III-425　*SOME EFFECTS OF METAL STRIPS AND FACING ON REINFORCING OF SAND SLOPES*

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INTRODUCTION

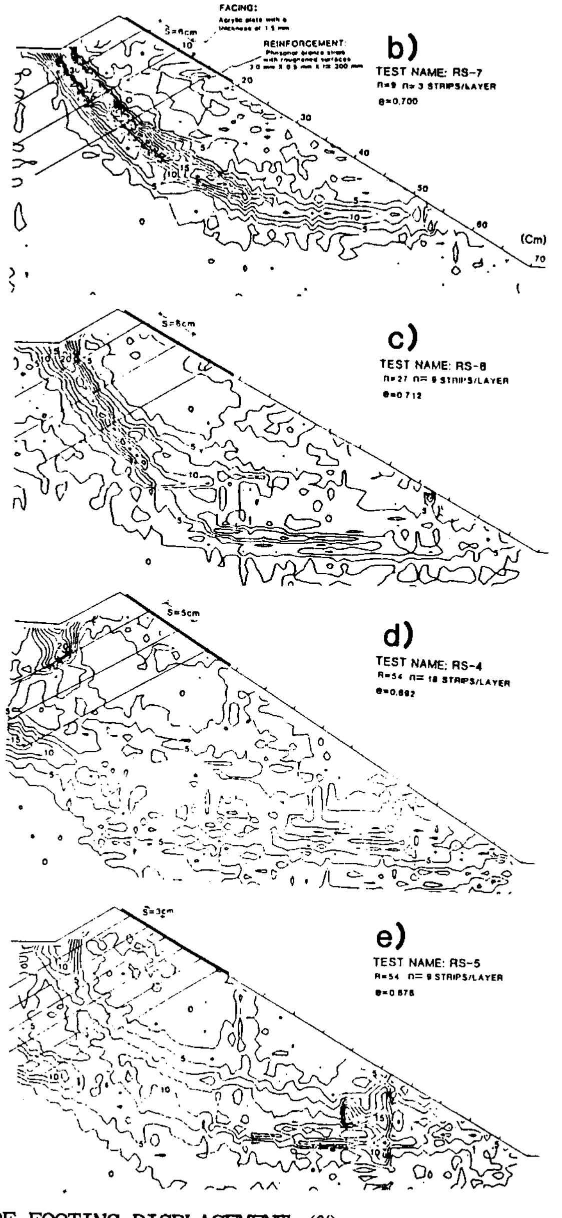
Several experiments have been performed in order to investigate the effect of the number and arrangement of reinforcements on the stability of sand slopes reiforced with metal strips and facing. The results show that the strength of reinforced slope increases with the increase in the reiforcement number whereas the role of facing becomes larger for less number of reinforcements, and also that the arrangement of reinfocements plays an important role on the strength of the slope.

A) FAILURE MECHANISM

The distribution of shear strain in the model sand slopes was obtained by constructing a 1709 elment's mesh on a latex membrane attached on a lateral side of the sample (see ref.1 for more details).

1) Effect of Number of Reinforcements: For investigating this effect, sets of strips of 54:27:9 in number (i.e. 1:1/2:1/6 in ratio) were used. Figs.1 a-c show that the failure mechanism change gradually as the number of reinforcements increases. Zones of intense shear strain develop earlier and shallower in both unreinforced and lightly reinforced slopes, whereas in heavily reinforced slopes (Fig.1d) zones of shear strain concentration are generated downwards from the heel of the footing as well as at the end of the reinforcements. This means that the reinforced zone restrained by both dense reinforcements and a facing became like a monolith and thereby a failure zone appeared firstly almost outside the reinforced zone.

2) Effect of Arrangement: In Fig.1e) it can be seen that the deformation pattern is similar to that for three layers (R=54 Fig.1d) but the strain is more uniformly distributed in the



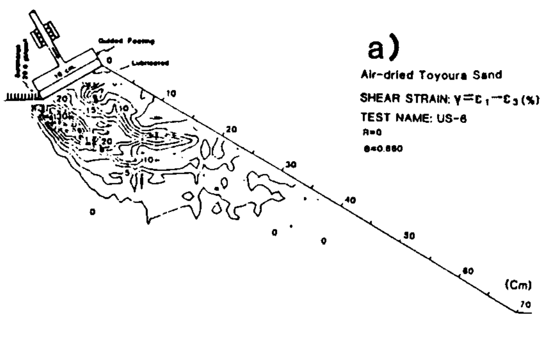


FIG.1 SHEAR STRAIN AT 10MM OF FOOTING DISPLACEMENT (%)

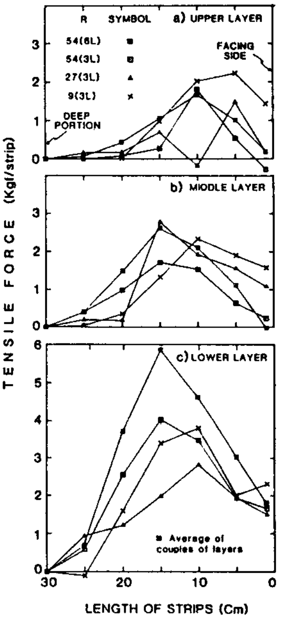


FIG.2 TENSILE FORCE ON REINFORCEMENT AT 10MM OF FOOTING DISPLACEMENT

reinforced zone.

B) TENSILE FORCE ON REINFORCEMENTS

Fig.2 shows the distribution of tensile force along the three layers for different number of reinforcements. It can be observed that as the number of reinforcement decreases larger tensile force is activated near the facing. It is also noteworthy that generally maximum values of tensile force are attained closer to the facing in upper layers; in the first layer the maximun tensile force appeared at one third or less of the reinforcement length from the facing, whereas in the third layer it appeared at the middle of the reinforcement where the slip surface intersects the reinforcements. We can see also that the tensile force increases as a result of better distribution of the strips; i.e., Test RS-5 (n=54, 6 layers) as compared with Test RS-4 (n=54, 3 layers).

C) STRENGTH OF SLOPES

Fig.3 compares the average axial stresses for the several conditions of reinforcing, and Fig.4 shows the detailed distribution of axial stresses along the footing base. A larger degree of stress concentration near the footing toe (i.e. near the facing) for a smaller number of reinforcements may be seen. Comparing the two cases of different arrangement we can see that with 6 layers there is an activation of large stresses on the facing side but still the stresses concentrate at the middle portion of the footing too.

CONCLUSIONS

1)The role of facing becomes more significant for a smaller number of reinforcements for the stability of reinforced slopes. 2)The strength of the slope is dependent on the arrangement of the reinforcements.

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REFERENCES

1.GUTIERREZ,Valerio & Tatsuoka Fumio (1987) "Roles of Tensile Metal Strips and Facing in Reinforcing Sand Slopes";Proc. 22th Annual Meeting of JSSMFE,Niigata,Japan.

2.Juran,I.(1983), Reinforced Soil systems, Applications in Retaining Structures";7th Asian Regional Conference on Soil Mechanics and Foundation Engineering;Israel.

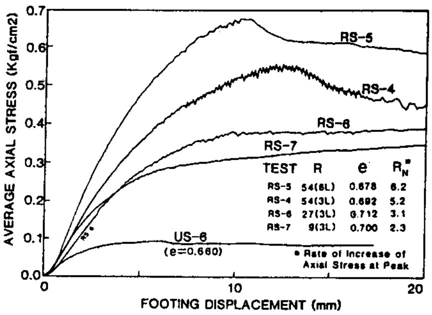

FIG.3 AVERAGE AXIAL STRESS-DISPLACEMENT

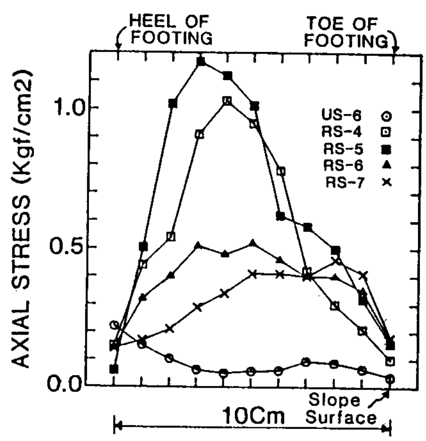

FIG.4 PROFILE OF AXIAL STRESSES AT 10MM OF FOOTING DISPLACEMENT