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STRENGTH OF CEMENTED FLY ASH SOIL

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***Abstract*— Stabilisation is one of the common way to improve geotechnical performance of a soil specimen. Stabilisation has been conducted in many research and real practices. Replacement of soil with by-product is very interesting due to positive geo-environmental impact. Application of Portland cement to stabilise soil is one of the common way to increase the strength of soil. This study considers the effect of curing time and PC percentage on the UCS values and compaction characteristics of fly ash mixed with PC and soil. The PC changed from 1 to 4%. The curing time considered as 3 to 28 days.**

Keywords— **UCS, Fly ash, cement, clay, stabilisation**

I. INTRODUCTION

Usage of by-product is one of the areas that researchers found it to be interesting. On other hand, complete replacement of soils with fly ash is one of the interest in this area due to shortage of soils. Fly ash in civil project has been widely used. Some studies used fly ash as additive while the others used together with slag. In general additives has specific role in making soil stable. There are examples in literature fibre [1-5], geo-grid [6], tire [7-9], lime [10-12], fly ash [13-16] or agricultural waste [17-19]. Apart from experimental testing, numerical modelling also been conducted [20-25] on pavement application of those materials. In addition, sometime the issue is relevant to contamination which can be seen in [26-35] or effect of directional issue [36-48]. As can be seen the interest of usage of other materials. This study focuses on how Portland cement would affect the performance of fly ash by itself as a soil replacement.

II. MATERIALS

The used materials were:

a) Fly ash:

The characteristics of flyash can be found in the table below. The major component of used fly ash is Sio_2 and Al_2O_3.

Table 1 Fly ash ingredient

Item	Symbol	Percentage
Silicon dioxide	SiO_2	51.80%
Aluminium oxide	Al_2O_3	26.40%
Ferric oxide	Fe_2O_3	13%

b) Cement:

The Portland Cement (PC) had specific gravity (SG) 3 to 3.4. The appearance was grey powder. pH was alkaline.

c) Clay

Kaolinite clay used in this study obtained from a local provider.

III. COMPACTION TESTING

In order to get the UCS samples, the first stage was to run the compaction tests. The following results were derived as shown in Table 1. Also, Fig. 1 and Fig. 2 shows the results of OMC and MDD.

Table 2 OMC and MDD of samples

Sample ID	OMC (%)	MDD (gr/cm3)
F	46	1.2
F-PC1	48.1	1.15
F-PC2	49.6	1.12
F-PC3	50.3	1.11
F-PC4	52	1.09

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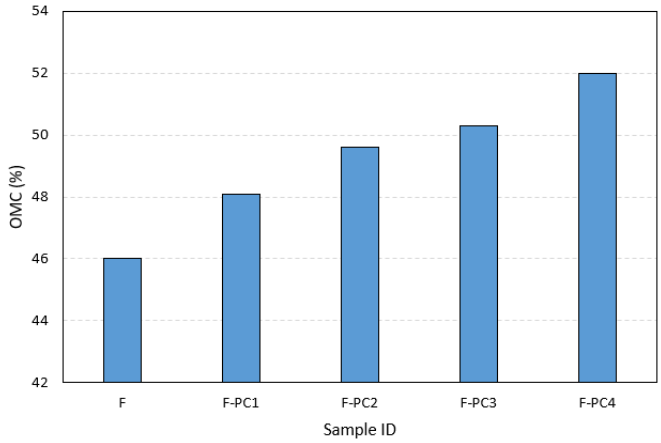

Fig. 1. OMC values of tested samples

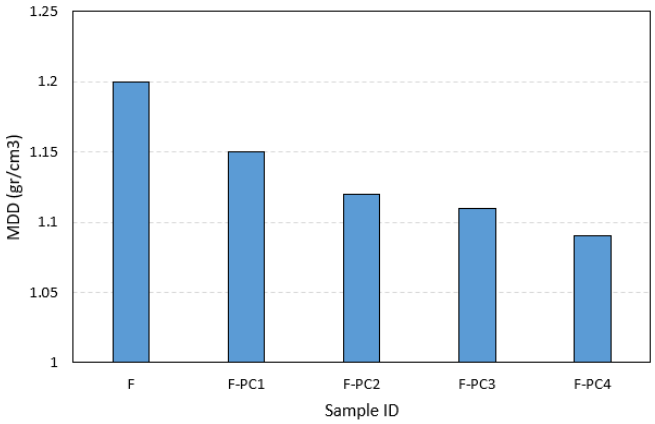

Fig. 2. MDD values of tested samples

IV. UCS RESULTS

The UCS tests was conducted on the specimens and the following results were derived:

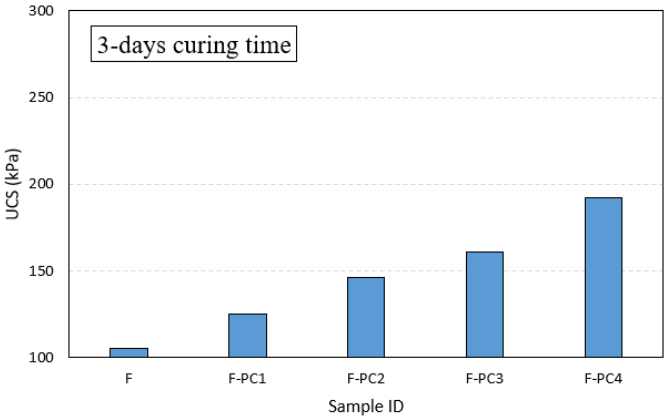

Fig. 3. UCS values of 3-days cured samples

As can be seen the trend shows increment by increasing glass percentages for 3 days curing.

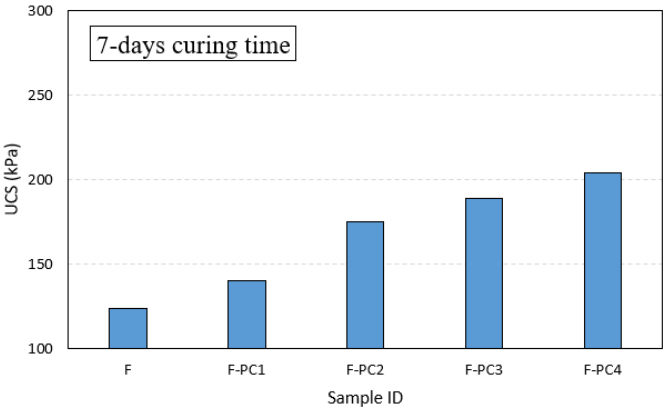

Fig. 4. UCS values of 7-days cured samples

As can be seen the trend shows increment by increasing glass percentages for 7 days curing.

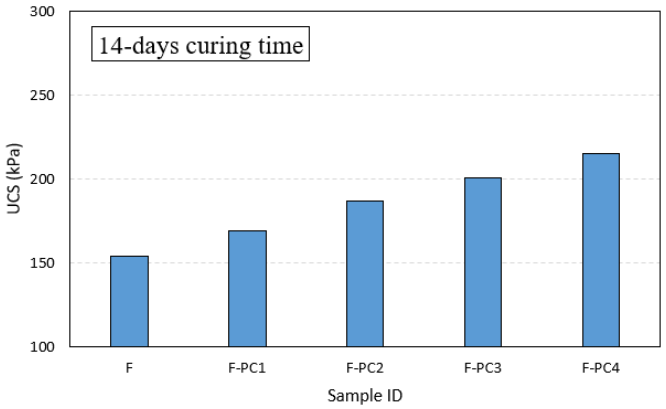

Fig. 5. UCS values of 14-days cured samples

As can be seen the trend shows increment by increasing glass percentages for 14 days curing.

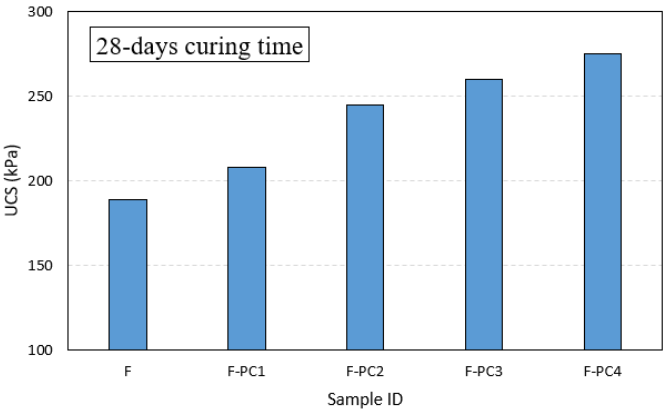

Fig. 6. UCS values of 28-days cured samples

As can be seen the trend shows increment by increasing glass percentages for 28 days curing.

V. CONCLUSION

A series of compaction tests were conducted, and the outcome shows that cement pushed the OMC to higher values and decrease the maximum dry density. The UCS results also proved that PC increased the compressive strength of flyash-cement. The curing time also increased the strength of specimens.

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