Hindawi
Advances in Civil Engineering
Volume 2018, Article ID 1945808, 9 pages
https://doi.org/10.1155/2018/1945808

Research Article

Investigation of the Application of Various Water Additive Ratios on Unconfined Compressive Strength of Cement-Stabilized Amorphous Peat at Different Natural Moisture Contents

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Received 13 March 2018; Revised 26 July 2018; Accepted 9 August 2018; Published 12 September 2018

Academic Editor: Constantin Chalioris

Natural peat is considered incapable of supporting built structure due to its poor engineering properties. Chemical stabilization is one of the peat soil improvement methods which has been studied by many researchers. This study describes an investigation of water additive (W/A) ratio application on cement-stabilized peat strength. Peat soil at different moisture contents, which are 1210%, 803%, and 380%, were stabilized with cement by W/A ratio of 2.0, 2.5, 3.0, 3.5, and 4.0. Unconfined compressive strength (UCS) test was conducted after the specimens were being air-cured for 28 and 56 days. The result shows that there is an increase of UCS value as the decrease of W/A ratio (the increase of cement dosage) and the increase of curing time and peat moisture content. The higher strength found in the specimen with higher moisture content, compared to the lower one at the same W/A ratio, shows that the mix design of cement-stabilized peat using W/A ratio should have differed under different peat natural moisture contents. From the result, it is also found that cement hydrolysis reaction occurred despite the presence of humic acid in the peat soil, which by many studies is assumed will hinder the cement-soil reaction.

1. Introduction

A mixture of fragmented organic material formed in wetlands under suitable climatic and topographic conditions is called peat. Peat is derived from vegetation that has been chemically changed and fossilized as described by Dhowian and Edil [1]. Approximately, Malaysia has 2.6 million hectares of peatlands. Sarawak has the largest area of peat soils in Malaysia for about 69.08% of the total peatland area in the country [2].

In civil engineering, peat is classified as a problematic soil due to its weak characteristic related to its ability to support the civil structures. Peat consists of water and decomposed plant fragment with no measurable strength in its natural state. Peat has a high natural moisture content, high compressibility including significant secondary and tertiary compression, low shear strength, high-degree spatial variability, and potential further decomposition as a result of changing environmental conditions [3]. Peat properties are site-dependent. Not only has a high natural moisture content, peat also has a wide range of moisture content depending on sites. The water content of peat can be more than 1500% [4]. Huat et al. [5] reported that the natural water contents of peat sample from several locations in Malaysia were found to range from 150–700%. Moisture content in the range of 200–2200% is reported by Zainorabidin and Wijeyesekera [6] for east Malaysian peat.

Ground improvement method has to be done prior to construction on peat. Chemical stabilization such as cement-peat stabilization is considered the effective method for peat stabilization especially for deep peat which can reach up to 10 meters deep. There are some factors that influence

cemented-soil mixture [7, 8], which are: type and properties of soil, quantity and type of cement, soil mixture content, mixing and compaction method, and condition and curing time. Many of cement-stabilized peat studies were conducted considering these factors. Table 1 shows the summary of peat stabilization studies by some researchers.

1.1. Cement as Chemical Stabilizer. When cement is added into the soil, there occur two chemical reactions. First is primary hydration where water reacts with cement, forming a binding gel called tobermorite/CSH. The second reaction is called secondary pozzolanic reaction. It happens by the reaction of calcium hydroxide [$Ca(OH)_2$], formed in primary hydration and water and pozzolan (silica and alumina) in the soil, which then forms more binding agents.

Axelsson et al. [15] recommended that the binding effect of stabilization should be based on hydraulic or pozzolanic reaction, for example, those from cement or lime. Compared to lime, cement is considered better for peat soils [7, 15]. With lime, pozzolanic reaction hardly occurs because of the presence of fewer clay particles and humic acid that inhibit the strength-enhancing mechanism. Meanwhile, cement still forms binding materials with water, despite the presence of humic acid [16]. OPC is the common type of cement used as the stabilizer and considered the best stabilizer for peat [13]. OPC is good for handling the high moisture content of peat [17].

Unlike clay, peat has a humic acid that can retard the strength development of cement-stabilized peat. However, Huttunen et al. [18] indicated that humus or humic acid is one of the factors affecting the stabilization effectiveness; thus, it is not merely determined by organic and humus content of the soil. Axelsson et al. [15] indicated that in soils with high organic contents, the quantity of binder needs to exceed a threshold to neutralize the humic acid to be stabilized. Soil will remain unstabilized without sufficient binder added. Ali et al. [10] also conducted a study to prove the addition of sufficient binder to neutralize humic acids. Quantity of 150–250 kg/m^3 cement was recommended by Axelsson et al. [15] for peat soil. Ali et al. [10] found the dosage of 250 kg/m^3 binder with 75% cement and 25% slag is the minimum dosage for stabilized peat to achieve significant strength gain. Meanwhile, according to Dehghanbanadaki et al. [19], the combination of 300 kg/m^3 of cement gives the highest strength for all the samples tested as for eight times greater than untreated peat.

1.2. Water Additive (W/A) Ratio as Stabilization Mix Design. Compaction method greatly contributes to the effectiveness of stabilization. However, it is difficult to compact peat soil because of its high moisture content and organic particles which make a slurry-like and sticky texture. Many of chemical-stabilized peat studies [3, 7, 12–14] utilized the compaction test to determine the maximum dry density and optimum moisture content with a certain percentage of a stabilizer by the wet or dry weight of soil mass to find mix design for stabilization. This method is actually difficult to apply in the field for peat soil due to the high initial moisture content.

Axelsson et al. [15] studied the shear strength of 28-day-cured-specimens added with several quantities of binder and reported that water-binder ratio has an effect to the soil-stabilized specimens. Therefore, this study used various water additive (W/A) ratios to calculate the cement dosage of the cement-peat mixture based on its field moisture content and to observe the interaction between cement added and the moisture content yielded to the strength increased. This method of mix design is assumed to be more simple and practical, where peat moisture content is highly taken into consideration as one of the prominent characters of peat. Highest strength of 28-day-cured UCS value was found at the water to binder ratio at 4 (within the data range of the study) by Timoney et al. [20], who stabilized highly organic soil with cement in dry soil mixing. Several UNIMAS researchers [21–24] also have conducted cement-peat stabilization using the W/A ratio. The maximum strength achieved at the W/A ratio of 3.5 (within the data range of the study) was found by Ismail [21] and Jimbai [23]. However, more studies and wider data range are still required in investigating the optimum W/A ratio for peat stabilization.

1.3. Air-Curing for Cement-Stabilized Peat. Curing time has an important role for cement-stabilized peat to gain strength since cement needs time for reacting with water and pozzolan materials. Many researchers had proved the strength increase over curing time in peat stabilization [3, 7, 9, 10, 12, 14, 19, 23]. Several studies of peat stabilization often used water curing method to allow cement hydrolysis reaction [10–13]. Kalantari and Huat [9] used air-curing technique in peat stabilization in exchange of water curing technique that has been used before by many researchers. Air-curing technique allows the peat to lose their moisture content and gradually become harder. Kalantari and Huat [9] evaluated the effect of curing age and water-cement ratio on unconfined compression strength. The study found that the hardening process can occur with initial water content of natural peat soil and does not need extra water for the curing process.

1.4. Engineering Properties and Unconfined Shear Strength of Cement-Stabilized Peat. Several studies of peat stabilization show the increment of engineering characteristics of peat after stabilization. The pozzolanic activity in stabilized specimens leads to the increase in its density due to the reduction of the amount of interparticle voids [14]. Liquid limit and plasticity of soils are reported to decrease after the addition of cement [3, 7, 14]. From the linear shrinkage test, Ali et al. [10] found stabilized peat had better volume stability than that of untreated peat. Rahman et al. [14] also reported a decrease in permeability value after stabilization. The pH value of cemented peat specimens is increasing with cement addition, and the materials change from acidic to alkaline [3, 10]. From the compaction test, maximum dry density increase and optimum moisture content decrease was observed [3, 7, 14, 25].

Many researchers agreed with the finding that unconfined compressive strength of cement-stabilized peat is

Table 1: Summary of tropical peat chemical stabilization study by some researchers.

Reference	Origin and sampling depth	Peat classification	Stabilizer	Stabilization method	Curing method and curing period
[7]	Banting, Bukit Changgang and Dengkil, Selangor 0.5–1 m	H4–H7	OPC 5–15% lime 5–25%	Compaction with MDD and OMC	Water curing 7, 14, 28 days
[9]	Kampung Jawa, Malaysia 0.05–0.6 m	H4–H5	OPC 15, 30, 50% and polypropylene fibers 0.1, 0.15, 0.25% (of natural wet soil)	Amount additive added is percentage additive of wet soil hand-mixed	Air-curing 28, 90, 180 days
[10]	Kampung Sri Nadi, Klang, Selangor Darul Ehsan, Malaysia 1 m	H4	Cement and slag 300, 250, 200 kg/m^3 (25–75%, 50–50%, 75–25%) + 950 kg/m^3 siliceous sand	Amount additive added is percentage additive of wet soil mixer mixed	Water curing with pressure 9 kPa 7, 14, 28 days
[11]	Sri Nadi Village, Klang, Selangor, Malaysia	Fibrous peat	300 kg/m^3 binder + 25% sand, w/o and w/4% accelerator (of wet soil mass) OPC specially manufacture cement: Walcrete, Avancrete, Phoenix, Mascrete Cement accelerator: Sodium chloride and calcium chloride	Amount additive added is percentage additive of wet soil Kitchen mixer mixed	Water curing with pressure 100 kPa 7 days
[12]	Matang, Sarawak, Malaysia 0.4–0.8 m	H3–H4	OPC 5–40% FA 5–30% QL 2–8%	Compaction with MDD and OMC	Water curing 7, 14, 28 days
[13]	Matang, Sarawak 0.4–0.8 m	H3	OPC 5–20%, quick lime 5–20%, fly ash2-8% (of soil dry mass)	Compaction with MDD and OMC	Water curing 7, 14, 28 days
[3]	Tropical peat	H4	85% cement, 15% bentonite (5%, 10%, 15%)	Compaction with MDD and OMC	Water curing 7 and 14 days
[14]	Kp Tumbuk darat, Sepang, Selangor, Malaysia 1 m	H5–H6	10, 20, and 40% OPC (of soil dry mass)	Compaction with MDD and OMC	Air-curing 3 and 28 days

MDD, maximum dry density; OMC, optimum moisture content; OPC, ordinary Portland cement; FA, fly ash; QL, quick lime.

increased compared to the untreated peat. The unconfined compressive strength was found to increase with the increase of cement content and curing time [3, 7, 9, 10, 12–14, 19, 25]. It is also found that the UCS values increase with the decrease of water-cement ratio [9]. Kalantari and Huat [9] also found that the strength gain continues through curing period of 6 months as well. Hebib and Farrell [8] found a considerable increase in strength that was gained for cement-stabilized Ballydermot peat in 1-year time period. The 90-day unconfined compressive strength achieved 70% of the 1-year strength. However, the UCS value of cement-stabilized peat reported decreasing after optimum amount as the binder increase, which is related to the moisture content of natural peat [19].

2. Materials and Methods

2.1. Sampling and Materials. The disturbed peat sample was collected in Kampung Meranek, Sarawak, Malaysia, from 0.5–1 m depth below the surface. The peat sample transported to the laboratory was kept in a sealed container. Before the tests were performed, the peat sample was screened through 6.63 mm (0.3″) sieve to remove larger objects. Leaving in the larger objects would introduce an inconsistency in the test result.

For the UCS test, peat soil with three different moisture contents were prepared, which are peat with moisture content of 1210% as the field moisture content (later referred as peat A), moisture content of 803% (later referred as peat B), and moisture content of 380% (later referred as peat C). The last two moisture contents are the result of air-dried peat. The stabilizer used was the ordinary Portland cement (OPC).

2.2. Physical Properties. The physical properties tests carried out were Von Post classification (degree of decomposition), moisture content (BS 1377), organic content (ASTM 2974), fiber content (ASTM D 1997), specific gravity (BS 1377), liquid limit (BS 1377), linear shrinkage (BS 1377), and pH

test (BS 1377). There are some adjustments for peat soil tests due to their distinct characters compared to other inorganic soils. For the specific gravity test, kerosene was used as the standard liquid instead of water due to the lightness of peat material. For the liquid limit test, the reversed method was used. Peat was tested from wet to dry condition using a dryer, instead of adding water to the dry peat. The reversed method was applied because peat will unlikely return into its natural state once dried.

2.3. Mould Preparation. A PVC pipe was used as a split mould for UCS specimens. The sample size was 38 mm in diameter and 76 mm in length. Both ends of PVC were covered with Styrofoam and PVC cover. Plastic wrap was used around the PVC mould to prevent water leakage. The inside part was lubricated with grease to prevent the specimen adhering to the mould surface.

2.4. Stabilization and Air-Curing. The *W*/*A* ratio was used as the mix design for stabilization to calculate cement dosage based on a specified *W*/*A* ratio and peat moisture content. The *W*/*A* ratio of 2.0, 2.5, 3.0, 3.5, and 4.0 were used for peat A, B, and C. Three samples were prepared for each varied conditions to get more reliable data. Peat A with cement mixture is later referred as peat A specimen, peat B with cement mixture is later referred as peat B specimen, and peat C with cement mixture is later referred as peat C specimen. Cement dosage for both peats is shown in Table 2.

Peat and cement were weighed according to the mix design calculation and mixed well with a putty knife. Therefore, the mixture was put inside the mould and pressed with a plastic spoon by three layers. Since the mixture was a kind of slurry, the standard compaction method cannot be used. After the mould had been covered, the air-curing procedure was done by keeping the specimens at a normal temperature and without any water intrusion. The air-curing procedure was carried for 28 and 56 days for peat A, B, and C specimens. To prevent water accumulation, the specimens were turned over every day for the first 3 days and then every 3-4 days.

2.5. Unconfined Compressive Strength (UCS) Test. After the curing process, the unconfined compressive strength test was conducted for the peat specimens according to ASTM D 2166 guidelines. The specimens were loaded axially using UCS testing equipment with 2 kN load proving ring until the load values decreased, the sample failed, or the strain has reached 15%.

3. Results and Discussion

3.1. Physical Properties. The test result of the physical properties of the peat is shown in Table 3.

The peat sample had a dark brown color. The consistency was very pasty and amorphous with faintly recognized plant remains. When squeezed, about two-thirds of peat escaped between the fingers. Therefore, the degree of decomposition of Kampung Meranek peat by Von Post classification was classified as H7-H8 or sapric (amorphous) peat [26]. The moisture content tested in the lab was 1210.497%, which was very high. The specific gravity was 1.408, which was a typical value of peat soil. The liquid limit value showed that the sample would enter liquid consistency by the moisture content of 458%. Linear shrinkage of 27.338% indicated that the peat had a high shrinkage when dried out.

Peat should be contained by organic content more than 75% [4]. The organic content of the tested sample was found to be 95.793% which fell into the peat category mentioned by Huat [4]. The fiber content of 32.333% showed that the peat is classified as sapric (amorphous) peat based on ASTM D 4427. The pH value was 3.31, indicating that the peat is highly acidic [26].

3.2. Unconfined Compressive Strength Test

3.2.1. Stress vs. Strain Relationship of Cement-Stabilized Peat with Varied W/A Ratio. Figures 1–4 show the stress-strain graphs of the peat A, B, and C specimens with varied *W*/*A* ratio.

From the result of the UCS test, peak strength is found in peat A specimens. From the graphs, it can be inferred that UCS values increase as the decrease of *W*/*A* ratio, which also means the increase of cement dosage. For both curing times, *W*/*A* ratio 2.0 is showing a drastic increase of stress compared to other ratios, while close values of UCS strength are observed from *W*/*A* ratio of 2.5 to 4.0. This finding illustrates the quantity of binder needs to exceed a threshold to neutralize the humic acid to be stabilized as mentioned by Axelsson et al. [15]. The close values of the stress of specimens with *W*/*A* ratio of 2.5–4.0 shows that there is no significant increase in strength, despite the addition of the cement. It means that the inadequate binder could not neutralize the humic acid, thus hinders the cement hydration process.

In contrary with the stress, *W*/*A* ratio 2.0 has the smallest strain value followed by other ratios consequently. This also shows the increase of the brittle characteristic as the decrease of the *W*/*A* ratio.

The pattern of the graphs from peat B specimens is relatively the same with peat A specimens. The peak strength is found, and strength from *W*/*A* ratio 2.0 is noticeably greater than other ratios. Therefore, *W*/*A* ratio 2.0 could be assumed as the optimum *W*/*A* ratio of peat A and peat B. However, the strength from peat B seems to be lower than that from peat A for both curing times.

Aside from peat A and B, peat C shows a different response with *W*/*A* ratio variation. As shown in Figures 5 and 6, for both curing times, there is a drastic decrease in strength after *W*/*A* ratio of 2.5 to 2.0, despite the addition of cement dosage. Accordingly, from the graphs, *W*/*A* ratio 2.5 is assumed to be the optimum ratio for peat C. This finding is in agreement with Dehghanbanadaki et al. [19] who reported the decrease of UCS value of cement-stabilized peat after optimum amount as the binder increase that related to the moisture content of untreated peat.

Table 2: Cement dosage for peat A of various W/A ratios.

W/A ratio	w (%)	W (g)	Ws (g)	Ww (g)	Wc (g)	% cement in wet soil	Cement dosage (kg/m^3)
Cement dosage for peat A of various W/A ratios							
2.0	1210.497	500.000	38.153	461.847	230.923	46.185	472.282
2.5	1210.497	500.000	38.153	461.847	184.739	36.948	377.825
3.0	1210.497	500.000	38.153	461.847	153.949	30.790	314.854
3.5	1210.497	500.000	38.153	461.847	131.956	26.391	269.875
4.0	1210.497	500.000	38.153	461.847	115.462	23.092	236.141
Cement dosage for peat B of various W/A ratios							
2.0	803.920	500.000	55.315	444.685	222.343	44.469	459.402
2.5	803.920	500.000	55.315	444.685	177.874	35.575	367.521
3.0	803.920	500.000	55.315	444.685	148.228	29.646	306.268
3.5	803.920	500.000	55.315	444.685	127.053	25.411	262.515
4.0	803.920	500.000	55.315	444.685	111.171	22.234	229.701
Cement dosage for peat C of various W/A ratios							
2.0	380.606	500.000	104.035	395.965	197.982	39.596	421.350
2.5	380.606	500.000	104.035	395.965	158.386	31.677	337.080
3.0	380.606	500.000	104.035	395.965	131.988	26.398	280.900
3.5	380.606	500.000	104.035	395.965	113.133	22.627	240.772
4.0	380.606	500.000	104.035	395.965	98.991	19.798	210.675

w, moisture content; W, wet soil mass; Ws, dry soil mass, Ww, water content; Wc, cement mass.

Table 3: Physical properties of Kampung Meranek peat.

Properties	Values
Degree of decomposition	H7-H8
Moisture content (%)	1210.497
Specific gravity	1.408
Liquid limit (%)	458
Linear shrinkage (%)	27.338
Organic content (%)	95.793
Fiber content (%)	32.333
pH	3.31

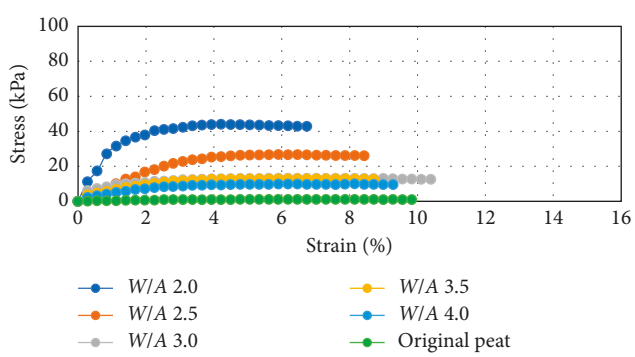

Figure 1: Stress vs. strain of peat A specimens after 28 days air-cured.

The strength obtained by peat C specimens is a lot greater than peat A and B specimens. The greater availability of soil particle in peat C specimens might affect the greater strength compared to peat A and B specimens. Nevertheless, it is interesting that the strength of peat A specimens, which has fewer soil particles and higher moisture content compared to peat B specimens, is greater than that of peat B specimens. Therefore, the secondary pozzolanic reaction might occur in the stabilization of peat C specimens, while primary hydration took a more dominant role for peat A and B specimens since both have a high moisture content that exceeds the liquid limit and has fewer soil particles.

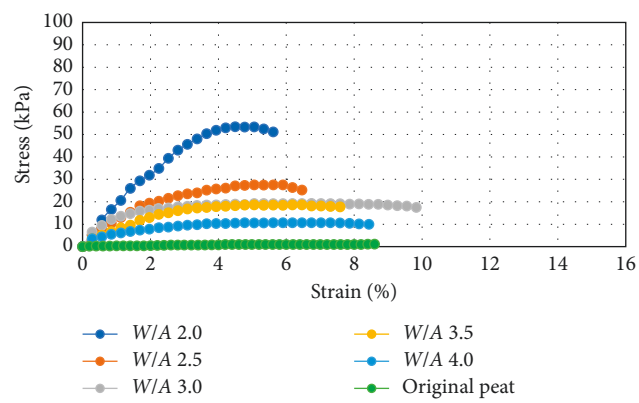

Figure 2: Stress vs. strain of peat A specimens after 56 days air-cured.

3.3. UCS Value vs. Curing Time. Figure 7 shows the increase in UCS value towards curing time for each W/A ratio of peat A specimens. All of the specimens indicate the increase of UCS values through curing time, even though W/A ratio of 2.5 to 4.0 does not show a big increase of strength, unlike W/A ratio 2.0. Similar behavior was also found for peat B specimens, as shown in Figure 8. The increase factor from 28 days to 56 days is 9–40 folds for peat A, and about 4–20 folds for peat B (from varied W/A ratios). The graphs of W/A ratio 2.0 show that there is a significant increase in strength through longer curing time and show the workability of cement-soil reaction. These also confirm that W/ratio 2.0 is the optimum ratio for peat A and B specimens.

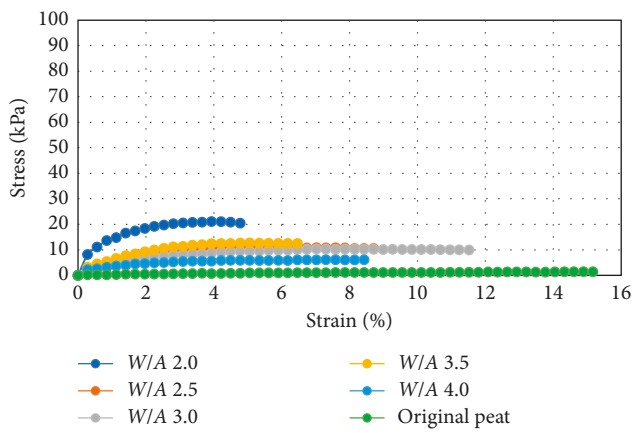

Figure 3: Stress vs. strain of peat B specimens after 28 days air-cured.

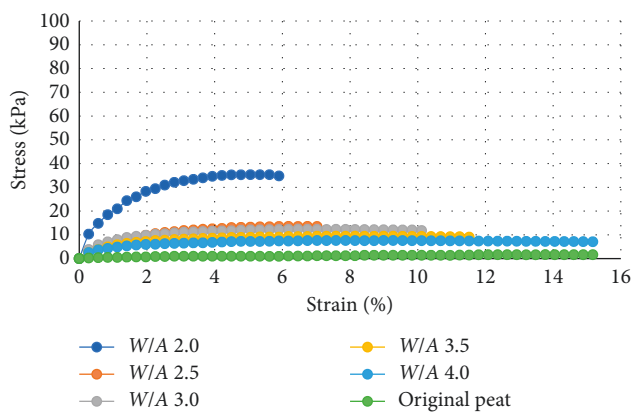

Figure 4: Stress vs. strain of peat B specimens after 56 days air-cured.

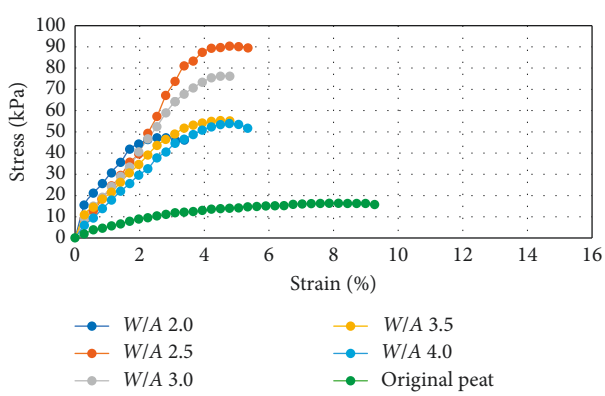

Figure 5: Stress vs. strain of peat C specimens after 28 days air-cured.

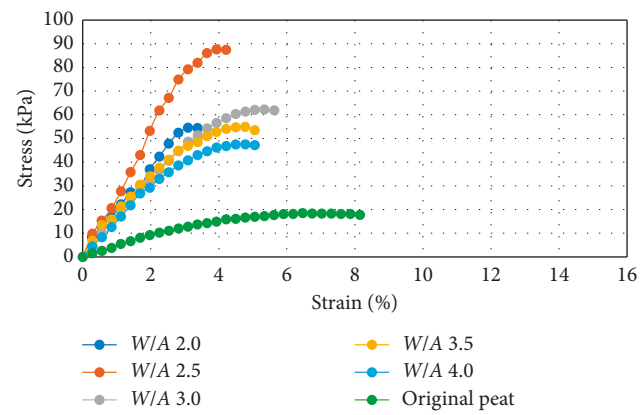

Figure 6: Stress vs. strain of peat C specimens after 56 days air-cured.

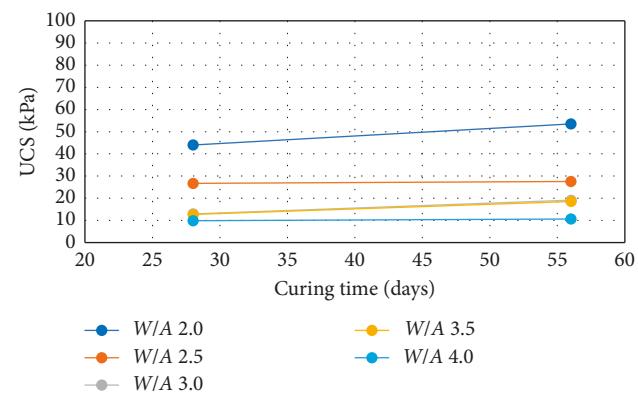

Figure 7: UCS value vs. curing time for peat A specimens ($w = 1210\%$).

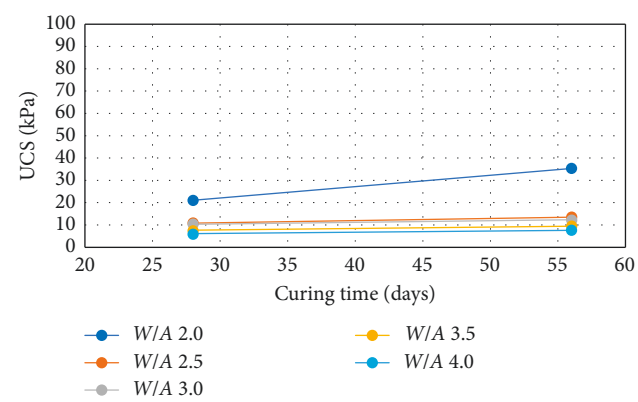

Figure 8: UCS value vs. curing time for peat B specimens ($w = 803\%$).

For peat C specimens graph as shown in Figure 9, there is a decrease of UCS values with longer curing time for every W/A ratios except for W/A ratio 2.0. The data result shows a contrary belief by many studies that strength of cement-stabilized peat would increase with longer curing time which might be affected by uniformity or mixing method.

3.4. UCS Value vs. W/A Ratio. From Figure 10, the peat A specimens which have 1210% moisture content achieve higher strength compared to the peat B specimens which have 803% moisture content. This proves the workability of cement hydrolysis reaction in the stabilized peat, despite the presence of humic acid. In other words, higher moisture

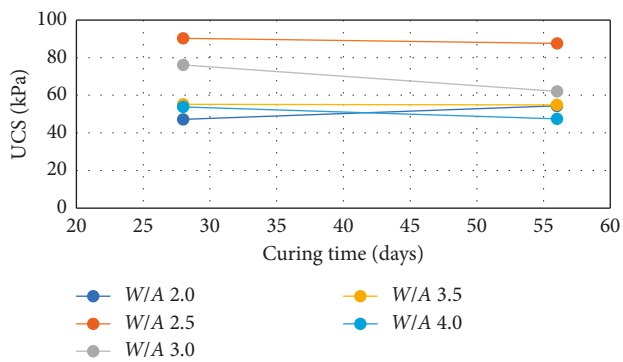

Figure 9: UCS value vs. curing time for peat C specimens ($w = 380\%$).

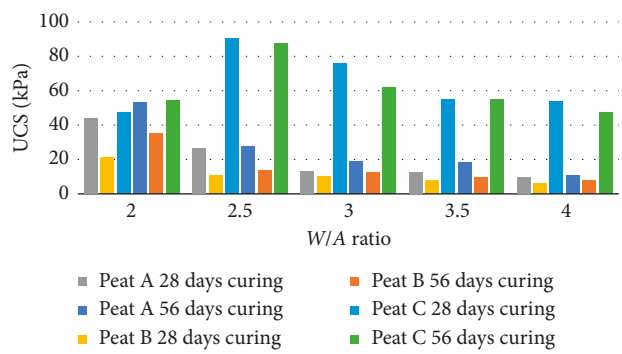

Figure 10: UCS value vs. W/A ratio for each specimen.

content inside the soil provides more water for the cement to react and produces the binding agent.

Peat C specimens, otherwise, have a different condition from peat A and B specimens, to begin with. The moisture content of peat A and B which exceeds the moisture content of the liquid limit (Table 3) makes it categorized in the liquid state, while peat C does not. Therefore, the different factors that peat C has, are believed to influence the greater strength achieved compared to peat A and B specimens, which also include the possibility of secondary pozzolanic reaction since peat C has more soil particles than the other two peats.

As discussed above, W/A ratio 2.0 seems to be the optimum W/A ratio for peat A and B specimens. Meanwhile, W/A ratio 2.5 is the optimum W/A ratio for peat C specimens. The increase of cement addition after optimum ratio decreases the UCS value of peat C specimens. Therefore, it can be presumed that the optimum additive by W/A ratio mix design on peat stabilization is different for different moisture contents. For example, from the data results, W/A ratio 2.0 of peat B specimen which has 803% moisture content can give quite the same strength with W/A ratio 2.5 of peat A specimen which has 1210% moisture content.

3.5. UCS Value Increase Factor vs. W/A Ratio. Figure 11 shows the strength increase factor for each specimen with

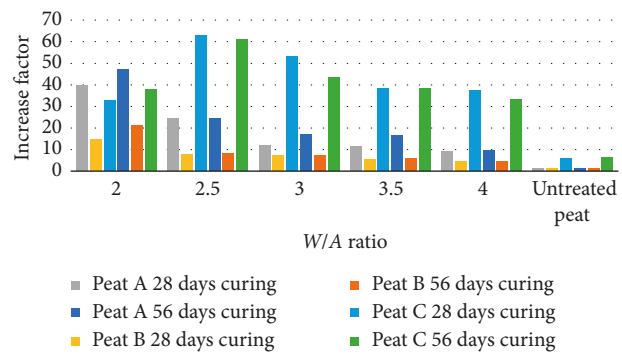

Figure 11: UCS value increase factor vs. W/A ratio for each specimen.

varied W/A ratio. Compared to the untreated peat strength, the specimens show a large improvement in strength. For peat A specimens, the highest increase factor is achieved by the 56-day cured specimens of W/A 2.0 which is 47 folds to the untreated peat strength. Peat B achieved 21 folds to the untreated peat strength by the 56-day-cured-specimens of W/A 2.0. And peat C achieved 62 folds to the untreated peat strength by the 28-day-cured-specimens of W/A 2.0.

Peat A and B, which had given the same variations of W/A ratios and have the same optimum W/A ratio based on this study, have different outcomes in the strength performances. For the same W/A ratio and close quantity of cement percentage, peat A specimens show higher UCS values for about 1.6–2 folds than peat B specimens for 28-day-curing. Meanwhile for 56-day-curing, peat A specimens show higher UCS values for about 1.4-1.5 folds than peat B specimens.

4. Conclusions

From the investigation of the various water additive ratio application on the unconfined compressive strength of cement-stabilized amorphous peat at different natural moisture contents, several conclusions are made:

(i) UCS values increase with the increase of cement dosage (decrease of water additive ratio).

(ii) UCS values increase with the increase of curing time. Even though the increase is not really significant between 28 and 56 days, but compared to the original peat strength, it gives increase factor of 9–40 folds (from varied W/A ratios) for peat A, 4–20 folds for peat B, and about 6–30 folds for peat C.

(iii) The insignificant results in W/A ratio below 2.0 for peat A and B might be caused by inadequate cement to neutralize humic acid which retards the strength development of cemented peat.

(iv) For the same W/A ratio and close quantity of cement percentage, peat A specimens show higher UCS value than peat B specimens. For 28-day-curing, peat A specimens show higher UCS values

for about 1.6–2 folds than peat B specimens. For 56-day-curing, peat A specimens show higher UCS values for about 1.4-1.5 folds than peat B specimens.

(v) The application of W/A ratio on peat stabilization is different for different peat moisture contents, in terms of specified strength gain purpose. For example, W/A ratio 2.0 of peat B specimen which has 803% moisture content can give relatively the same strength with W/A ratio 2.5 of specimen peat A which has 1210% moisture content.

(vi) W/A ratio 2.0 is the threshold for peat A and B to be stabilized, as W/A ratio 2.0 shows a drastic strength gain from W/A ratio 2.5, while W/A ratio of 2.5 to 4.0 does not show any drastic change from each other. Brittle behavior of W/A ratio 2.0 is evident from the stress-strain graphs compared to W/A ratio 2.5–4.0, which could be evaluated for the future study.

(vii) W/A ratio 2.5 is the threshold for peat C to be stabilized. Addition of cement dosage after the optimum amount will decrease the UCS value

(viii) Cement hydrolysis reaction is evident in the specimens, despite the presence of humic acid content of peat, proved by the higher strength values achieved by the higher moisture content of peat.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This research was funded by Zamalah Postgraduate Scholarship of Universiti Malaysia Sarawak (UNIMAS/NC-30/04–30/01 Jld. 3 (93)). The project was also supported by the Faculty of Engineering and Research Innovation Management Centre of Universiti Malaysia Sarawak and the Ministry of Education of Malaysia (FRGS/TK07 (01)/1055/2013(1)). The authors would like to express their gratitude to Zamalah Postgraduate Scholarship of Universiti Malaysia Sarawak (UNIMAS/NC-30/04–30/01 Jld. 3 (93)), Faculty of Engineering and Research Innovation Management Centre of Universiti Malaysia Sarawak, and Ministry of Education of Malaysia (FRGS/TK07 (01)/1055/2013(1)) for financial support. The authors also wish to acknowledge Cream-CIDB CoPS (Construction on Peat Soil) of UNIMAS and UNIMAS Geotechnical Engineering lab technicians for their assistance throughout this research.

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