ISSN 2347 - 3983
Volume 8. No. 4, April 2020
International Journal of Emerging Trends in Engineering Research
Available Online at http://www.warse.org/IJETER/static/pdf/file/ijeter52842020.pdf
https://doi.org/10.30534/ijeter/2020/52842020

Relative Density Effect on Shear Behaviour of Fibre-Flyash-Sand

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ABSTRACT
Relative density is one of the important factor in sample preparation for running traixial tests. The issue of different relative density has been interest of many studies. This study focus on changes in Relative Density (Dr) This study aims to explore effect of three different Dr (i.e., 10%, 40%, 60%) on peak shear strength extracted from triaxial tests. The mixture prepared as fibre, flyash and sand. Fiber dosage kept constant at 5%. The flyash percentage were 10%,15%. The results showed that deviatoric stress was increased by increasing in Dr.

Key words: Relative Density, Shear , Fiber,Flyash

1. INTRODUCTION
Research on sand has been conducted in literature [1-6].Fiber is one of the materials being used in many civil engineering projects. Among those, in particular application of fiber in soil has been researched [7-21]. Application of by product and waste in different view such as shear and consolidation [22-47] has been studied in literature. The above literature all proved that there is a need to consider combination of flyash and fiber. Among those effective parameters, relative density is one of the important factors. Therefore, this study considers effect of flyash (FA) content on the behaviore of fa-Fiber mixture with sand. This study incorporates triaixal tests on the above mixtures. In Curtin university, the application of fiber in direct shear tests, triaxials, consolidation tests and compaction tests were conducted example [8,10,12,14,17,19] and this study takes us further in usage of combination of by-product which again used in Curtin university example[22,34, 29,34,36]. Relative density (Dr) is an important parameter in preparation of a sample in geotechnical experimental study. In fact, relative density represents how close are soil particles and how loose or dense are sample. This parameter has a relation with void ratio in the loosest, densest and natural states of the soil. In general, a relative density in the range of 0 to 15% is categorized as a very loose, 15-35% is categorized as loose, 35-65% medium dense, 65-85% dense, and 85-100% very dense.

2. MATERIALS
The selection of materials was conducted to get the best outcome in accordance with subject of the study. The materials which was used: a) Sand b)Fiber c) Flyash

2.1 Sand
The sand was supplied from Perth's supplier. The sand had yellow color. The particle size distribution (PSD) can be found in Figure 1.

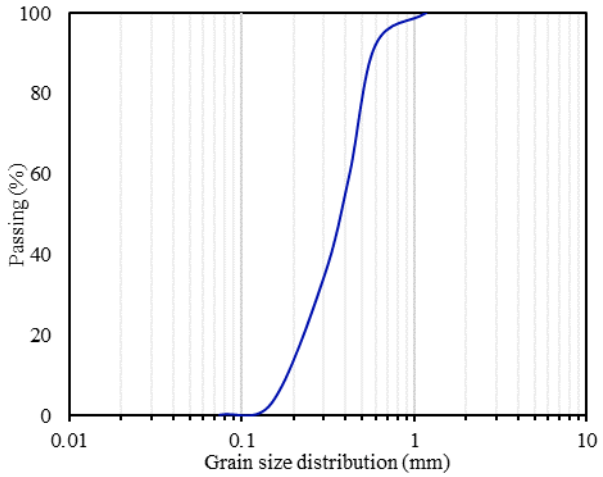

Figure 1: PSD of Sand

2.2 Flyash
Flyash(FA) properties can be found in Table 1.

Table 1: Flyash Properties

pH	10
SG	2
Color	Light gray

2.3. Fibre

Propylene fibre (PF) was used in this study with characteristics such as tensile moduli of 0.6 GPa and a elongations at break in the range 92%.

3.TESTING PLAN

Triaxial device was used to model the behavior of the mixture. The tests were conducted in three different confining pressure. The confining pressure were 100 kPa, 150kPa and 200 kPa. The mixture as explained earlier was constructed in with 5% fiber. The flyash also kept constant at 10%. In this plan, Dr was changed from 10 to 60% to evaluate the effect of Dr. Table 2 presents the testing program.

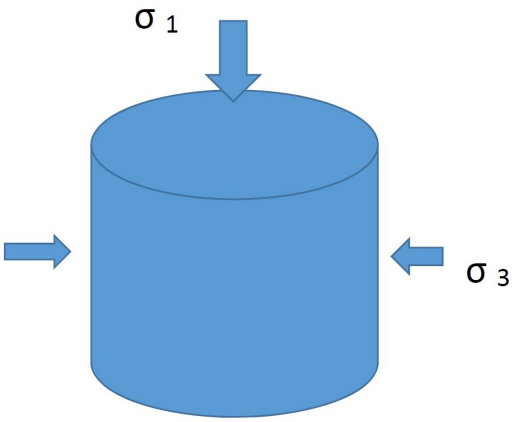

Figure 2: Triaxial Test Sketch

Table 2: Testing program utilized in this study

Sample ID	Flyash (%)	Dr%	Fiber (%)	Confining pressure (kPa)
S-10FA-5F	10	10, 40, 60	5	100,150,200
S-15FA-5F	15	10, 40, 60	5	100,150,200

4.TEST RESULTS

4.1. Compaction Results

Table 3 shows the compaction characteristics of the used mixture.

Table 3: Results of compaction tests

Sample ID	FA (%)	OMC (%)	MDD(gr/cm^3)
S-10FA-5F	10	14.5	1.54
S-15FA-5F	15	15.7	1.51

4.2. Triaxial Tests

Triaxial device was used to investigate shear behavior. This test has three steps:

a) Saturation
b) Consolidation
c) Run the test

The sketch of the sample under pressure can be seen in Figure 2. The results can be seen in Figure 3 to 8.

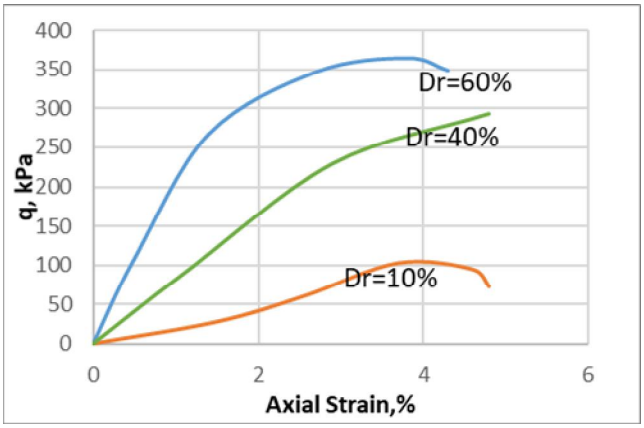

Figure 3: Deviatoric stress under 100kPa confining pressure, FA=10%

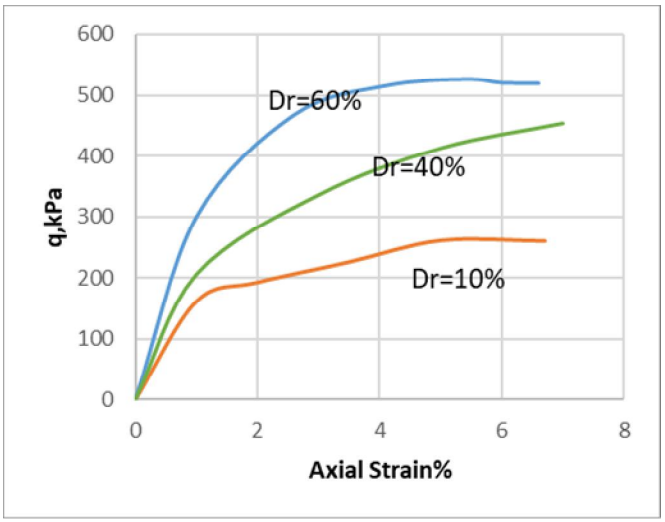

Figure 4: Deviatoric stress under 150kPa confining pressure FA=10%

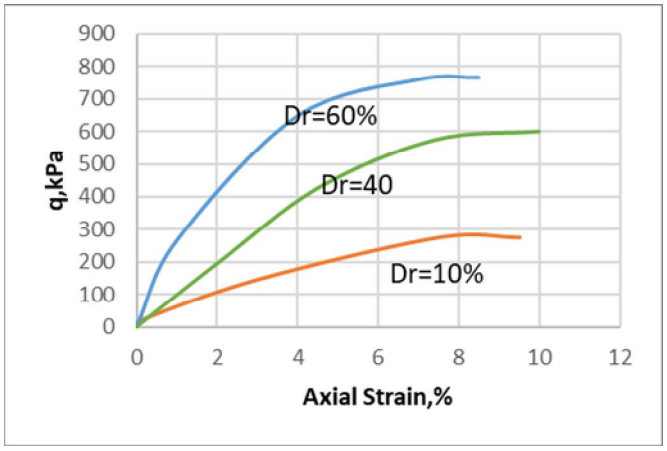

Figure 5: Deviatoric stress under 200kPa confining pressure FA=10%

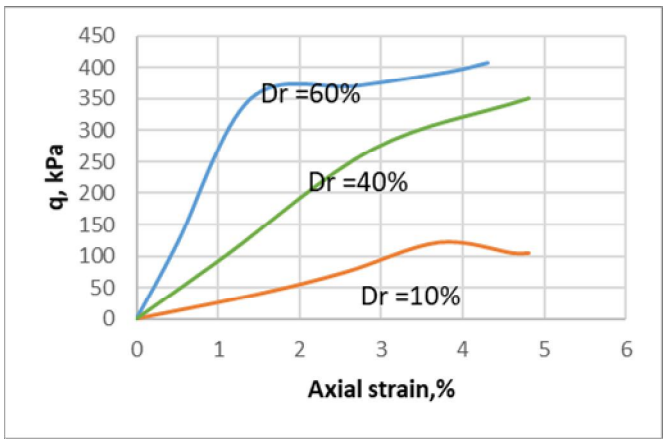

Figure 6: Deviatoric stress under 100kPa confining pressure, FA=15%

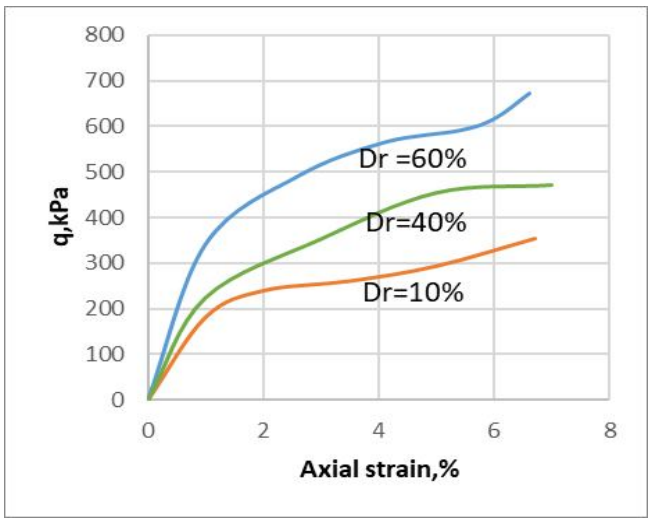

Figure 7: Deviatoric stress under 150kPa confining pressure, FA=15%

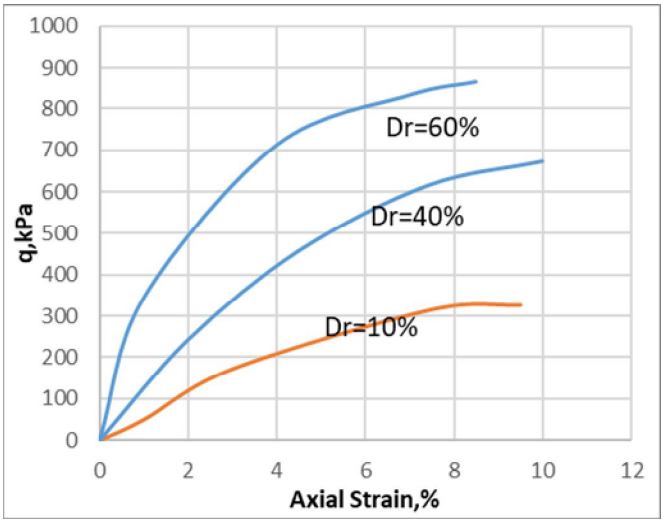

Figure 8: Deviatoric stress under 200kPa confining pressure, FA=15%

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5. CONCLUSION

A series of triaxial tests were conducted on a mixture. The mixture was combination of flyash, sand and fiber. The results proved that:

a) The MDD of compaction decreased by increasing in flyash dosage.

b) OMC was increased due to inclusion of flyash.

c) The increase in Dr from 10 to 40% in all confining pressure of 100,150 and 200 kPa, showed increment in .q.

d) Flyash changed from 10 to 15%, similar trend was observed with effect of Dr on diviatoric stresses.

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