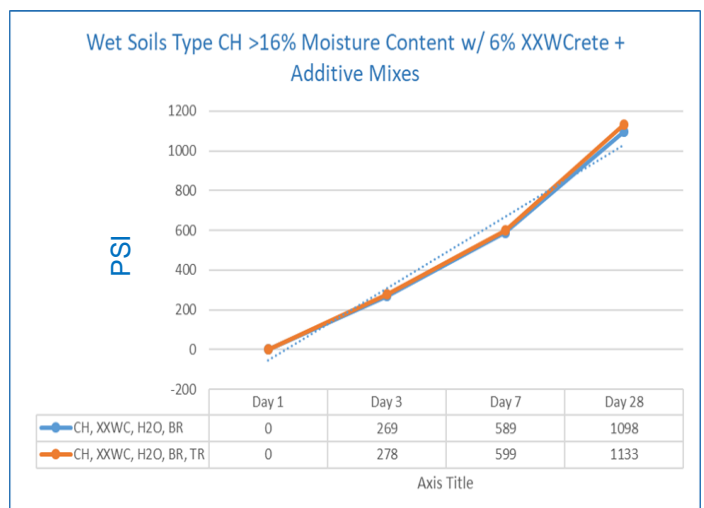
Leachates from Pro-Seal ECCO Stabilized Mine Tailings Soils	Description	Parts Per Million (ppm)
Volitile Organic Compounds (V.O.C.s)	V.O.C.	0.0000
Arsenic	As	0.0005
Mercury	Hg	<.01
Zinc	Zn	0.0300
Copper	Cu	0.0300
Nickle	Ni	0.0300
Iron	Fe	0.0300
Manganese	Mn	0.0002
Chromium	Cr	0.0005
Vandium	V	0.0100
Calcium	Ca	0.0300
Potasium	K	45.3000
Aluminum	Al	0.0010
Magnesium	Mg	0.0002
Sodium	Na	0.3000
Argentum	Ag	0.1800
Aurum - Gold	Au	0.0100
Barium	Ba	<.01
Berylium	Be	<.01
Bismuth	Bi	<.01
Cadmium	Cd	<.01
Cobalt	Co	<.01
Dysprosium	Dy	<.01
Erbium	Er	<.01
Europlum	Eu	<.01
Gallium	Ga	<.01
Gadollum	Gd	<.01
Hafnium	Hf	<.01
Holmium	Ho	<.01
Lanthium	La	<.01
Lutetium	Lu	<.01
Molybdenum	Mo	<.01
Niobium	Nb	<.01
Neodymium	Nd	<.01
Phosphorus	P	<.05
Plumbum - Lead	Pb	<.01
Prayseodymium	Pr	<.01
Rubidium	Rb	<.01
Rhenium	Re	<.01
Sulfate	S	<.01
Antimony	Sb	<.01
Selenium	Se	<.01
Samarium	Sm	<.01
Stranum	Sn	<.01
Stromium	Sr	<.01
Terbium	Tb	<.01
Tellurium	Te	<.01
Titanium	Ti	<.01
Thallium	Tm	<.01
Uranium	U	<.01
Wolfram	W	<.01
Yttrium	Y	<.01
Ytterbium	Yb	<.01
Zirconium	Zr	<.01

Leachate Containment and PSI development

The table (Left) displays the leach limits in ppm of a variety of toxic materials after a thirty-day exposure to the sulfuric acid leaching medium, which far exceeds the 18 hour acidic acid leaching exposure limits parameters of the standard TCLP testing, as required by the EPA. Note: RCRA 8 metals evaluated passed in subsequent testing in ppb. You will note the binding and containment of critical toxic leachates is extremely significant and greater than any other known current technology is able to achieve as of this publishing.



Dry Soils Moisture Content (MC) PSI Gain over 28 days



Wet Soils Moisture Content (MC) PSI Gain over 28 days

All test results are based on laboratory testing, actual field application result may vary.



System Component

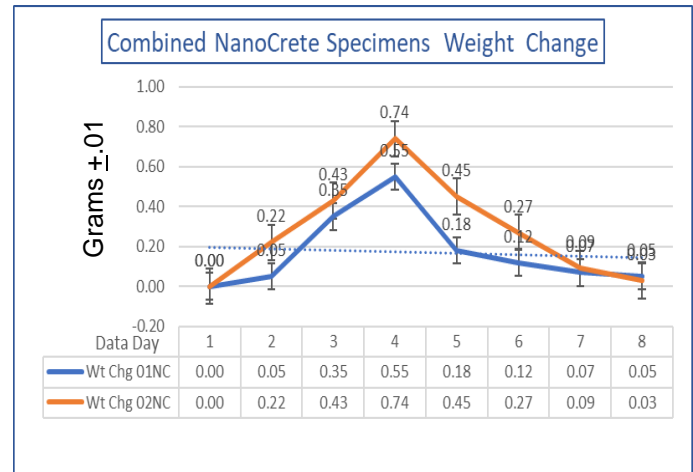


TopR.O.C. Category: Stabilization, toxic mine soils binder and containment as well as molding soils medium; TopR.O.C. is used with Pro-SealECCO Nano-Crete® and/or Pro-Seal® XWCrete® with Pro-Seal-ECCO BedROC® in soils as specified.

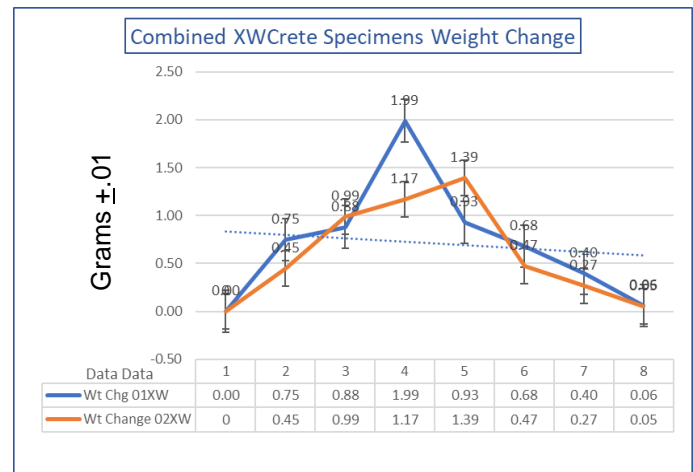
Component Description:

Pro-SealECCO TopR.O.C.® is a liquid surface densifying component as part of the patent pending Pro-SealECCO® rapid application landfill soils stabilization, containment, and soil molding systems. Pro-Seal-ECCO Top-R.O.C.®, applied properly with Pro-Seal-ECCO NanoCretes® and/or Pro-SealECCO XW-Cretes®, Pro-SealECCO BedR.O.C.'s® and soil, can bind in toxic leachates in soils, contains greywater, and low level radiation, PFAS, PFOS, or other toxic soil leachates.

Pro-SealECCO TopROC® when properly incorporated into the Pro-SealECCO® landfill soils stabilization, significantly enhances the systems ultimate performance over time. Pro-Seal® formulas are customized, by our labs, to the clients' soils, based in the clients' intended needs of those soils for both normalized moisture contents and high moisture content soils as demonstrated in the following two tables (top right).



Dry Soils Moisture Content (MC) Results:
Water Expulsion = Hydrophobic/Anionic



Wet Soils Moisture content (MC) Results:
Water Expulsion = Hydrophobic/Anionic

System Technical

Information	Value
Material	1 part
Mix Time	N/A
Appearance	Liquid
Freeze Temp	32°F/0°C
Boiling Point	212°F/ 100°C
V.O.C.	Zero
Enviro Hazard	None Known
Packaging	Bulk as Required

All results based on laboratory testing actual field application result may vary.

Tailings Specimens Tested as Follows: (modified tests)		
ASTM	Data	Value
C-67, Section 7	Decreased Absorption	Hydrophobic
C- 67, Section 14	Decreased Suction	Anionic
C-67, Section 7	Leaching Efflorescence	initial cure
C-156	Stabilizing, avoiding hairline cracking	Significant >
C-666	Freeze thaw damage	98% improved
C-666 Using 5% NaCl	Salt attack in the presence of moisture	97% improved
ORF Method	Dusting due to abrasion	100% improved

Pro-SealECCO® Landfill in Place Site Soil Semi-Structural Stabilization Secondary
 Containment with Primary Containment Seamless Membrane System
 City of LA RR# 26015 (CSI # 07130)



1. Excavate Site



2. Grade To Slope and Drain



3. Wet To spec'd Moisture Content



4. Spread Pro-SealECCO NanoCrete®



5. In Situ reclaim into soil Pro-SealECCO NanoCrete® & Pro-SealECCO BedR.O.C. the Pro-SealECCO Secondary Containment barrier



6. Re-grade To Slope and Drain as needed



7. Back Drag or Box Blade for Initial Compression



8. Drum Roll Flats and Slopes for Deep Compression



9. Pneumatic Roll for Surface Densifying Compression



10. Spread Pro-SealECCO TopR.O.C.



11. Spread Pro-SealECCO FlexSystem II® Primary Containment Barrier

Above: Typical eleven step application of the Pro-SealECCO Nano Novel Matrix® secondary containment semi-structural leachate binding soil additives and the primary seamless, monolithic, elastomeric, containment barrier Pro-SealECCO FlexSystem II®. Contact technical for your specific site needs.

Call Technical:

Toll Free USA/CND: 800 349 7325
 International : +1 520 349 7325

Email: technical@prosealproducts.com





System Component



Seamless Monolithic, Elastomeric, Pro-SealECCO FlexSystem II™ Primary Containment Over Pro-SealECCO NanoCrete® Stabilized Secondary Containment.

Pro-Seal FlexSystem II® greywater, contaminant fluid, methane barrier and waterproofing/management primary containment system is a liquid membrane. It is a single component material forming a seamless, flexible, elastomeric, monolithic barrier containment/management system as applied over Pro-SealECCO® semi-structural soils stabilization system. The ProSealECCO System® upon proper in-stalllation of all components is a primary and secondary containment system.

Application

Spray or spreader apply Pro-SealECCO FlexSystem II® over a cured 14 day minimum Pro-SealECCO® semi to structurally stabilized soil surface, which has been compaction rolled to a smooth compressed finished surface, ready to accept the Pro-Seal FlexSystem II® monolithic, seamless, elastomeric, barrier material.

- May be used on vertical, overhead, or horizontal applications
- Multiple coats are applied with no peeling, if applied in more than six hours and less than 12 hours between coats.
- Tough, durable, seamless, monolithic, and flexible with zero perms (.0004).
- Low V.O.C. to NO V.OC.
- Environmentally friendly

Caution: Store containers of this material out of heat and sunlight. Applied material may be exposed to sunlight at 70°F / 21°C for not to exceed 120 days.



System Technical

Information	Value
Material	1 part
Mix time	None
Appearance	Liquid
V.O.C. content	20 grams/liter
Flash point	150°F
Service temperature	>-70°F to 175°F
Cure time recoat	6-12 hours
Cure time complete	96 hours
Stain resistance	Very Good
Weight	9.2 lbs./ gallon
Shelf life	6 months when stored properly
Spread rate	30 mils @50 ft²/ gal
Packaging:	5 or 55 gallons

Chemical Resistance

ASTM D 2299 (in laminated system contact surface to contaminants)	
Cured material	Rating
Alkalize spillage/splash	Very Good
Methane, Radon (in FS II System only)	Excellent
Solvents spillage/splash (In FS II System only)	Excellent
Salt fumes (in FS II System only)	Very Good
Salt spillage/splash	Excellent
Water spillage/splash	Excellent
Water constant immersion 48 hours max	Excellent

Specifications (Component of System)

ASTM/Test	Data	Value
D 154	Resistance to decay	No surface defects
D 412-98	Elongation	700% ± 10
D 412-98	Recovery	98% ± 2 4 groups tested
D 412-98	Tensile strength	436 psi (3.0 n/mm²)
D 751-00	Hydrostatic pressure resistance	94 psi (3.38 n/mm²)
D 903-98	Adhesion to concrete	19 psi (3.38 kg/cm) No peel/film break
D 2240-97	Shore hardness	35 ± 5 A
D 2369-98	Solids content	86% ± 2 weight 80% ± 2 volume
E 96-00 Procedure B	Water vapor transmission System) (in	<.0004perms
Brookfield viscometer	Viscosity	250 cps ± 50

All results based on laboratory testing actual field application result may vary.



Contractor Training and Authorization

To become an authorized applicator of Pro-Seal® Products Systems and materials attend Pro-Seal University™. Learn about a variety of unique Nano tech materials users may apply in adverse environments and save time and labor. For more information contact Pro-Seal® Products Technical Department.

Drawings, Design and Guide Instructions

The drawings contained herein these pages are (not to scale). The viewer of the drawings understands they are not precision and are not site specific “as applied” drawings. These drawings are likenesses meant to convey the concept, idea, and methods of potential use and application of the Pro-SealECCO® containment system, a combined primary and secondary containment system for landfills. Actual design layout and applied methodology, of the installation of the system, will be created by the specifying party. The manufacturer’s technical department will review, for manufacturer’s approval of final design, when a client requests a manufacturer’s warranty.

The manufacturer offers guide specifications and guide sketches, not project or site specific. Said information and information contained herein, is strictly a guide to convey design concept, layout concept, and use concept.

If you have a project in mind that requires, design, please see contacts and contact information, bottom right.

Compliance:

- ESG Guidelines Compliant
- GO Green Certified
- Red Line Certified
- NSF Certified
- LEED Compliant
- EPA Compliant

Contains and/or Binds In:

- Landfill
- Toxic Dust
- Soil Leachates
- Fly Ash
- Semi Structural Soil Stabilization
- Low Level Radiation

Cautions:

Keep out of reach of children. May cause skin or eye irritation. This product may be harmful if swallowed. Do not induce vomiting. Use in well ventilated areas. Contact a physician immediately and always seek a physician’s advice regarding first aid. Use only in commercial or industrial applications. Use only on intended surfaces specific application uses. See material safety data sheet for additional cautions.

Limited Warranty:

We warrant our product to be free of defects in material and workmanship; and to be in accordance with our company quality control standards. All data, statements, and recommendations made herein are based upon information we believe to be dependable. Said content herein these pages is-made-available, without any representation, guarantee, or warranty of accuracy. Pro-Seal’s products are-sold-on the condition that the user will evaluate them, as well as our recommendations, to determine their suitability for the user’s own purpose before adoption.

Statements made by any persons regarding the use of our products or processes are not recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall-be-limited to, replacement of material only. No statement claim verbal, written, paper medium, electronic medium or any other known or unknown medium made by independent representation, dealers, distributors or any third parties whatsoever that are not in written form, nor authored and/or distributed by from the manufacturer, shall not be the responsibility nor liability of the manufacturer.

Communication With Pro-Seal® Products Is Easy !

- We love our clients !
- We love customer service !

Contact:

Jim Griffin Global Team Leader

Cell: 480 797 0123 Int'l +1

Office TF US/CND: 800 349 7325

International: +1 520 3497 325

Email: jim.g@prosealproducts.com

Jeff Elser National Sales Manager

Cell: 702 241 6759 Int'l +1

Email: proseal.jeffe@gmail.com

Tim Lindor Head of Technical

Cell: 206 434 1225 Int'l +1

Email: timl@prosealcorp.com



Keeping it Green

Protecting Our Groundwater, Protects Our Food Sources

Let's Walk into Tomorrow Together, Making a Difference

We Must Now Work Together for Our Better Future

Together Let's Take a Stand for a Brighter Day

Building Today, for Our Children's Tomorrows

Let's make a Green, Low Carbon Footprint, Future

Tomorrows Nano Novel Matrix World Today



Above, Dirt, Pro-SealECCO® Semi-Structurally Stabilized

- ESG Guidelines Compliant
- GO Green Certified Compliant
- Red Line Certified Compliant
- NSF Certified Compliant
- USEPA Compliant
- USFDA Compliant
- Contains RCRA 8 Metals
Newest ppb Requirements
- USACE ASTM Compliant
- LARR Compliant
- CSI Compliant
- LEED Compliant