Parameters Influencing the Flowability of Sands

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Abstract

There is increasing interest in using flowable fill in various construction and rehabilitation projects. Hence the factors affecting the flowability of sand were investigated. Total of 11 granular materials including Ottawa sand, ASTM C 33 sand, and foundry sand were used in this investigation. Effects of physical properties such as angle of repose, water content, particle size distribution, void ratio, unit weight were investigated to evaluate the flowability of sands. Based on the test results, relationships between the flowability and physical properties have been developed.

1. INTRODUCTION

One of the main advantages of using the Controlled Low Strength Material(CLSM) as a backfill is that it can be used in tight or restricted-access areas where placing and compacting conventional fill is difficult. The flowable characteristics of CLSM makes it the only choice in the limited space application. Sand is the major constituent of a CLSM and hence the flowable characteristics of CLSM is affected by the flowability of sand. Nevertheless, very limited information is available in the literature about the relationship between the physical properties and flowability of sand.

2. OBJECTIVES

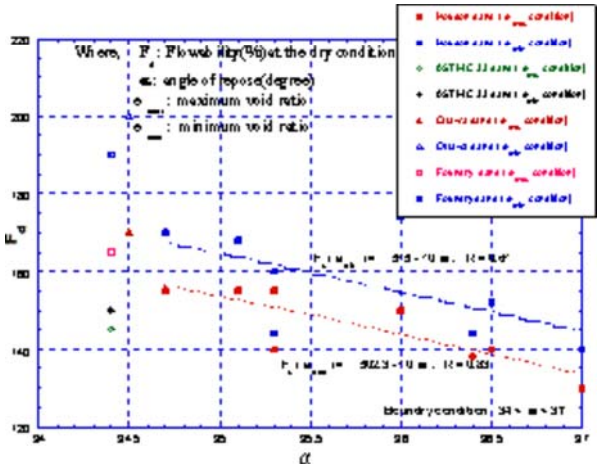
This study focused on developing relationships between the flowability and physical properties of sand. The specific objective are as follows: 1) investigate the role of particle size distribution, void ratio, angle of repose on the flowability 2) role of moisture content and 3) develop relationships for flowability in terms of important parameters.

3. TESTING PROGRAM

Maximum and minimum unit weight of 11 sands were measured using a cylinder (3 inch diameter and 6 inch height). After that, flowability test(ASTM D 6103) was performed of maximum and minimum unit weights. The angle of repose and flowability were measured for 11 sands with different moisture content.

4. RESULTS

Based on the preliminary test, maximum density has a liner with minimum density as shown in Fig 1 and the relationship between the flowability and angle of repose is shown in Fig 2.



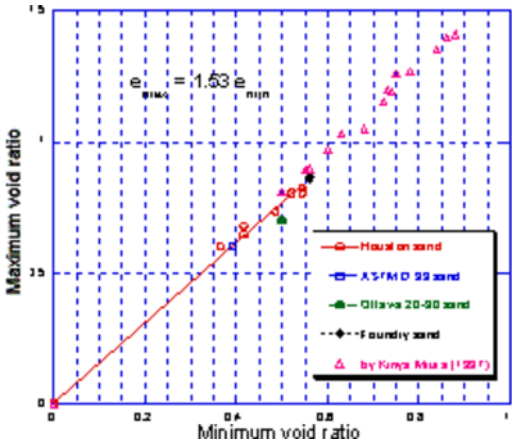


Fig.1 Relationship of�� Maximum and minimum void ratio

Fig.2 Relationship of flowability and angle of repose

5. CONCLUSIONS

Both dry and moisture sands were used in this investigation. The Physical characteristics of sands were investigated. Flowabilitry, angle of repose, maximum and minimum void ratio were measured. Based on the test results, the following observations are advanced:

1) There is a relationship between flowability and angle of repose. The flowability reduced with increased angle of repose
2) Flowability decrease with an increase in means grain size, D_{50}
3) Other parameters that affected the flowability are $D_{50,}$ void ratio and moisture content.

6. ACKNOWLEDGMENTS

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7. REFERENCES

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ASTM D 6103 "Standard Test Method for Flow Consistency of Controlled Low Strength Material(CLSM)".