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EFFECT OF BENTONITE DOSAGE ON SHEAR BEHAVIOUR OF SAND-FLY ASH

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***Abstract*— Bentonite addition to soil sometime will be dealt as stabilisation. Shear behaviour of soil always has a great importance on engineering design. This study considers direct shear test on mixture of sand-flyash-bentonite. The direct shear device was employed with shear rate of 0.3 mm/min and peak shear stress at failure of each specimen were recorded. The normal stress was applied as 150 kPa, 250 kPa, and 500 kPa. Addition of bentonite caused decreasing in peak shear.**

Keywords— **Shear, Flyash, Bentonite**

I. INTRODUCTION

Sand is one of the main type of soils which has been in direct attention of researchers due to its abundant existence in various sites [1-4]. Application of mining waste is of interest due to the help to remove waste from landfill and at the same time putting it into soil to get benefit out of this. In general, additives have specific role in making soil stable [5-9]. There are examples in literature fibre, geo-grid, tire, lime, fly ash or agricultural waste [10-18]. Apart from experimental testing, numerical modelling also been conducted on pavement application of those materials [20-23]. In addition, sometime the issue is relevant to contamination which can be seen in [24-28] or effect of directional issue [29-33]. As can be seen the interest of usage of other materials [34-37]. Bentonite is also one of the most applicable types of soil in the industry [38-42]. Bentonite is an expansive type of clay [42-49]. This study focuses on how Portland cement would affect the performance of fly ash by itself as a soil replacement.

II. MATERIALS

The employed materials can be listed as:
The characteristics of fly ash can be found in the table below. The major component of used fly ash is SiO2 and Al_2O_3. Silicon dioxide (SiO_2) 51.8%, Aluminum oxide (Al_2O_3) 26.40%, Ferric oxide (Fe_2O_3) 13%. The sand which was used in this study referred as yellow sand. The SG was 2.65. The medina size of particle was 1.2mm. The bentonite was expansive, and the median size was 36μm.

III. COMPACTION TESTING

In the first stage, the compaction values were derived. The results of compaction can be seen in the Table 1:

Table 1. Results of OMD and MDD

Sample ID	Bentonite	OMC %
S-F2	3	15
S-F2	5	16.2
S-F2	7	19
S-F2	10	20.4

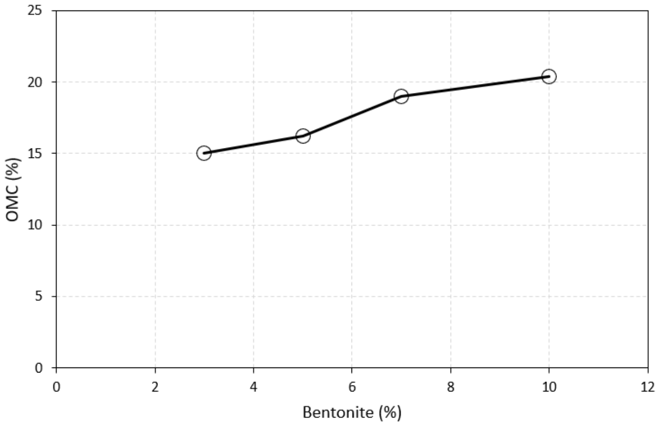

Fig. 1. OMC values of tested samples

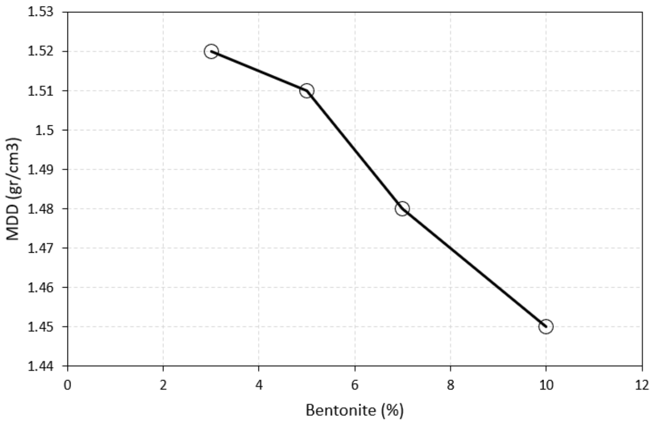

Fig. 2. MDD values of tested samples

IV. SHEAR TESTs

Direct shear test run with 0.3 mm/min. The sample were prepared in accordance with OMC and MDD of mixes. The results of peak shear stress at failure relevant to 150kPa with can be seen in the following figure. The below Fig. 3 is related to 150kPa shear at failure.

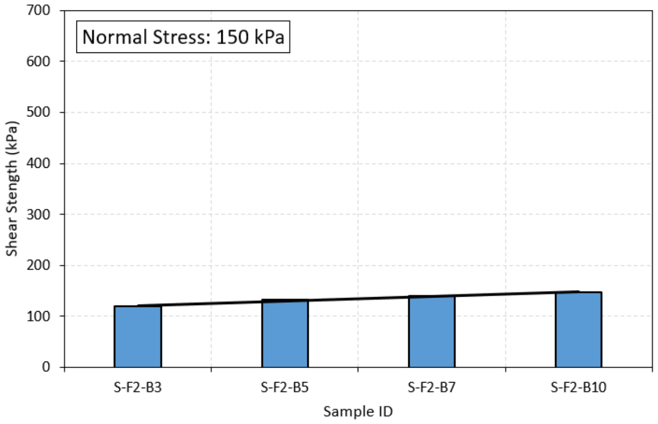

Fig. 3. Peak shear strength tested under 150 kPa normal stress

The below Fig. 4 is related to 250kPa shear at failure.

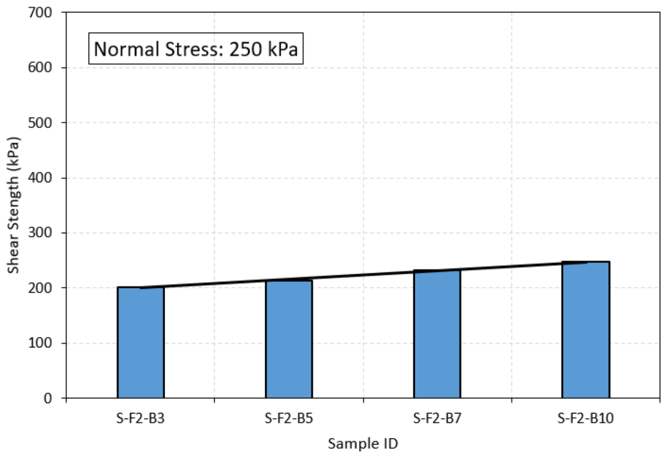

Fig. 4. Peak shear strength tested under 250 kPa normal stress

The below Fig. 5 is related to 500 kPa shear stress at failure for different specimen.

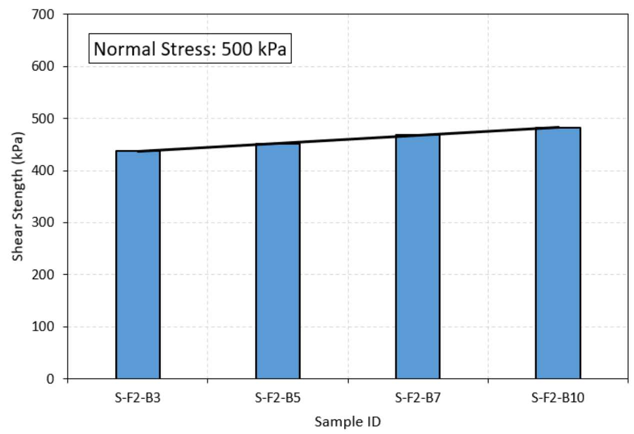

Fig. 5. Peak shear strength tested under 500 kPa normal stress

V. CONCLUSION

A series of shear and compaction test were conducted on the mixes and the result proved that bentonite increased the shear stress at failure. Compaction results showed the OMC increased by addition of bentonite and MDD increased at the same time.

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