III-277 IMPROVEMENT OF SOIL REINFORCED WITH METALLIC POWDERS

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INTRODUCTION

Roads have been constructed on bamboo fascines , logs or timber , or on brush or small trees (1). The reinforced earth structures was initially used for highway retaining walls and bridge abutments and subsequently to sea walls , marine bulkheads, dams , and safety dykes for the secondary containment of liquefied natural gas and crude oil. Now a days , these structures have also been applied to create large slot-type coal bunkers and ore storage facilities (2). From the findings of literature it shows that different type and shape of reinforcing materials have been used by a number of investigators in the past , but to date no one has reported on the use of metallic powder as earthwork reinforcement. Therefore , two type of metallic powders (cast iron and aluminium) have been selected for this present investigation. The main purpose of this present research attempted to assess the influence of metallic powders on strength and deformation behavior of compacted soil under undrained triaxial loading conditions.

SAMPLE PREPARATION AND TESTING PROCEDURES

Samples were typically 50 mm in diameter and 100 mm in height. Requisite amount of oven dried soil passing through IS 425 micron sieve was taken. Metallic powders in varying percentages of weight of soil were uniformly mixed with the soil. Exact amount of water was then added to each lot and was thoroughly mixed. The samples in the mould were always compacted in three layers. Soil prepared in the mould was divided into three equal portions approximately. The first portion of the sample was then transferred into the mould, roughly levelled and compacted with the rammer. The surface was levelled and the next portion of the soil was then transferred into the mould and the operation repeated till the full sample height was reached. The sample was then transferred from the split mould to a standard sampling split mould and was trimmed at top and bottom for level ends and stored in a desicator for testing. The weight of sample before and after the test were taken to check the moisture content and dry density of the sample and unsatisfactory samples were rejected. Strain controlled tests were used for all the undrained triaxial tests. A deformation rate of 3 mm/min. was used. The stress-strain curves were plotted in a X-Y pen recorder. Tests were carried out till either the failure of the specimen or 16% strain was reached.

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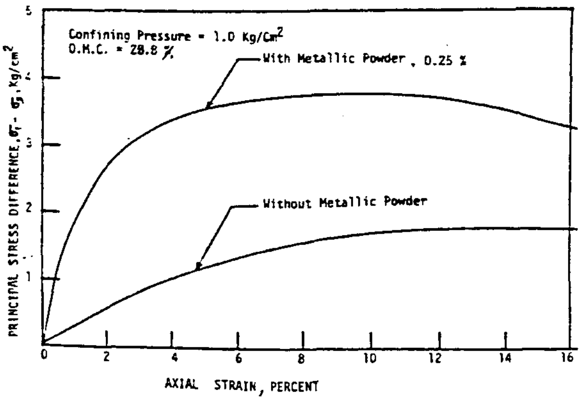

Fig. 1.-Stress-Strain Relationships for Metallic Powder (Aluminium)

EXPERIMENTAL RESULTS AND DISCUSSION

The typical stress-strain curves obtained from these tests are given in Figs. 1 and 2. The optimum moisture content of soil sample was 28.8%. The liquid limit and plastic limit of the soil was found to be 48.40% and 27.45 % respectively. The specific gravity of soil was 2.704. The effect of type of metallic powders, the apparent shear strength parameters and the initial tangent moduli were studied. It has been found from the experimental results that the apparent cohesion is improved by the presence of any type of metallic powders. On the other hand , the effect on the angle of internal friction is practically not affected by the introduction of metallic powders. For smaller strain levels , the deformation moduli are very much improved by the embeddiment of metallic powders.

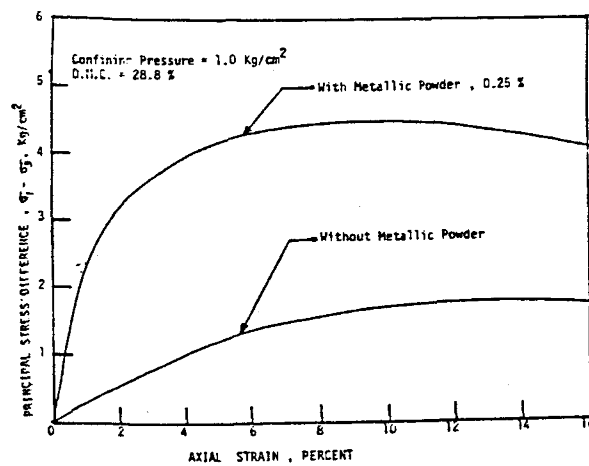

Fig. 2.-Stress-Strain Relationships for Metallic Powder (Cast Iron)

CONCLUSIONS

The response of metallic powders on soil samples depend on the function of the metallic powders. It can be revealed that the small amount of metallic powders caused a consistent and substantial increase in strength compared to that of an unreinforced sample. The initial tangent modulus shows to decrease at higher confining pressure. However , the peak stress was also found to increase due to metallic powders at higher confining pressure. The apparent cohesion can be improved considerably while the angle of internal friction was unaffected by the presence of metallic powders. The degree of improvement in the deformation characteristics of soil are markedly improved by all type of metallic powders.

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