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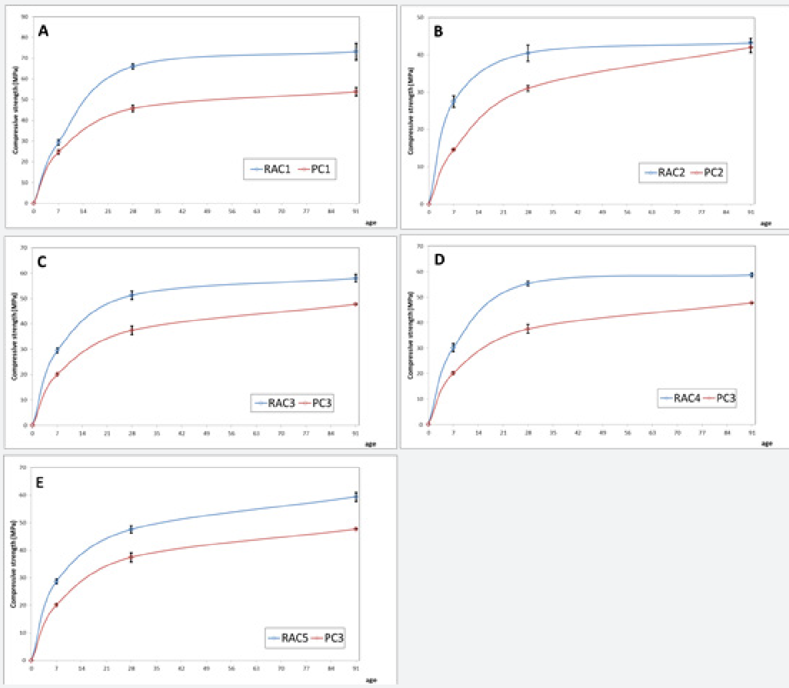

Figure 1: Compressive strengths for three concrete recipes starting from natural aggregate (red) versus five concrete recipes (blue) based on recycle aggregate from the first three concretes.

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can be used with concrete structures. Reinforcement materials such as geosynthetics can supply effective soil improvement when necessary to avoid the failure mechanism. If the resistance of the deformation which is called as "stiffness" of soil is less, reinforced structure (reinforcement+soil) would be the solution.

Usually the soil itself doesn't have enough resistance to keep its form under pressure. Geosynthetics help the soil to hold itself as a massive body especially at the embankments and the steep slopes. The soil gain resistance after reinforced by geosynthetics. This type of applications forms a composite body, which have better stiffness. Mechanical response of the composite material is far stiffer than the soil structure itself, that's the reason that they are widely used all around the world. This solution is achieved after many experimental procedure and monitoring. From this process empirical results are obtained. These results are used to form an applicable equation to estimate the equivalent elastic modules of geosynthetic reinforced soil. This mechanism is applied to the field to have safe and cost-effective solutions at the risky areas.

Reinforced Soil

The interaction between the soil and the reinforcement material (geosynthetics) is the starting point for the parametric study. The mechanical interaction between the soil and the geosynthetics governs the behavior of the whole structure. The stiffness and the failure threshold give an idea for parametric study of stress-strain relationship that will guide the constitutive equation of the soil to use in stability calculations and analysis. Experimentally, the stiffness of the composite body can be

geosynthetics be increased, (in which condition or composite system, the stiffness can be maximum).

E. How can the embankment be built in the field successfully as designed.

Interaction Between Soil and Geosynthetics

The compound material reinforced by geosynthetics can never be accepted as linear elastic body. It is rather nonlinear accompanied by irreversible deformation.

The final deformation of each structure can be used to calculate the elastic coefficient equivalent to Young's Modulus of the structure. Experimental studies on this type of reinforced soil structures indicate that the reinforcement contributes an increase of the equivalent Young's modules but there seems to be a limiting value of Young's modules.

In order to explain the above-mentioned experimental results, the following general expression can be used;

$$E = f(E_g, E_s, \alpha)$$

E: The global Young's modules

Eg: Young's moduli of geosynthetics

Es: Young's moduli of soil

α: Density of reinforcement (reinforcement amount per unit area)

If effects of Eg and Es can be combined into a parameter β, then the equation is written as

$$E = f(\beta, \alpha)$$

However, it should be noted here that, above equation is an empirical equation that can only be applied to some special cases. In this case, the equation is suitable for sandy soils and geosynthetics. The sandy soil is modeled by non-linear elastic model using hyperbolic stress-strain relations (Duncan-Chang 1970). The mechanical behavior of soil is highly non-linear, and they exhibit stress dependency according to their stiffness. And since geosynthetics can be regarded as the linearly elastic material based on the uni-extension test result. Then the geosynthetics can be modeled by linearly elastic bar element under two-dimensional space. On the other hand, an elasto/visco-plastic constitutive model proposed by Sekiguchi and Ohta (1977) is employed to model the mechanical behavior of clay materials. The necessary soil parameters (stress and strain data) can be determined from the triaxial CU test [1-5].

Conclusion

The displacement of the soil structure that leads to deformation and finally failure, vary according to the density and placement method of the reinforcement material. This phenomenon can be predicted by modeling the structure by using suitable empirical equation of soil. It is beyond doubt that stiffness of the structure can be improved considerably by using more reinforcement materials, however the application procedure is also very important. Geosynthetics have brought successful development in soil mechanics. Recently various techniques for the improvement of soil strength are designed and applied successfully by the help of geosynthetics. For this reason, they have been extensively used and proved to be very effective by many researchers.

References

1. Duncan JM, Chang CY (1970) Nonlinear analysis of stress and strain in soils. ASCE Journal of Soil Mechanics & Foundations Division 96(5): 1629-1653.
2. Sekiguchi H, Ohta H (1977) Induced anisotropy and time dependency in clays. 9th ICSMFE, Tokyo, Constitutive equations of Soils 17: 229–238.
3. Tatsuoka F, Ishihara M, Di Benedetto H, Kuwano R (2002) Time-dependent shear deformation characteristics of geomaterials and their simulation. Soils & Foundations 42(2): 103–138.
4. Iizuka A, Ohta H (1987) A determination procedure of input parameters in elasto-viscoplastic finite element analysis. Soil and Foundations 27(3): 71-87.

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