ENZYME ROAD AND SOIL STABILIZATION – F.A.Q.’S

Q: Over time will PERMAZYME 11X increase its bonding strength?
A: PERMAZYME 11X enzyme treated soils (for roads and ponds) achieve their greatest strength at the time of compaction and immediate subsequent curing (72 hours curing time). 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 their effect on all roads. PERMAZYME 11X treated roads will resist these forces due to the bonded, high density of the road material. The PERMAZYME 11X treated road will resist the detrimental effects of soil erosion and mechanical forces.

Q: Will the road come out with cracks or become fragile?
A: Cracking occurs as a result of 2 factors. (1) If the road material contains a high percent of expansive clays having a high shrink-swell factor, after the road is completed and dries out some cracking will appear. This condition reduces the effectiveness of the road stability. However, these roads still perform very well with a slightly reduced service life. (2) A soft sub-base (expansive clays) may not support the treated base under heavy wheel loads. The bearing capacity of the road is insufficient. This can be corrected by increasing the thickness of the road base. When the clay fines (~200 mesh) exceed 25% or are highly expansive, some surface cracking may occur. Generally, the cracks are superficial, often filling in with road particles during normal traffic use. Generally this condition is referred to as “Alligator/Crocodile 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 percentage of these fines should be kept low to reduce the amount of cracking 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.

Q: After compaction, what is the ratio of expansion?
A: 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 base, some heaving may occur. However, in the spring, the road should settle back to its original elevation without severe damage. Proper road construction including shoulder drainage will minimize the effects of frost. Good engineering practices should be observed.

Q: What can be expected of PERMAZYME 11X soil and road base enzyme stabilizer?
A: PERMAZYME 11X was formulated to increase the overall strength of poor quality clay based soils in the subgrade of pavements. It then requires less good quality gravels owing to the increase in CBR's of the subgrade and depending on the engineers design, possibly a thinner wear coat.

Q: What is the setting or curing time for PERMAZYME 11X.
A: Curing time is 7 days but cure continues for 28 days.

Note: CBR (California Bearing Ratio)
Q: How soon can traffic be run on the road.
A: All during the construction and immediately after, except for heavy vehicles, this may have to wait for a period of 24-48 hours.

Q: What can be done to correct this (cracking / crazing) and what will be the effect.
A: Two things can be done, on heavy traffic roads it will correct it's self with no problems or the surface 20mm can be re-worked as you have 7 days curing.

Q: How much gain in CBR can be expected.
A: This will depend on the soil and gravel being treated, but anywhere from 100% to 1200%. Independent empirical evidence is available.

Q: Can the surface be maintained should it be damaged or worn.
A: Yes! But PERMAZYMIE 11X must be used to patch or resurface the treated road. Please ask for a Maintenance Guide.

Q: If for some reason a customer does NOT profile the gravel road with a 5-6 % gradient to each side, but "accidentally" keeps it 100 % horizontal, then what?
A: Good work practices are essential to good road construction and should only be carried out by professionals. Drainage and profile errors are nothing to do with the efficacy of the product and puddling will occur which will undermine the road.

Q: Does water quality affect the result
A: Generally no! Brackish water and sea water have been used successfully but the better the water supply the fewer problems will occur.

Q: What is the largest benefit to using PERMAZYMIE 11X enzyme soil stabilization product?

Q: What are the main elements of PERMAZYMIE 11X.
A: There are three main elements 1] surfactants that allow the other two elements to penetrate the clay based soils and make it workable. 2] Electrolytes that change the cation exchange of the clay platelets and 3] enzymes that cement together the clay platelets within the sands, silts and gravel's.

Q: If we double the application rate will we get twice the strength.
A: No! You lose the benefit of the cation exchange as it will be reversed and you will end up with a lower strength.

Q: We are still getting dust from the road after 3 weeks, why.
A: The soil used is low in clay content and high in silt fines, a proportional mix design should have been used. Remember clay is the binder and that PERMAZYMIE 11X only works on the clay particles within a soil / gravel mix.

Q: It rained within seven days of construction and the road got very slippery and wheel tracks could be seen.
A: This has do with good work practices during construction which include, rain during construction, correct drainage and profile.

Note: CBR (California Bearing Ratio)
Q: 40 % clay gives about 17 plasticity index. Wouldn't 40 % normally give a far too slippery and "crocodile-cracking" surface?
A: "Crocodile-cracking" surface is caused only through high moisture content at compaction.

Q: Would you say that an increase of the Plastic Index from say 8 to say 15, has any specific advantages towards the end-result.
A: Yes! If you look at a grading chart the ideal is a plastic index of 17% backed up by a good grading of silts, sands and gravel to add to the overall strength. The clay content plus Enzymes are the cement that binds the mass together.

Q: When you are making your own calculations on clay-addition on a job, do you normally work on the basis weight/weight and thus use different bulk densities on clay and rest respectively to come up with the % clay necessary.
A: No we use a proportional mix design that we have put together over the years and update from time to time.

Q: I checked grain size distributions of aggregates we have now. Maximum grain sizes are 20-32mm. One aggregate has about 7-8 % fines (<0.063 mm) we use the 0.075mm sieve and two others aggregates have about 15-17 % fines.
A: All three soils are below the required guide lines of a minimum of 20% passing the 0.075 sieve but the PI could put them within possibility of improvement in CBR. The increase in CBR will not be as great but could make an otherwise useless resource into a better road. I suggest we try to view the Atterberg Limits when they are available. Most soils will have some silt content unless they are straight sandy gravels.

See Summary On Page 4 Below.
SUMMARY

Profile: The road profile is very important in the construction of a dirt road and should be between 5 and 6% to a central crown, compaction from the center out on both sides so that the integrity of the crown is not changed.

Drainage: Table drains and culvert design are in the hands of the design engineer and any fault in this area is not the fault of the product or the workers on the day.

Compaction: This is a large subject and has many different viewpoints held by academics and engineers worldwide. Almost all of these views are held and vented on non-plastic soils and the teaching in general is to exclude clay from any construction were possible. For clay areas were highway construction is in progress all forms of compaction will be used and mostly in this order: Sheep’s Foot, steel drum and rubber tire.

PERMAZYME 11X and dirt road construction: Dirt road construction is low cost construction and is the finished product, it does not usually come under the same strict design control as highways. Good work practices must still be adhered to at all times. Ideally all three roller types should be used during construction but excellent roads have been constructed using nothing but the steel drum roller and the water cart used as the rubber tire roller. The point here is that a steel drum roller will bridge soft spots but the wobbly tire rollers will not, potholes can be the result of poor compaction; rubber tire rollers give a better finish to fine soils and dehydrate the moisture far more rapidly. (Heavy traffic will accelerate the cure and seal the surface)

Rain: If rain is expected on the day of construction use the local knowledge available to gauge the extent of rain that is normal and use as little water as possible to apply PERMAZYME 11X to the soil. Use the rain instead of the water truck and continue to work the soil ready for compaction, it is most important that the road is fully compacted prior to leaving the site. If heavy rain suddenly appears from nowhere and you are in the middle of construction, simply grade all treated soil into one windrow and lay out later or when the rain stops, up to seven days after application of PERMAZYME 11X. On returning make sure the base has a moisture content equal to the treated soil to be laid so that delamination does not occur, PERMAZYME 11X at 1000 to 1 in the water truck during this procedure will help ensure sufficient bonding. Nobody can change the weather but good work practices and knowledge of how PERMAZYME 11X works will always get a great result. PERMAZYME 11X has three main elements, the one of concern were moisture is in abundance (rain) is the surfactants in the formulation. These surfactants are used to get into the clay based soils and take with it the other two very important elements, they also render the water ten times wetter than water alone and increase the drying time to allow for a slow cure to eliminate cracking and shrinking. So you can see that if you then add more moisture you are headed for major problems.

Conclusion: Good profile, compaction and finish are paramount and then all rain will end up in the table drains were it should be.

If rain is forecast do not start the construction.