



PURE CRETE

TECHNICAL MANUAL

Presented by

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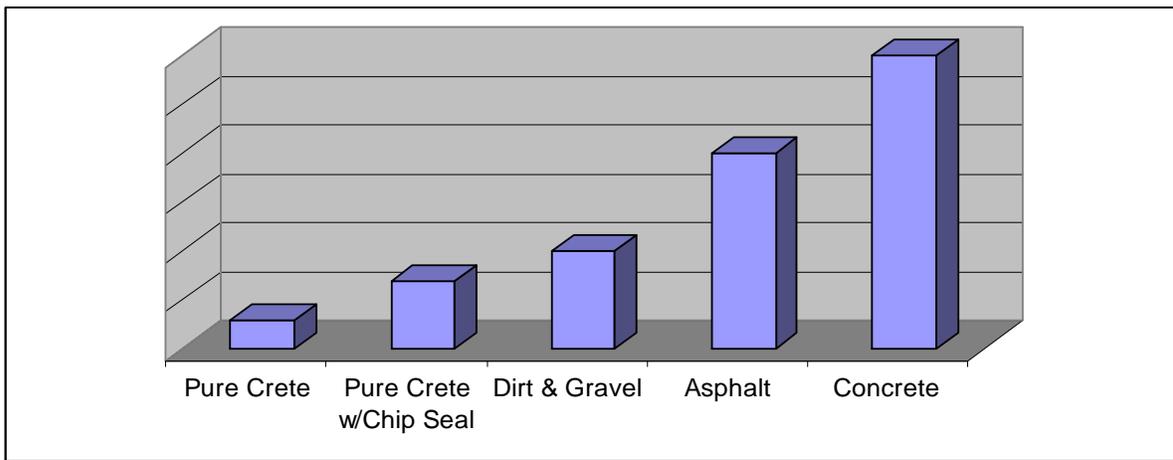
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Table of Contents

PURE CRETE General Information	3
Road Design Elements	6
Chip Seal & PURE CRETE	7
Considerations in Road Construction, Design, & Maintenance	8
PURE CRETE Technical Tools	10
• PURE CRETE Metric Worksheet	11
• PURE CRETE English Worksheet	12
• Road Base/Moisture Calculation Metric Worksheet	13
• Road Base/Moisture Calculation English Worksheet	14
• Water Application Guidelines (Metric)	15
• Water Application Guidelines (English)	16
• PURE CRETE Application Calculation	17
• PURE CRETE Palm Application Calculation	18
• Load Weight Calculations	19
PURE CRETE Frequently Asked Questions	20
Personnel and Equipment Requirements	23
MATERIAL SAFETY DATA SHEET	26



Construction Costs Per Mile

PURE CRETE is a complex non-bacterial concentrated multi-enzymatic formulation that alters the properties of earth materials, providing one of the most cost effective methods to stabilize roads and seal ponds and landfills.

WHAT IS PURE CRETE?

PURE CRETE is one of the world's finest products for road stabilization and pond and/or landfill sealing. Although it has been available for the past 20 years, due to a recent major change in marketing direction **PURE CRETE** is now available for the first time through a specialized distributor network offering the product to the marketplace. **PURE CRETE**, a concentrated enzyme formulation alters the properties of earth material to produce superior road base stabilization compared to all other road treatment now in use. Developed and proven through many years of field testing, **PURE CRETE** provides additional advantages to road builders, communities and the environment by being non-toxic, non-corrosive and totally biodegradable.

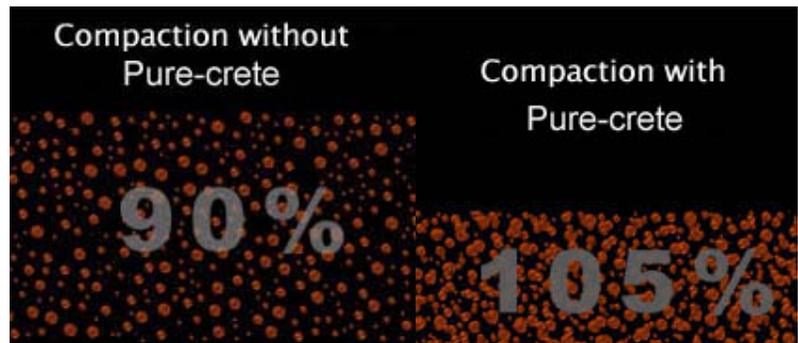


PURE CRETE provides soil stabilization that enhances road construction and reduces repair and maintenance costs. It is also used in pond construction and other soil stabilization applications.

PURE CRETE is an organic enzyme formulation designed to maximize compaction and increase the natural properties of soil to optimal conditions. An enzyme is a natural organic compound similar to proteins, which act as a catalyst. Their large molecular structures contain active sites that assist molecular bonding and interaction.

When mixed with water and applied prior to compaction, **PURE CRETE** acts upon organic fines contained in the soil through a catalytic bonding process, producing a strong cementation action. Unlike inorganic or petroleum based products which temporarily hold soil together, **PURE CRETE** causes the soil to bond during compaction into a dense permanent base which

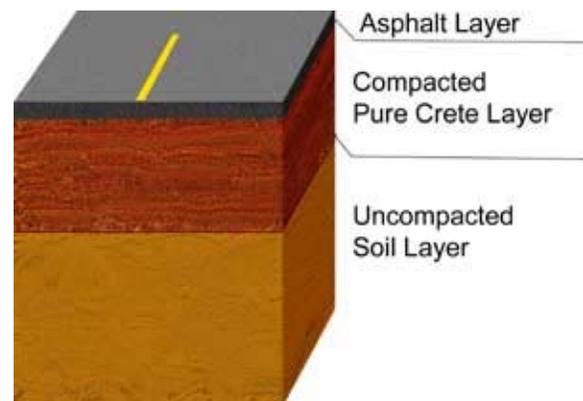
resists water penetration, weathering and wear. This process takes place 72 hours under normal summer conditions. **PURE CRETE's** formulation increases the wetting action of water for increased penetration to assist compaction to obtain greater soil densities. Also, **PURE CRETE** accelerates cohesive bonding of soil particles, creating a tight permanent stratum. Unlike inorganic or petroleum-based products with their temporary action, **PURE CRETE creates a dense and permanent base, which** resists water penetration, weathering and wear. In normal road construction methods, compaction in the 90 percent range is normal. With **PURE CRETE**, compaction of up to 105 percent can be expected.



In addition to creating a new and better way of building and maintaining roads, **PURE CRETE** is being used successfully in the construction of lake beds; mine leach pads, ponds and landfill liners, wherever there is a need to increase the load-bearing capacity of the soil and to reduce the plasticity and permeability.

PURE CRETE'S ADVANTAGES

PURE CRETE lowers the surface tension of water, which promotes fast and thorough penetration, and dispersal of moisture. This action causes hydrated clay particles to be pressed into and to fill the voids throughout the soil, thus forming a tight, dense permanent stratum. The increased lubricity of soil particles allows the designated soil density to be reached with less compaction effort.



PURE CRETE reduces, by as much as 25%; the amount of water required to reach the optimum moisture level of the soil since it promotes rapid saturation and inhibits surface evaporation. The **PURE CRETE** cementation action increases the soil bearing characteristics by promoting a closer binding of soil particles. This reduces the tendency of the soil to expand after compaction and results in a strong, stable earth layer. By achieving greater bonding density, soil materials resist migration of water. A properly treated **PURE CRETE** base becomes almost impervious to water penetration and much more resistant to frost heaving.

Road builders can now construct a new road base using existing soil materials without trucking in additional aggregate (if sufficient fines are present.) Mixing **PURE CRETE** with the top 15 or 16 centimeters of soil will produce a road base that has more strength and less permeability than can be attained with any other treatment. If imported material is needed, less expensive, dirty aggregate is a requirement. The dirty fines are needed to bond the material together. Dirty here means 15% to 20% cohesive fines passing a 200-mesh screen. The best part is that only 37 liters of **PURE CRETE** is needed to treat one kilometer of an 8-meter wide

roadway (30.4 centimeters deep.) 30 gallons is required to treat one mile of road 25 feet wide 12 inches deep.

PURE CRETE can be applied over a wide weather and locale range. From near freezing to hot summer days, from a rain forest to a desert, from Lake Bottom to an earthen dam, **PURE CRETE** will provide superior results. New or existing roads treated with **PURE CRETE** to the recommended depth will retain a tough, rupture-resistant surface that requires minimal maintenance, often requiring no additional “dressing” for a number of years.

PURE CRETE is sold in liquid concentrate form. This eliminates the bulk storage, pre-mixing and handling of large amounts of materials. It will not corrode equipment. **PURE CRETE** is non-toxic. It requires no special handling equipment and no special containment procedures as required with toxic and/or corrosive agents. It does not irritate skin tissue and causes no rashes or burns. **PURE CRETE** contains no combustible materials, is non-explosive and can be used near open flames. It is non-gaseous and can be stored in poorly ventilated areas. It will not harm humans, animals, fish or vegetation under normal use and is totally biodegradable.



CHARACTERISTICS & OPERATING PARAMETERS

CHARACTERISTICS

1. **PURE CRETE** is highly concentrated.
2. The product is formulated to contain an enzyme base with a dispersant in water-based solution.
3. **PURE CRETE** is non-toxic, non-hazardous and non-flammable.
4. **PURE CRETE** has a shelf life for more than two years.
5. Store the product in an environment less than 120F (49C.) Freezing is not harmful to product.

OPERATING INSTRUCTIONS

1. **PURE CRETE** should not be diluted less than one part **PURE CRETE** to five hundred (500) parts water. This will insure sufficient water for **PURE CRETE** to penetrate evenly throughout the soil.
2. Total moisture should never exceed optimum moisture. (Hint: A hand sample should make a firm ball.)
3. Road construction should not be done when rain is expected.
4. Soils with high moisture content prohibit penetration of **PURE CRETE** into the soil.
5. The concept is to never exceed the optimum moisture. It is hard to dry out wet soil.
6. Work when the daytime temperature is above 50F (10C) and the night temperature is above freezing (32F - 0C.)

ROAD DESIGN

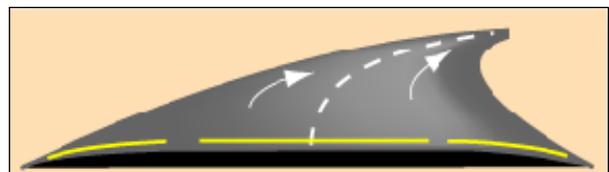
Construction of new & existing roads must consider **design elements** some of which are listed below:

1. *Traffic Loads (wheel weight & frequency of use.)*
2. *Available road building materials.*
3. *Topography & sub-base soil conditions (soft or firm.)*
4. *Moisture (rain, snow & ground water.)*
5. *Long term use and maintenance requirements.*

Soft sub-base conditions require greater thickness - in some cases as high as 24 inches (60 cm.) Where the sub-base is firm, a minimum thickness of 6 inches (30.4 cm.) can be used. Roads with truck traffic require greater thickness to support the high wheel loads of 20,000 lbs to 30,000 lbs (9,000 to 13,000 kilos.) Analysis of the sub-base conditions and testing for load bearing capacity may be required to achieve proper design specifications.

Traffic loads and speed also affect the life of a road. In many instances a hard “wearing” surface cover is necessary. High-speed traffic increases the mechanical forces applied to the road surface. To prevent surface wear a protective cover such as asphalt, concrete or a chip seal coat may be necessary.

Surface and sub-surface moisture conditions also enter the equation for good road design. It is important that the road have **adequate drainage** and that the sub-base and road base be kept as dry as possible to prevent structural failure. **Side drainage channels are important as well as crowning of the road surface** to allow water to flow away from the road surface. Where ground water is near the surface it may be necessary to place a rock sub-base or other engineered treatment. It is up to the engineer to evaluate these conditions.



Road building materials also affect the design of a road. The type and properties of the material greatly affect the performance of a road. Well-graded gravel and soil give maximum performance. Cohesive fines enhance the performance of a road (less rutting and pot holes.)

There are other factors, which must be considered. Civil Engineers qualified in road construction should be consulted for specific site conditions.

STRENGTH

The load, which the wheel of the vehicle exerts on a gravel surface, spreads out as it passes down through the road base. The angle of force, increasing in width as it penetrates deeper into the road material is referred to as the internal angle of friction ϕ . It varies depending upon the type of material present. The objective in road design is to have sufficient road base thickness to support anticipated wheel loads.

PURE CRETE treated material has increased compressive strength, which resists deformation and excessive flexing due to wheel loading. This stabilization results in an overall stronger base. It also means less maintenance.

ASPHALT COVER OVER PURE CRETE “CHIP SEAL”

*(General guideline discussion only
Refer to qualified oil-asphalt representative
for further information)*

Either Emulsion (CRS) or (MC) asphalt can be used. The emulsion means it is cut back or diluted with water and is shot at a temperature around 106° F. (71°C.) The MC is cut back with diesel fuel or other petroleum product and shot at temperatures of 225° F. (107° C.) The advantage of one over the other is debatable. Generally specking the MC will penetrate dirty gravel better than emulsion, but may have a tendency to bleed off more if the balance of oil to gravel is not correct. When using MC, the first coat is thinner, usually MC-800, and the second coat heavier - MC-3000.



When using Emulsion, use the same weight, CRS2 for both layers. There is also available variations of CRS-2, some quick dry, some rubberized, some hard. Check with your supplier to see what is available in your area. Also, when using Emulsion, you need approximately 29% more material to obtain the same amount of asphalt thickness, due to drying where water evaporation reduces the overall weight.

The **PURE CRETE** road surface should be prepared at least three (3) or more days prior to applying the asphalt. The surface should be a smooth and dry hard surface. Dress any imperfections prior to applying the asphalt, as they will extend up through the finished surface (a smooth base is essential.) Prior to applying or “shooting” the first layer of oil, dampen the surface with a mist of **PURE CRETE** treated water diluted 1 gallon of **PURE CRETE** to 10,000 gallons of water. The **PURE CRETE** mist will help the oil bond to the road surface. After this dries



or looses it sheen, you are ready to apply the oil. Usually approximately .4 to .5 gallons of oil is applied per sq. yd. of surface. Then immediately apply 3/4 inch of 3/4 minus clean gravel and compact with compactor. After the first layer of oil and gravel is rolled down, you can pull a (non-rotating) drag broom over the surface to smooth out any roughness caused by the chip spreader, trucks or roller. This will insure a smooth surface for the second layer. Now the second (final) layer of .35 to .40 gallon per sq. yd. of oil and 1/2 inch of 1/2” or 3/8” chips can be laid down and compacted. The gravel chips must be fractured rock to stay in place. Pea gravel cannot be used. If you have the proper amount of oil, gravel and chips, the oil should penetrate both layers and bond together. If too much oil is used, bleeding will occur. Insufficient oil will not allow proper bonding.

PLEASE NOTE: This is just a guideline. Different oils and gravels react differently. Consult your oil distributor representative for further information and recommendations.

CONSIDERATIONS IN ROAD CONSTRUCTION, DESIGN AND MAINTENANCE

MOVEMENT

Aggregate will move under wheel loading. If such movement is not prevented, deformation or rutting of the roadbed structure will result. Consider repeated wheel loadings from passing vehicles. The load from the wheel is transmitted to the aggregate or gravel, which transmits the load down to the sub grade. This downward force tends to move the aggregate and sub grade in the downward direction. As the granular material penetrates the soil, the soil is displaced. The displaced soil particles move to the point of least resistance, which is determined by several factors:

- Natural restraints imposed by the geometry of the road system.
- The plastic flow mechanism of the particular soil type.

Frequently, particles move to the point of least resistance - upward into voids or spaces between granular materials. This results in a loss of bearing capacity and a deformation or rut of the surface. With movement of fine soil particles within the aggregate, they add a lubricating effect on the aggregate, which further adds to deformation.

PURE CRETE treated road base, which by design has approx. 20% cohesive fines, is compacted into a dense, high strength material. This minimizes void or air space between the aggregate. The resulting increased density eliminates movement of soil particles within the road base material. PURE CRETE treated material also binds together the soil particles - creating greater strength.

MOISTURE

Roads experience cycles of moisture penetration Rain and surface water is driven down into the road base, both by pounding rainfall and by gravity. Water is also driven up through the road base by evaporation, transpiration and pumping. The number of cycles depends on the amount and frequency of the precipitation, the amount of heat on the road surface, which draws moisture and aids evaporation, and the number and, type of wheel loads. Moisture movement carries smaller grained soil particles which contaminates the structural integrity of the road base.

As previously discussed, this causes rutting and surface deformation.



PURE CRETE treated road base, with increased density and cohesion of smaller soil particles, resists the penetration of moisture and eliminates the ability of soil particles to migrate within the road material. The reduction of moisture decreases the plasticity of the material - reducing road deformation under wheel loads.

STRENGTH

The load, which the wheel of the vehicle exerts on a gravel surface, spreads out as it passes down through the road base. The angle of force, increasing in width as it penetrates deeper into the road base. The angle of force, increasing in width as it penetrates deeper into the road material is referred to as the internal angle of friction ϕ .

It varies depending upon the type of material present. The objective in road design is to have sufficient road base thickness to support anticipated wheel loads.

PURE CRETE treated material has increased compressive strength, which resists deformation and excessive flexing due to wheel loading. This stabilization results in an overall stronger road base. It also means less maintenance.



SOIL COMPACTION

COMPACTION is the process densifying or packing the soil...resulting in an increase in weight per unit volume. It is generally accepted that the strength of a soil can be increased by densification. Three important factors affect compaction:

- Material Gradation
- Moisture content
- Compactive effort

MATERIAL GRADATION - Refers to the distribution (% by weight) of the different sizes of particles within a given soil sample. A sample is described as well graded if it contains a good, even distribution of particle sizes. If a soil sample is composed of predominantly one size particle, it is said to be poorly graded. In terms of compaction, a well-graded soil will compact more easily than one that is poorly graded. In well-graded material the smaller particles tend to fill the empty spaces between the larger particles, leaving fewer voids after compaction. This is further supplemented by using **PURE CRETE** in the water during compaction.

MOISTURE CONTENT - or the amount of water present in a soil, is very important to compaction. Water lubricates soil particles thus helping them slide into the densest position. The wetting action of PURE CRETE further enhances this action during compaction. Water and **PURE CRETE enzymes** also assists clay particle bonding, giving cohesive materials their “sticky” qualities. Proper compaction cannot be achieved in materials that are too wet or too dry. Engineers have determined that in almost all soil there is an amount of water, called optimum moisture content, at which it is possible to obtain maximum density with a given amount of compactive effort. The curve below shows this relationship between soil dry density and moisture content. It is called a compaction curve, moisture - density or Proctor curve.



COMPACTIVE EFFORT - refers to the methods a compactor imparts energy into the soil to achieve compaction. Compactors use one or more types of compactive effort:

- Static weight (pressure) such as a drum roller
- Kneading action (or manipulation) Sheep foot roller
- Impact (or sharp blow)
- Vibration (or shaking) vibrating roller



PURE CRETE TECHNICAL TOOLS

PURE CRETE WORKSHEET (METRIC)

DESCRIPTION	CALCULATIONS	EXAMPLE
#1 Width	_____meters	8 meters
#2 Length	_____meters	1,000 meters
#3 Depth	_____meters	0.152 meters
#4 Volume (#1x#2x#3)	_____meters	1216 c meters
#5 PURE CRETE (c. m./1.)	_____33 c meters	33 c meters
#6 Total PURE CRETE	_____L.	36.8 liters

PURE CRETE WORKSHEET (ENGLISH)

DESCRIPTION	CALCULATIONS	EXAMPLE
#1 Width	_____ Ft.	25 Ft.
#2 Length	_____ Ft.	5280 Ft.
#3 Depth	_____ Ft.	0.5 Ft.
#4 Volume (cu ft.) (#1x#2x#3)	_____ Cu. Ft.	66000 Cu. Ft.
#5 Total Volume (cu. yd.) (#4/27)	_____ Cu. Yd.	2444 Cu. Yd.
#6 PURE CRETE (yds. /Gal.)	_____ 165 Cu. Yds.	165 Cu. Yds.
#7 Total PURE CRETE Required (Gal.) (#5/#6)	_____ Gal.	15 Gal.

TYPE OF ROAD BASE / MOISTURE CALCULATIONS (METRIC)

DESCRIPTION	CALCULATION	EXAMPLE
DETERMINE ROAD TYPE	_____	CLAY
A. Soil Density (Kg./C.M.-per type)	_____ Kg. /C. M.	1602Kg./C.M.
B. Optimum Moisture (Lab Tested)	_____%	12%
C. Less Existing Moisture) Lab Tested)	_____%	2%
D. Net Moisture (to be added)	_____%	10%
E. Water Required per C. M. (A x D)	_____%	160.2 Liters
F. PURE CRETE (C. M./L.)	_____33 C. Meters	33 C. Meters
G. Amount of Water per liter. PURE CRETE dilution Factor (E x F)	_____L.	5287 Liters

TYPE OF ROAD BASE / MOISTURE CALCULATIONS (ENGLISH)

DESCRIPTION	CALCULATION	EXAMPLE
DETERMINE ROAD TYPE	_____	CLAY
A. Coil Density (#cu. yds-per type)	_____#/Cu. Yd.	2700 #/Cu. Yd
B. Optimum Moisture (lab tested)	_____%	12%
C. Less Existing Moisture	_____%	2%
D. Net Moisture (to be added)	_____%	10%
E. Water Required per Yd. (A x D)	_____Lbs.	270 Lbs.
F. Water (weight of one gal.)	_____8.3#/Gal.	8.3 #/Gal.
G. Water Required per Cu. Yd. (e/f)	_____Gal.	32.5 Gal.
H. PURE CRETE (yds./Gal.)	_____165 yds.	165 Yds.
I. Amount of Water per Gal. PURE CRETE Dilution Factor GxH	_____Gal.	5362 Gal.

PURE CRETE Water Application Guidelines (Metric)

*Water to be added to reach optimum moisture compaction

***IMPORTANT---** Determine approximate moisture in soil before starting

*Estimate optimal moisture then subtract existing moisture to obtain water needed

EXAMPLE: Field Calculations Estimated for one (1) 8 Cubic Meter LIFT

Volume	8cm x 8 meters x 1000 meters =	640 Cubic Meters
Material Weight	640cm x 1600 kg/cm =	1024000 kg or liters
Additional Water to achieve optimum moisture	8% moisture x 1024000 =	81920 liters of water
Safety factor (avoids excess water)	70% x 81920 liters =	57344 liters of water
PURE CRETE	1 liter treats 33cm of soil =	19 liters (640 cubic meters of road base material ÷ 33cm)
PURE CRETE DILUTION RATE	FOR THIS EXAMPLE ONLY (DRY CONDITIONS)	3000:1 PURE CRETE

PROCEDURE

1 Determine (estimate) water to be added to soil then determine capacity of water truck and add PURE CRETE according to the dilution rate calculation. (Estimate water slightly below amount needed)

2 Apply water and PURE CRETE to base material, wetting surfaces evenly.

3 Blend and mix PURE CRETE and water into soil with grader blade or recycler. Several passes may be required using blade.

4 Observe is road base material has enough moisture for compaction. (A hand sample should make a firm ball.)

5 If more moisture is needed, add plain water and re-blend. **DO NOT USE MORE WATER THAN IS NEEDED.**

6 Compact materials to maximum density, usually 5 to 8 passes.

7 Repeat the above procedure for the top lift (layer).

8 If the first surface is too dry, dampen with a small amount of water before the second lift is extended across the road and compacted.



PURE CRETE Water Application Guidelines (English)

*Water to be added to reach optimum moisture compaction

***IMPORTANT---** Determine approximate moisture in soil before starting

***Estimate optimal moisture then subtract existing moisture to obtain water needed**

EXAMPLE: Field Calculations Estimated for one (1) 3 Inch LIFT

Volume	3 in. x 24 feet x 5280 ft. =	1173 Cubic Yards
Material Weight	1173 cu. yd. x 2700 lbs/cu. yd. =	3167100 lbs.
Additional Water to achieve optimum moisture	8% =	30404 gal. of water
Safety factor (avoids excess water)	70% =	21283 gal. of water
PURE CRETE	(1 gal. treats 165 cu. yds. of soil) - gal. required =	7.11 gal. PURE CRETE (1173 cu. yds. road base material ÷ 165 cu. yds.)
PURE CRETE DILUTION RATE	FOR THIS EXAMPLE ONLY (DRY CONDITIONS)	3000:1 PURE CRETE

PROCEDURE

1 Determine (estimate) water to be added to soil then determine capacity of water truck and add PURE CRETE according to the dilution rate calculation. (Estimate water slightly below amount needed)

2 Apply water and PURE CRETE to base material, wetting surfaces evenly.

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7 Repeat the above procedure for the top lift (layer).

8 If the first surface is too dry, dampen with a small amount of water before the second lift is extended across the road and compacted.



PURE CRETE APPLICATION CALCULATIONS

#1. Width	25	ft		
#2. Length	5280	ft		
#3. Depth	0.5	ft		
#4. Volume (c ft.) (#1x#2x#3)	66000	Cu. Ft.		
#5. Total Volume(c. yd.) (#4/27)	2444.444	Cu. Yd.		
#6. PURE CRETE (1 gal/163 yds cu)	0.006135	gal/cu yd		
#7. Total PURE CRETE Required (Gal.) (#5/#6)	15.00	Gal.		
A. Soil Density(#cu. yds-per type)	2700	lbs/Cu. Yd		
A1. avg soil weight	6600000	lbs		
B. Optimum Moisture (lab tested)	12.00%			
C. Less Existing Moisture	2.00%			
D. Net Moisture (to be added)	10.00%			
E. Moisture Required in LBS(axd)	660000	Lbs.		
F. Moisture Required in Gal e* 8.3 (gal w	79518.07	Gal		
H. PURE CRETE	15.00	Gal.		
PURE CRETE *70% safety factor	55652.15	Gal.		
Dilution factor water to PC	3710.987	to 1		
Vol of water truck	4000	Parts		
Add parts PC	1.07788			

PURE CRETE PALM APPLICATION CALCULATIONS

*Width	25	ft		
*Length	5280	ft		
*Depth	0.5	ft		
Volume	66000	Ft3		
Total Volume	2444.444	Yd3		
PURE CRETE /yd	0.006135	gal/yd3		
Total PURE CRETE	15.00	Gal.		
*Soil Density	2700	lbs/Yd3		
Total soil LBS	6600000	lbs		
*Optimum Moisture	12.00%			
*Existing Moisture	2.00%			
ADD Moisture	10.00%			
Moisture Req LBS	660000	Lbs.		
Moisture Required Gal	79518.07	Gal		
PURE CRETE	15.00	Gal.		
H2O to mix w/PC*70%	55652.15	Gal.		
Dilution Ratio H2O to PC	3710.987	to 1		
*Vol of H2O Truck	4000	Parts		
Add parts PC	1.07788			

PURE CRETE LOAD WEIGHT CHART

	Conv								Calculate road
Miles		1	0.62137	0.62137	0.62137	0.62137	0.62137	0.62137	0.621
KM		1.6093	1	1	1	1	1	1	1.00
Inches of Compaction Depth		1	6	10	12	14	16	20	50
Centimeters		2.54	15.24	25.4	30.48	35.56	40.64	50.8	127
Road width (ft)		1	25	25	25	25	25	25	72.18
Road width (meters)		0.3048	7.62	7.62	7.62	7.62	7.62	7.62	22
Cu. Ft. soil		1	41,010	68,351	82,021	95,691	109,361	136,701	986,711
Cu. Meters		0.02832	1,161	1,935	2,323	2,710	3,097	3,871	27,940
Gallons		1	9.32	15.53	18.64	21.75	24.85	31.07	224.25
Liters		3.7854	35.28	58.80	70.56	82.32	94.09	117.61	848.89
Load Wt.Tons			10	20	40	50	80	100	250

Frequently Asked Questions about PURE CRETE

Is there any effect when PURE CRETE is mixed with any other organic material e.g. CaO or CaCO₃?

PURE CRETE works well with all organic soils. It will increase the bonding of the fines (-200 mesh) and allow greater moisture penetration to facilitate compaction. **PURE CRETE** has been used successfully in roads containing Limestone (CaO) Calcite (CaCO₃), a fine grain limestone. The use of clays in road building should usually be less than 30% - 200 mesh.

As time goes on will PURE CRETE reduce or increase its bonding strength? Will the road come out with cracks or become fragile?

PURE CRETE treated soils (for roads or ponds) achieve their greatest strength at the time of compaction and immediate subsequent curing (72 hours drying.) Bonding of the soil particles takes place in the presence of moisture and compactive force. This condition will last as long as the material resists external forces. Heavy wheel loads, water, freeze-thaw cycles ultimately have an effect on all roads. **PURE CRETE** treated soil resists these forces due to the bonded, high density of the road material. The road will resist the detrimental effects of erosion and mechanical forces.

Cracking occurs as a result of two factors: (1) If the road material contains a high percent of expansive clays - having a high shrink-swell factor. When the road is completed and dries out some cracking will appear. This reduces the effectiveness of the roads stability, however we have seen roads showing this condition that have performed very well - but with reduced life. (2) Soft sub-base may not support the treated base under wheel loads i.e. expansive clays. The bearing capability of the road is insufficient. This is corrected by increasing the thickness of the road base.



When the clay fines (-200 mesh) exceed 25% or are highly expansive some surface cracking will occur. Generally the cracks are superficial, often filling in with road particles during normal traffic use. Generally this condition is referred to as "Alligator Cracking" and does not significantly affect the stability of the road base.

Rain or other moisture will moderately swell the clay fines and the cracks will close. If the clay material is highly expansive, then the amount of fines should be kept low to reduce the amount of cracking.

Prior to placement of any surface material, the **PURE CRETE** treated soil should be lightly sprayed with a dilute solution of water & **PURE CRETE** to assist in the bonding of the new surface material (i.e. Asphalt) to the road base. Moisture will close many of the cracks.

Reflective cracks should not migrate upward through the asphalt, unless the clay fines are in the upper range and site conditions see radical sub-surface ground moisture variations.

Proper drainage will reduce ground moisture and keep cracking to a minimum.

After compaction, what is the ratio of expansion? Will extreme weather affect the road (hot or cold)?

After compaction, the expansion-contraction ratio will be dependent upon the soil type (percentage of expansive clays) as well as the gradation range (distribution of particle sizes.) Well-graded soils (ranging from -200 mesh to 1 inch) are ideal for road building. The -200 mesh fines should be approximately 20%. If the frost level extends below the level of the road some heaving may occur, however in the spring the road should settle back to its original elevation without damage. Proper road construction including shoulder drainage will minimize the effects of frost. Good engineering practices should be observed. Hot weather does not affect a road, other than dry dirt surfaces tend to be dusty under high wheel loading.

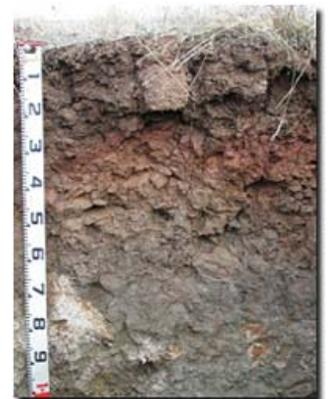


PURE CRETE treated surfaces will reduce the amount of dust.

When the road contains more than 20-30% clay, will the road surface become too slippery and lose traction?

Road constructed with material containing a high clay content will exhibit slippery surfaces when wet. It may be necessary to use some aggregate to increase traction in wet conditions.

In many applications surface treatment is applied as part of the overall design. This provides a wearing surface for traction, moisture protection, and greater overall strength. Cost and availability of materials are the primary factors affecting the type of surface building material.



PURE CRETE works well with soils that have a clay content passing a 200-mesh screen between 18% to 39%. This range of fines has been indicated as an acceptable range for road building material.

The State of California Transportation Department has recently tested **PURE CRETE** in soil that has a high clay content and found approximately 27% increase in unconfined compressive strength using **PURE CRETE**. The soil tested was substantial clay with over 95% passing a 200-mesh screen. The clay is classified as a “Fat Clay.”

In road building it is desirable to minimize excessive clay content. Under moist conditions the surface will not have proper surface friction and excessive plasticity may be present.

A County road worker experienced using **PURE CRETE** for over five years; they have reduced their road maintenance by 25%. For example where a road typically required bi-monthly grading activities, and periodic re-gravelling he used **PURE CRETE** to stabilize the road and then placed a thin “chip seal” over the surface. A portion of the road was left bare. Substantial cost savings were obtained and the “bare” section of road did not require any maintenance for over 16 months of the shoulders only. This

road is in a rural location and is categorized as a feeder road; however it receives a wide range of traffic. There are some roads that have been in use for over 8 years with no significant maintenance.

How long will the road last when used with PURE CRETE?

PURE CRETE treated roads have been in use for over 10 years. The longevity of a road is a function of several factors:

- a. Climatic conditions such as temperature ranges and rainfall.
- b. Type of soils used in construction.
- c. Road design - crowning, drainage & other engineered parameters.
- d. Type of vehicular traffic, speed and degree of usage.
- e. Wearing surface applied (if any.) Example: Chip Seal, Chip Coat, or Asphalt.
- f. General maintenance - frequency and quality.

We have seen **PURE CRETE** treated roads retain their integrity over long periods than previously experienced by road departments. For example a road in the USA has been in continual use for over eight years, with very little maintenance. Other geographic areas have reported substantial reduction in road maintenance by over 50%. **PURE CRETE** treated road bases last longer.

Can temporary roads be constructed using less PURE CRETE?

PURE CRETE is always used at the rate of 1 gallon per 165 cubic yards or 1 liter per 33 cubic meters of soil material. Temporary roads might be constructed with reduced thickness, providing the wheel loads would not immediately destroy the road.



Is compaction required when using PURE CRETE?

PURE CRETE is used when moisture is applied to soil for compaction. Stability or stabilization occurs when soil particles are in close contact. Even when used in pond applications, the downward force of the water assists in compaction.

Spraying **PURE CRETE** on soil without any compaction will not affect a change in erosion. The soils ability to resist erosion is a function of the mineral makeup of the soil and compaction (or density.)

Will PURE CRETE affect plant life if there is contact?

PURE CRETE is not harmful to plant life in its full range of various applications i.e. road building, pond construction, etc.

MILITARY CORPS OF ENGINEERS LABOR FORCE FOR PURE CRETE ROAD DEVELOPMENT PROJECT OF A DEVELOPING COUNTRY.

Training teams consist of:

- 1 Grader and 1 operator
- 1 Water truck and 1 operators and 1 assistant
- 1 20 ton Drum compactor and 1 operator
- 1 Sheep's foot compactor and 1 operator
- 1 Pneumatic Roller and 1 operator
- 1 Team leader and vehicle
- 1 Maintenance support truck and 1 person

Equipment total 7
Personnel total 8

- 1 Production team

- 2 Graders and 2 operators
- 4 Water trucks and 4 operators and 4 assistants
- 2 20 Ton Drum compactors and 2 operators
- 1 Sheep's foot compactor and 1 operator
- 1 Pneumatic Roller and 1 operator
- 2 Team leader
- 2 Maintenance support trucks 2 persons
- 1 Food, drink, and facilities service vehicle and 1 person
- 1 Fuel truck and 1 operator

Equipment total 16
Personnel total 20

Planning that one team can complete 2 kilometers per day and in the areas of the world where weather will only allow work to be performed for 6 months out of the year, the following is presented:

- 1 Production team of 20 people and 16 pieces of equipment

- 2 klms per day
- 12 klms per week
- 48 klms per month
- 288 klms in six months which will be the years total

- 10 Production teams totaling 200 people will complete 2880 klms (1789 miles) of roads in 6 months.
- 10 Production teams require 160 pieces of equipment
- 20 Production teams totaling 400 people will complete 5760 klms (3579 miles) of roads in 6 months.
- 20 Production teams require 320 pieces of equipment

MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200 Standard must be consulted for specific requirements

PURE CRETE ALL NATURAL SOLUTION PURE ONE ENVIRONMENTAL, INC.

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Santa Ana, CA 92704 Lake Forest, CA 92630

714-935-9297 Fax – 949 586 7610 info@pureone.com 949 586 7610 Int'l Office

SECTION I: PRODUCT INFORMATION	
<ul style="list-style-type: none"> • Trade Name: • Chemical Name: • Formula: • D.O.T. Proper Shipping Name: • D.O.T. Hazardous Class: • D.O.T. Identification Number: 	PURE CRETE ENZYMES All natural proprietary blend of enzymes Pure Crete - Non-Hazardous Liquid Non-Hazardous Liquid Class 70 Sch. B Harmonizing Code 1212.20.0000
SECTION II: PHYSICAL DATA	
<ul style="list-style-type: none"> • Specific Gravity: • Boiling Point: • Freezing Point: • Vapor Pressure: • Evaporation Rate: • Solubility in Water: • Appearance & Odor: 	(H ₂ O) 1.09 212° F 32° F 21.84 @ 75° F Same as Water Complete Brown liquid with slight odor
SECTION III: HAZARDOUS INGREDIENTS	
NONE	
SECTION IV: FIRE & EXPLOSION	
Treat the same as water	
SECTION V: REACTIVITY DATA	
<ul style="list-style-type: none"> • Stability: • Incompatibility: • Hazardous Polymerization: 	Stable. Avoid high temperatures as this will neutralize the enzymes. Avoid low or high pH substances (i.e. acids, caustics). None. Product is compatible, will not polymerize nor create hazardous by-products. There are no specific conditions to avoid. Will not occur.
SECTION VI: HEALTH HAZARD DATA	
<ul style="list-style-type: none"> • Eye Contact: • Inhalation: • Skin Contact: • Ingestion: • Non-Carcinogenic: 	Avoid eye contact. If product gets in eyes, flush with water. None None Will cause slight laxative condition. No known conditions to avoid.
SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE	
No special gloves No ventilation No exhaust No protective clothing No special equipment No respiratory protection	

Prepared: 07-01-1995

Revised: 02-02-2010

We believe that the information contained in this MSDS is current. Since the use of this information and the conditions of the use of the product are not within the control of PURE ONE ENVIRONMENTAL INC., it is the user's obligation to determine the conditions of safe use of this product. The information herein is given in good faith, but no warranty, expressed or implied is made.

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