DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

STABILIZATION OF DREDGED MATERIAL OF İZMİR BAY SOILS USING CEMENT AND LIME MIXTURES

by

Hikmet Polat KARAÇOBAN

March, 2018

İZMİR

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A Thesis Submitted to the
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M.Sc. THESIS EXAMINATION RESULT FORM

We have read the thesis entitled "**STABILIZATION OF DREDGED MATERIAL OF İZMİR BAY SOILS USING CEMENT AND LIME MIXTURES**" completed by **HİKMET POLAT KARAÇOBAN** under supervision of **ASSOC.PROF. DR. OKAN ÖNAL** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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ABSTRACT

In this thesis, importance of reusing dredged materials and methods of soil stabilization and solidification are investigated. Quantities and types of soil agents are mentioned. Test procedures and test results are examined and compared with other researches. In addition; previous researches that related to this subject were briefly mentioned.

As the experimental part of this study, soil samples, taken from Izmir Bay are treated with different chemical additives with different proportions in order to obtain strength values for the possible usage of the dredge material as a raw material for geotechnical construction purposes. Sieve analysis, hydrometer tests and Atterberg limits determination were performed for the classification of the dredge material as a soil. Specific gravity tests and organic content determination were also performed. The variations at the Atterberg limits due to change of pH value of artificially prepared soil binder mixtures have been determined in order to estimate the optimum binder ratio. Standard Proctor tests were performed to understand the compaction behavior of dredge materials and finally, unconfined compression tests are performed for the evaluation of the treated soil mixtures. Sea water was used in curing method in order to supply realistic conditions. Also, different curing periods are applied in order to investigate short and long-term gains of soil in terms of stabilization. The highest improvement observed with 9% lime-soil mixture. Maximum unconfined compression strength obtained 5.76 kg/cm^2 after 42 days cured samples.

Keywords: Soil stabilization, organic soil, soil classification, lime-cement mixtures

İZMİR KÖRFEZİNİN TARAMA MALZEMESİNİN ÇİMENTO VE KİREÇ KARIŞIMLARI İLE STABİLİZASYONU

ÖZ

Bu tez kapsamında zemin iyileştirme yöntemleri ile beraber tarama malzemelerinin tekrar kullanımının önemi incelenmiş ve zemin iyileştirmede kullanılan malzemelerin türleri ve miktarları hakkında literatür taranmıştır. Test usulleri ve sonuçları incelenmiş ve diğer çalışmalar ile karşılaştırılmıştır. Ek olarak; bu konu ile ilgili daha önce yapılmış çalışmalardan kısaca bahsedilmiştir.

Bu çalışmanın deneysel kısmında ise, İzmir Körfezi'nden zemin örnekleri alınmış, farklı kimyasal katkı malzemeleri farklı oranlarda eklenerek tarama malzemesinin geoteknik amaçlı muhtemel dolgu malzemesi olarak kullanılabilirliği araştırılmıştır. Tarama malzemesini zemin olarak sınıflandırmak için elek analizi, hidrometre analizi, kıvam limiti deneyleri yapılmıştır. Ayrıca özgül ağırlık ve organik malzeme tayini deneyleri de gerçekleştirilmiştir. En uygun karışım yüzdesini belirlemek için sistematik şekilde bağlayıcı karışımlar oluşturulup, pH ve kıvam limiti değerlerindeki değişimler gözlenmiştir. Tarama malzemesinin sıkıştırma özellikleri hakkında bilgi sahibi olabilmek için standart Proktor sıkıştırma deneyi gerçekleştirilmiştir. Son olarak serbest basınç deneyi yapılarak seçilen karışımların mukavemet değerleri değerlendirilmiştir. Karışımlar, daha gerçekçi koşullar oluşturmak adına tuzlu su ile kür edilmiştir. Ayrıca kısa ve uzun süreli kazanımları görmek için farklı kür süreleri uygulanmıştır. En yüksek oranda iyileştirme %9 kireç eklenmiş zemin karışımlarında gözlenmiştir. Maksimum serbest basınç mukavemeti 42 günlük kürün sonunda 5.76 kg/cm^2 olarak ölçülmüştür.

Anahtar kelimeler: Zemin stabilizasyonu, organik zemin, zemin sınıflandırması, kireç-çimento karışımları

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INTRODUCTION AND LITERATURE REVIEW

1.1 Reuse of dredged materials

Dredged materials are soil or excavated materials, which accumulate in the water bodies. These materials constitute minerals, organic properties and they dredged in the process of waterway maintenance, expansion for warranty of safety and easiness of shipping traffic. Dredging operations are required in order to maintain navigation in waterways and access to harbors.

Every year, several hundred million tons of materials are dredged all over the world (Boutin, 1999). These dredged materials, having different grain sizes, can contain a variable amount of organic matter and contaminants such as salt and sodium. Management of dredged materials is a worldwide problem. After dredging, traditional solutions such as dumping the materials at the seabed are constrained by international regulations. Alternative solutions, such as terrestrial disposal, are uneconomical and require big areas (LIFE, 2002; Grégoire, 2004). Therefore, The research and development on the beneficial uses of dredged materials are necessary. Dredged material management hierarchy is shown in Figure 1.1.

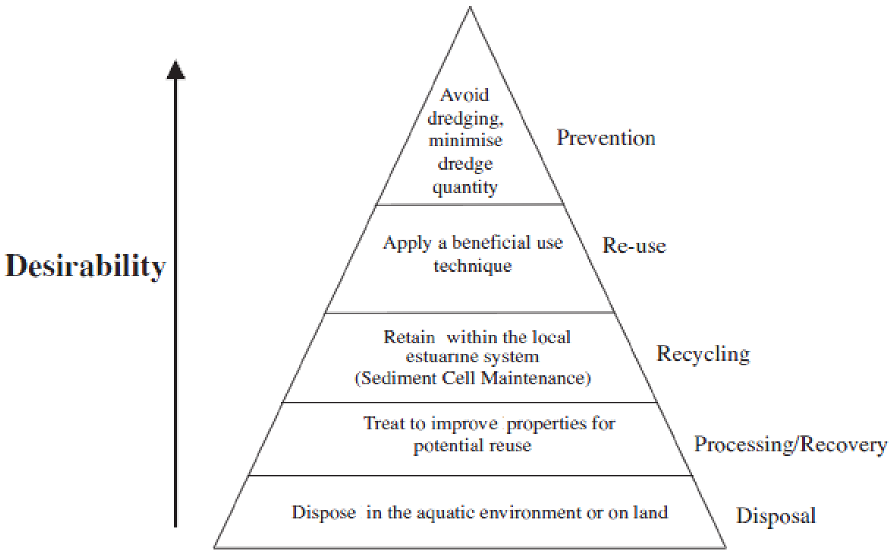

Figure 1.1 Hierarchy for prioritizing dredge material management (Sheehan and Harington, 2012)

Beneficial use of dredged material allows alternative and innovative management procedures to be implemented with the reduction of any environmental impact from dredged material disposal (Sheehan and Harington, 2012). Studies for the island of Ireland (Harrington et al., 2004; Sheehan et al., 2008) have identified the limited amount of beneficial use of dredged material practiced for the fine-grained fraction, which is primarily from maintenance dredging projects. Innovative beneficial uses, such as sub-base material for road construction (Dubois et al., 2009), landfill liner (Riordan et al., 2008), lightweight aggregate (Port of Baltimore, 2009) and stabilized construction fill material (Maryland Port Administration, 2009) are being researched and developed to increase the options available and aid the decision-making process at the planning stage of a dredging project. Implementation of enhanced dredged material management practices are internationally required in order to lower the level of disposal at the seabed and achieve more environmental friendly sustainable solutions (Sheehan and Harington, 2012).

Due to shortages of natural resources and the sustainable development approach, the beneficial use of dredged materials has gained broad acceptance in various domains such as agriculture, civil engineering and manufacturing (Centre Saint Laurent, 1993; Boutouil, 1998; LIFE, 2002; Ulbricht, 2002; Colin, 2003). The beneficial use in the civil engineering domain, consuming over four hundred million tons of such materials each year in France (Michel, 1997; UNPG, 2005), is interesting from several points of view. The distribution of beneficial uses of dredged materials in France can be seen in Figure 1.2 as a pie graph. Dredged sediments can be viewed as a new source of materials for the sake of the environmental constraints and concerning the opening of new quarries with the continuous increase in demand for aggregates. The characteristics of dredged materials could be similar to those of currently used materials, from grain size distribution (coarse to fine grains but generally fine grains) to the variability of required mechanical properties for the road construction (Sheehan and Harington, 2012).

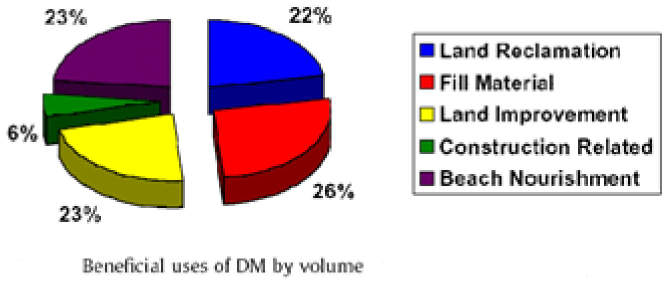

Figure 1.2 Beneficial use of dredged material in France (Sheehan et al., 2009)

Previous studies on the use of raw fine dredged sediments as construction material have shown that stabilization with binders could satisfy the required mechanical characteristics. However, the proportion of hydraulic binders, needed to meet required specifications is crucial for the stabilization. For instance, for sediments from Le Havre Harbor (France), about 15% of a hydraulic binder was required (Boutouil, 1998). The need for such large amount of hydraulic binder makes the use of raw dredged materials unlikely to reuse from an economical point of view. On the other hand, the presence of organic materials can cause problems with regards to hydration (Kujala et al., 1996).

In addition, roads, pavements or embankments constructed with unstabilized dredged material have been detected as they corrupt quickly due to micaceous material. Micaceous soils could be dangerous due to the fact that flaky particles in soil hamper the compaction behavior. This concludes to respectively high void contents even if soil at the maximum compaction, thus the permeability of soil increases. If micaceous soils expose to air, it shows slow air-drying behavior and becomes fine pulverized material afterwards and this fine pulverized material is hard to compact with compaction equipment. However, sand and lime stabilizations are convenient and economical solutions for stabilizing soils that contain mica for re-using in geotechnical point of view because these materials can be found rapidly and economically in the local stores. Usually these types of soils are inconvenient for stabilizing with Portland cement or bituminous material (Frempong, 1994). Portland cement and bitumen were not taken into consideration due to high costs, and the plasticity characteristics of dredged material which are undesirable.

Adding small amount of lime to clayey soils can enhance their permeability, Atterberg limits, whereas reduce its shrinkage and swell potential, also supply ease of pulverization workability (Bell, 1989). However, efficiency of such stabilization varies according to quantity and quality of binding agent same as structural and chemical component of the soil. Generally, this stabilization varies with the chemical reaction commenced by clay minerals and lime to constitute cementation bonds.

Lime stabilization could be defined as chemical reaction between clay minerals, water and lime in the soil. If the clayey particles are structurally dispersed, or the soil has amorphous silica, the reaction is highly efficient. The reason for this reaction is commenced by an alkaline attack with hydrated lime on clayey particles. This reaction would advance steadier when the mineral structures are dispersed because of weak bonds and clay minerals degrade easier. The alumina and silica released by reaction from clay particles, get in reaction with lime in the soil to compose calcium silicates (and calcium aluminum hydrate in the event of soils with rich aluminum) with which soil particles are transformed into a heavily-bonded granular structure. If the soil contains amorphous silica, soil can get in reaction with lime to constitute calcium silicate gel. These lime-soil reactions are pozzolanic either soil contains siliceous or aluminous materials that are not cementitious by themselves. However, these materials could react with lime in the existence of moisture to form cementitious bonds (Gogo, 1990).

On the other hand, adding sand is a physical technique for changing the structural component of the soil mixture and enhance mechanical stability of soil (Muktabhant and Ongskul, 1969). Adding sand to soil or in other words sand modification of fine grained soils could reduce swelling and plasticity characteristics. It could be beneficial for coarse grained soils in terms of reduction in void ratio and so that indicate a potential improvement in volume stability and strength.

Recycling dredged sediments for engineering fills requires checking specific geotechnical criteria that are specified in local construction rules. Proctor test is the main test recommended to determine the convenience of a material to be used in engineering fills. In Turkey, qualifications are clearly stated in Turkish Highway Commission Technical Dictionary. Atterberg limits, organic matter content, California Bearing Ratio (CBR), unconfined compression values, lime content determination and curing methods are the basic parameters for a stabilized soil to be used in road construction.

In New York, The United States of America, there are a few different alternative approaches exist to utilize large amount of dredged materials (D. J. Yozzo et.al. 2004) such as:

- Creation of artificial reefs and shoals
- Oyster reef restoration
- Bathymetric recontouring
- Creation/restoration of intertidal marshes and mudflats
- Filling dead-end basins and canals
- Creation of bird/wildlife islands
- Remediation/creation of upland habitats (landfill/brown fields reclamation).

1.2 Dredging in Izmir Bay

Dredging operations has been conducted in Turkey, Alsancak Harbor in the content of revision for accumulated materials that needs to be dredged day by day. Similar dredging operation performed in Izmir, Ragıp Paşa Lagoon and one million m^3 materials has been dredged from shore with excavators. Dredged materials have been stored in Çiğli, Izmir.

Planned destination of dredging is from Yeni Kale (İnciraltı) to Alsancak Harbor. Totally 25 million m^3 material would be dredged. Main purpose of this action is to increase the depth of harbor in order to allow large ships and crafts to steer. Planned navigation and circulation canals are illustrated in Figure 1.3. The accomplishment of this job requires heavy equipment. Two large ships (1 Cutter-Suction Dredger, 1 Tugboat) have been bought by government at a cost of nearly 3 million dollars.

At the end of the project, average depth of harbor would be increased from 12 meters to 16-18 meters. In addition, harbor would be supported with two canals (1 Navigation Canal, 1 Circulation Canal) in order to increase interoperability through third generation large ships could enter Alsancak Harbor. This circulation canal is required for the maintenance of bay for sustaining the traffic in Izmir Alsancak Harbor. The improvement of existing water quality and sustainability of aquatic and terrestrial ecosystems are main purposes of this project.

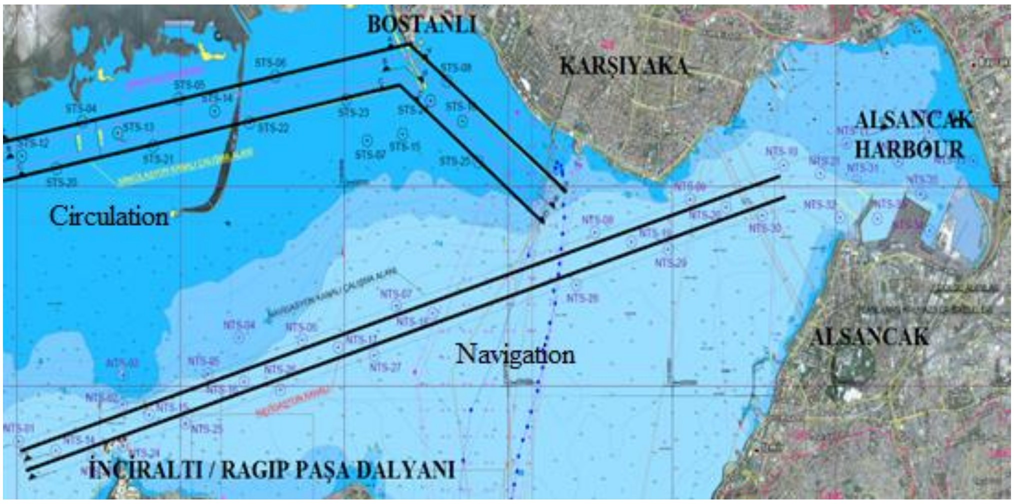

Figure 1.3 Planning navigation and circulation canals in Izmir Bay

1.3 Stabilization

Soils are composed of layers that loads of upper structure are transferred. Soils are also foundations for upper structure loads and could be used as construction material as concrete or steel. Generally, first step for all construction projects is to determine the soil properties correctly and accurately. However; in some cases, soils properties may not be sufficient for required functions such as bearing capacity or slope stability.

Soils are used as construction materials and bearer layers in the history. However, inconvenient circumstances could occur in the field engineering applications due to highly unpredictable nature of soil. In order to overcome this problem soil could be improved, location could be changed or project could be revised (Atanur (1973), Ingiess and Metcalf (1972), Önalp (1983), Özaydın (2008)). The list of soil improving objectives is given below.

- Increase bearing capacity
- Reduce the total settlement and reduce deformations.
- Accelerate the consolidation
- Reduce permeability
- Reduce the potential of liquefaction
- Increase the shear strength of soil
- Reduce the pore water pressure.
- Reduce the environmental effects of swelling and freezing potentials.

Researchers aim to define the potential problems for the problematic soils and also to generate solutions. Various methods could be selected for problematic soils. Firstly; removing the inconvenient soil and replacing it with another soil that has better properties is an option. This option also causes some problems such as excavation-refill, shipping, finding borrow pit, costs and time loss. Secondary option is to change the location of project. In such conditions, other options may be revision of the project or to stabilizing and improving the existing soil. In most cases, the preferable option is to stabilize and improve existing soils due to its low cost amongst others.

It is possible to improve soil properties by using proper stabilization methods. One of the widely used soil improvement method is using chemical additives. In this method, main purposes are increasing the soil strength, reducing the permeability and the swelling potential by strengthen the bonds between soil grains.

Stabilization refers to the process, which involves chemical reactions that reduce the reachability of contaminants to soil particles; so to say, it chemically immobilizes the contaminants and reduces its solubility, hence the contaminants become less mobile. (USEPA, 1993) Generally, the term of '*Stabilization*' represents processes that increase in shear strength, reduction in permeability and settlement properties. Similarly, referring to Turkish Highway Commission Technical Dictionary '*chemical and mechanical processes could be applied in order to improve soil engineering properties*'. In the process of stabilization with additives, required improvement according to environmental and loading conditions should be supplied with a material which is natural and safe obtainable with low cost. This processes commonly used in transportation constructions, hydraulic structures, foundations, and solid waste landfill facilities with binding agents of cement, lime, fly ash, bitumen, chlorite, lignin, sirup, and some chemical compounds (Herin and Mitchell, 1961).

Main purposes of soil stabilization are reducing the plasticity of soil, permeability, compressibility and increasing strength. As the result of the stabilization, bonds between soil grains could be stronger. Improvements in soil could be summarize as reduction or increment in plasticity index due to liquid limit for lime contribution, filling to pores between coarse grains to increase strength of soil for cement contribution, reduction in plasticity index for fly ash contribution. (Wasti, 1990; Savran, 1988).

1.3.1 Stabilization with lime

1.3.1.1 Lime

Lime is an appropriate stabilizer for most cohesive soils. After addition of lime to soil, Ca^{++} and Mg^{++} ions in lime displace with Na+ or K+ ions in soil(cation exchange) and this leads to flocculation in clay particles. The reactivity of lime with soil is predicated on the type of clay mineral present in the soil. Although lime has been effective in the stabilization of a wide range of soils, certain index properties can be used to decide whether lime is an appropriate stabilizer or not. A study in the l970's sponsored by the U. S. Air Force (1976) identified plasticity index and percent fines (-No.200 material) as simple and effective indices to select soils for lime stabilization. According to this study, a soil for lime stabilization should possess at least 25% -No.200 material and with 10% PI value.

Lime is calcium based material that obtained from raw material of lime (limestone) by calcining. Chemical structure of lime contains calcium carbonate ($CaCO_3$) or magnesium carbonate ($MgCO_3$). Apart from these aluminum, silicium, iron, sulphur can be found.

It's required that to have temperature 900°C - 1100°C in a furnace for obtaining lime. This heat supplied from solid, liquid and gas fuels.

The most used lime types in stabilizations are hydrated lime (Ca $(OH)_2$), unhydrated lime (quick lime (CaO)) and limes that contain high amount of calcium (Ca $(OH)_2$.MgO and CaO.MgO). Generally hydrated lime preferred in-situ applications. However; in the last 20 years, use of quick lime significantly increased (U.S. Federal Highway Administration, 2010).

Lime obtained from calcining process is called as unhydrated lime. After hydration of unhydrated lime, quick lime (hydrated lime) can be obtained [Eq 1.1]. There are different utilization areas for these different lime types. Product that generated from this process is unhydrated lime (CaO). It is possible to use this lime directly as commonly used in steel and chemistry industries.

$$CaCO_3+Heat \Rightarrow CaO+CO_2 \tag{1.1}$$

$$CaO+H_2O \Rightarrow Ca(OH)_2+Heat \tag{1.2}$$

Hydrated lime is a hydroxide product from unhydrated lime + water reaction. In order to perform this reaction, a certain amount of water required as 1/3 mass of lime. Product of this reaction is hydrated lime ($Ca(OH)_2$). Interaction between lime particles and water molecules cause a high amount of heat and surface tension. Thus, lime becomes fragmentized.

Area of utilization for lime may be listed as below:

- Raw material component in Portland cement and concrete
- Binder in construction mortars and plasters
- Impurity in iron-steel industry
- Binder in aerated concrete industry
- Purification chemical in environmental surveillance
- pH stabilizator in acidic soils
- Intermediate chemical for obtaining various chemical materials.

- Road and foundation constructions as stabilizator or agent for asphalt surface course

Academic researches prove that properties of soil could be improved by chemical methods. The last option is to stabilize the inconvenient soil with various methods. The most economical and mostly used chemical stabilization method is utilization of lime as additive. This method yields best results with soils that has high amount of clay (Ormsby and Kinter, 1973).

In conclusion; lime is main input for many chemical processes such as absorption, neutralizations, etc. It could remove unwanted materials in short time. Lime has a property of recycling valuable chemicals. It is a nutritional source for organic live. Lastly; lime is a cheap and easy accessible material.

1.3.1.2 Lime stabilization

Lime stabilization could be defined as increasing strength, resistance and durability values of soil by using lime as agent.

Using lime in clayey soils in order to improve its engineering behaviors is a very old method. Lime stabilization method has been proven for road and airway lining. Lime is a stabilization agent mostly for clayey soils because of clay minerals-lime interactions in soil stabilization (Tunç, 2002).

Soil stabilization occurs when sufficient lime added to soil. Table 1.1 suggests lime ratios for a proper stabilization (Ingles and Metcalf, 1972).

Table 1.1 Suggested lime ratios for lime stabilizations (Ingles and Metcalf, 1972)

Soil type	For modification (%)	For stabilization (%)
Rocks with low fissure	2 ~ 3	Not suggested
Fine Graded Clayey Gravels	1 ~ 3	~ 3
Sands	Not suggested	Not suggested
Sandy Clays	Not suggested	~ 5
Silty Clays	1 ~ 3	2 ~ 4
Plastic Clays	1 ~ 3	3 ~ 8
High Plastic Clays	1 ~ 3	3 ~ 10
Organic Soils	Not suggested	Not suggested

Bell (1996), determined that required lime is 1%-3% of dry mass in order to obtain greatest strength values. More amounts of lime than this ratio yields no change in plastic limit however; stress and strength values significantly increased in time.

Other researches about lime stabilization point outs that efficient interval for lime quantity is 2%-8%. Small amounts of lime in terms of mass (2-8%) significantly reduce liquid limit, plasticity indices, maximum dry unit weight and swelling; whereas, increase optimum water content, plastic limit and strength values of soil (Croft, 1967; Abduljauwad, 1995; Basma et al., 1998).

Adding lime to soil cause various chemical reactions. These reactions are cation change, flocculation, cementation and carbonation. Cation change, flocculation and carbonation reactions start immediately after lime contact with soil. Cementation occurs in time and in proper conditions such as water content and temperature. This reaction lasts for years. Cation change consists with cations at surface of clay minerals and cations at surface of lime particles. So that clay minerals approach each other. This reaction causes flocculation. Clay particles flocculate with each other and form larger particles.

Soil-lime reactions and the stabilization process are not only affected by mineralogy but also by the presence of other compounds within the soil such as organics and salts. High salt concentrations may interfere with or affect stabilization. Because high sulfate concentrations can lead to deleterious reactions among the lime, the soil minerals, the sulfate ions and the water in construction or water within the soil. These deleterious reactions can lead to loss of stability and heaving. As a general rule, it is important to consider the presence of sulfate salts by investigating local information. If the total soluble sulfate level is greater than about 0.3% in a ten to one water to soil solution, then additional precautions to guard against sulfate reactions, such as swell tests, may be needed (Little, 1987).

In order to summarize, lime causes three main chemical reactions in soil: Cation change and flocculation; cementation; carbonation.

1.3.1.2.1 Cation exchange and flocculation. Cation exchange and flocculation take place in all fine-grained soils that treated with lime. These reactions start when lime contact with soil. In Figure 1.4 cation change and flocculation reactions are shown.

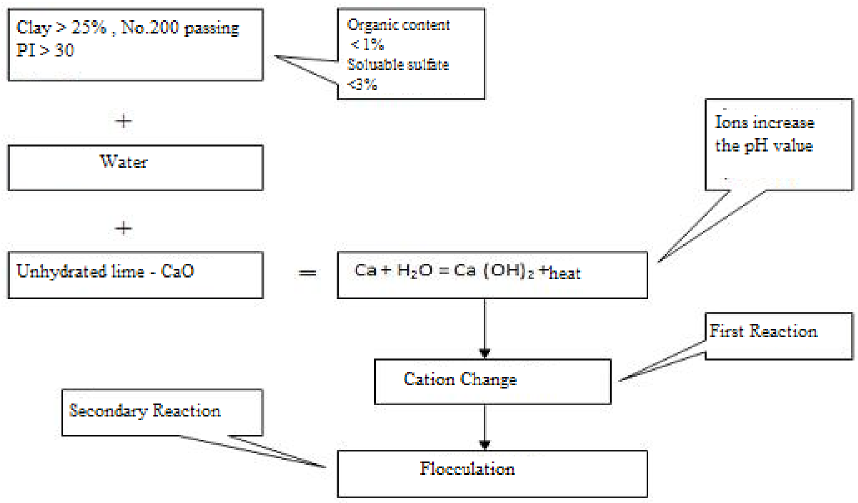

Figure 1.4 Cation change and flocculation reactions

Cations in clay minerals could be sorted by its displacement property: Na+ < K+ < Mg++ < Ca++ (Grim,1953). Cations with high valence exchange with low valence cations. After lime contacts with soil Ca^{++} ion of lime substitutes with low valence cations of soil. This action cause clay particle to come closer and flocculation occurs.

Cation change includes cementation reactions between fine clay particles and coarse clay particles. Cation change is the main reason for change in plasticity characteristics of soil (Al-Rawas et al., 2002).

If more than sufficient amount of lime is used, cement components can be flocculated and cause extra strength (Al-Rawas and et al., 2002).

1.3.1.2.2 Cementation. Cementation reaction could be defined as; production of calcium-silicate and calcium-aluminate or calcium-silicate-aluminate by the chemical reactions. The reactions occur between calcium in lime and silica and alumina in soil. Generated cement components have the properties of high strength and low volume changes (Terrel et al., 1979).

Minerals that compose cement components in lime reactions defined as pozzolana. Types and quantity of pozzolana and reaction amount with lime differs by soils. Pozzolanic reactions occur in stabilized soil between lime, water, silica and alumina. Silicate and aluminate, calcium silicate and calcium aluminate gels formed in the consequence of this reaction. Main pozzolanic reactions are given below.

$$Ca(OH)_2 \rightarrow Ca^{++} + 2\,(OH)^- \; Ca^{++} + OH^- + SiO_2 \rightarrow CSH \qquad (1.3)$$

$$Ca^{++} + 2\,(OH)^- \; Ca^{++} + OH^- + Al_2O_3 \rightarrow CSH \qquad (1.4)$$

In soil-lime reactions insufficient amount of pozzolanic components could be generated. In these cases, fly ash could be added in order to obtain sufficient pozzolanic components.

Addition of sufficient amount of lime increases the pH value of soil-lime mixture approximately up to 12.4. This value is acceptable for natural soils. Solubility of silica and aluminate increases at pH 12.4. Hence, if soil-lime mixture supplies sufficient water, calcium, pH values; pozzolanic reactions lasts for years (Little, 1987). Structural changes of soil in consequence of pozzolanic reactions are shown in Figure 1.5.

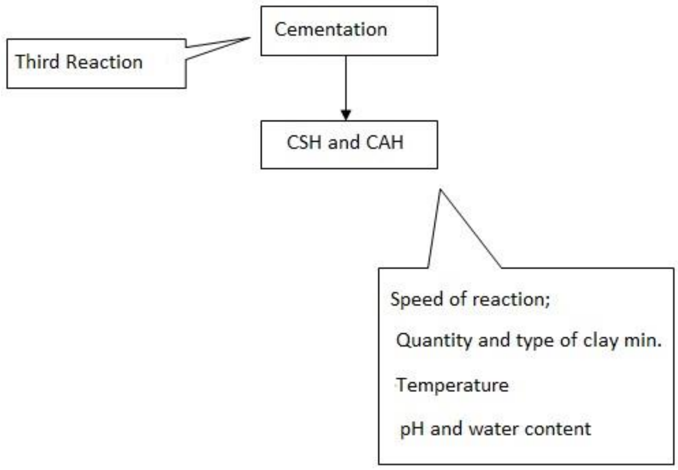

Figure 1.5 Structural changes of soil in consequence of pozzolanic reactions

Cementation caused by adding lime to soil is a slow reaction. This period is generally longer then Portland cement hydration reaction. Cementation amount is related to mineral type of clay and temperature conditions.

1.3.1.2.3 Carbonation. Carbonation reactions occur by the effect of CO_2 in the air during the lime-soil reactions. Calcium carbonate ($CaCO_3$) is the product generated through the reaction between calcium hydroxide in lime and carbon dioxide in the air. (Herin and Mitchell, 1961).

There are many soil properties that effect soil-lime reactions. These influencing factors are: organic content, sulfate content, mineralogy of clay, pH value of soil, degree of dissociation, natural drainage, presence of carbonate, and content of silica-aluminate. The most influencing factor at soil-lime reaction is organic content and sulfate contents (Dallas, N.L., 1999).

1.3.1.3 Literature work regarding the performance of lime stabilization

Results of lime stabilization could be separated as short and long-term reactions. In the short-term reactions, optimum water content increases, proctor density decreases, plastic limit increases, liquid limit decreases, Proctor curve flattens and CBR values increases. In other words; lime treated soil is compacted in low density than that of untreated soil. In the long-term reactions, CBR values still increases, tension strength, unconfined compression strength and shear strength values, resistance against swelling and shrinkage increases (Croft, 1967; Abduljauwad, 1995). These behaviors have been summarized in Table 1.2.

Table 1.2 Results of Lime Stabilization

In Short term;	**In long term;**
Decrease in proctor densities	Increase in CBR values
Increase in plastic limit	Increase in unconfined compression strength
Decrease in liquid limit	Increase in shear strength
Flatten in proctor curve	Increase in tension strength
Increase in CBR values	Increase in resistance for swelling and shrinkage
	Increase in resistance for freezing

In terms of durability, tests were performed in order to determine continuity of lime contribution in soil. Due to results; if stabilization is not related with carbonation and cementation, then calcium could exchange cation with leaking water (Eades and Grim; 1960).

According to Kennedy (1988), when soil physically changed with silicate hydrate (CSH 1 and 2), silicates does not affect soils permanently. In lime stabilization, soil properties have limited degenerations against environmental conditions. Lime quantity is important for gaining this resistance and lasting long-term reactions.

Kelley (1977) performed extended site research in order to determine the effect of lime stabilization in road construction. In 1940's during world war two, area underneath 4. Command Center which constructed with a rush was stabilized with lime. The reason for using this method was the suitability of lime stabilization technique because of the plasticity index of clayey soils which are ranging between 12 and 50%. Lime stabilization was a new method for these years and lime ratio selected as 2-8% randomly. 25 years later, layers that stabilized with lime was examined and obtained no deterioration or settlement. It's observed that strength of the soils-lime mixtures is significantly increased (Kelley, 1977).

Eades and Grim (1960) performed a research about lime stabilization. They examined 6 samples with different lime ratios and subjected them to unconfined compression tests. They obtained an improvement at unconfined compression strength values with increasing lime ratios around 200%-1000% comparing to untreated samples.

Lime stabilization is not a common method in Turkey. On the other hand; lime stabilization for clayey soils is a followed project for many years by “National Lime Producers Association”. After long researches in Turkey, trial road that 200-meter-long and 7-meter width, stabilized with lime at 2003 in a village called “Yukarı Yurtçu”, Ankara. Data of this trial collected by researchers and reported (Kavak, 2003). After this achievement, other attempts started. At 2004, 360-meter-long divided road stabilized with lime in Ankara.

Kelley (1977) observed that strength parameters are preserved perfectly even after many years in lime stabilized soils. He performed 5 studies in military bases of America. Fort Polk–Louisiana (1951), soil was stabilized with a lime-cement mixture and they obtained 12.6 MPa compression strength that equals to weak value of reinforced concrete value. In Fort Chaffe, Arkansas (1949), soil was stabilized with lime gained 12.8 MPa compressive strength. In Fort Sam Houston, Texas (1953), despite heavy traffic load, lime stabilized soil remains perfectly stable even after 24 years. In Fort Sill, Oklahoma (1949), lime stabilized soil exposed heavy military truck and tank load for 28 years. In Fort Hood, Texas (1953), despite heavy traffic load, lime stabilized soil remains perfectly stable even after 24 years.

McCallister and Petry (1990) examined stabilized clayey soils in Texas. In their research, they obtained that lime quantities were insufficient. They also observed that sufficient amount of lime supplies optimum benefits.

Eades et al. (1960), Thompson (1968) performed Atterberg limit tests on lime treated soils and obtained that plasticity index of these soils decreased and soil became more applicable. This reaction varies with mineralogy of soil however; nearly all plastic soils indicated reduced plasticity and increased workability. After stabilization with lime, some soils having 50% or greater plasticity have lost their plasticity and became non-plastic.

Neubauer and Thompson (1972) obtained that soil lime reaction results change in water content and dry unit weight values varying with lime quantity and curing time. As a contribution of lime, dry unit weight of soils was decreased.

Biczysko (1996) obtained that pH value remained over 10 after 16 years in lime stabilized soils.

Perry et al. (1996) indicated that small amount of unhydrated lime treatment (approximately 2.5%) to a soil at 35%-40% water content, causes reduction in water content and increment in wet CBR value from 1.5% to 30%.

1.3.2 Stabilization with cement

1.3.2.1 Cement

Cement stabilization is a conventional method and commonly used in transportation constructions especially airway areas. It’s also known that cement stabilization is an effective method.

Cement is a binder with high content of silica that binds mineral particles (sand, gravel, brick etc.) which main raw materials are gypsum chalk and clay. Cement combines with pore water in grained materials. First, it became paste and then this paste hardens, gains strength and finally form a solid structure (Özışık, 2000).

Chain reaction between cement and water constitutes strong binds between soil particles. First part of cement-soil reaction is known as hydration. Secondary part of this reaction is structural change of clay minerals and existing amorphous material. This leads to a new binder effect. The most common cement types are composite Portland cement, sulphate resisting cement, cement with clinker and cement with additive. In general; there are three main factors that affect strength: aggregate, cement paste and adherence.

Portland cement is the most widespread cement type at the present time. There are five types of Portland cement according to American Standards. In Table 1.3, areas of utilizations and components properties are given (Akman, 1992).

Table 1.3 Types of Portland cement (Akman, 1992)

Type	Component Properties	Hydration heat in 72 hours cal/gr	Area of Utilization
I	No limitation	68	Non-Specific works
II	$C_3A<\%8$ $C_3A+C_3S<\%58$	-	Works with weak sulphate effect
III	$C_3A<\%15$ C_3S high content	83	Works require high Strength
IV	$C_3A<\%7$ $C_3S\%35$ $C_2S>\%40$	47	Works require low hydration heat
V	$C_3A<\%5$		Sulphate Res.Cement

Portland cement with additive may be obtained by adding pozzolana in grinding process at the time of normal Portland cement production process. Pozzolanas increase strength and chemical resistance by combining $Ca(OH)_2$ which is generated in hydration of Portland cement.

Cement could be used with water to obtain grout or paste. Also, it could be used with water and aggregate (sand and gravel) in order to obtain concrete and mortar. Cement and water mixtures can be used in grouting, injection, foundation reinforcement and impermeable partition productions. It’s not recommended to use only cement because of shrinkage cracks and economic reasons.

The main reasons for use of Portland cement in soil stabilization are workability, high strength and cost effectiveness. Soil type and water/cement ratio should be noticed in cement usage. Minority and excessiveness of water significantly effects compressive strength. For example; a water/cement ratio greater than 1.0 could cause excessiveness and low strength. Contrary to this, low water/cement ratios could cause harder injection, low workability however higher strength values.

Some additives could be used for improving geotechnical properties except for strength on condition that limited contents. However, the main purpose for using clay with cement is to reduce permeability. Hence cement-clay mixture is the best injection material to overcome leakage problems. Setting period of cement could be shorten by adding calcium chlorite or sodium silicate. Liquid limit, grain size of clay and clay content in mixture is extremely important for such stabilizations (Domone, 1994).

1.3.2.2 Cement stabilization

Cement includes required pozzolanic materials which is mandatory for silicate stabilization (Özaydın, 2008). Therefore, it is effective for non-clayey soils; in other words, for containing no pozzolanic material. Cement binds soil grains as in concrete production. Diversely to concrete, using very low amounts of cement is common in soil stabilizations (i.e. 5%- 15%). Soil-Cement mixtures could be defined as concrete with low strength. Similar to concrete, strength values depend on cement ratio and time. Strength and resistance (against moisture and heat change) values should be obtained by performing experiments in cement stabilized soils. Mechanism of soil-cement reaction is shown at Figure 1.6.

Cement stabilization could be applied for both sandy and clayey soils. Cement stabilizations begins when mixing pulverized soil and cement. This method is effective in soils which is not in liquid state, homogeneous and dense. Liquid limit is decreased, plastic limit and workability is increased when cement added to soil. If liquid limit is lower than 45-50% and plasticity indices lower than 25% then this method is very effective. Strength contribution of cement is related to cure time as lime.

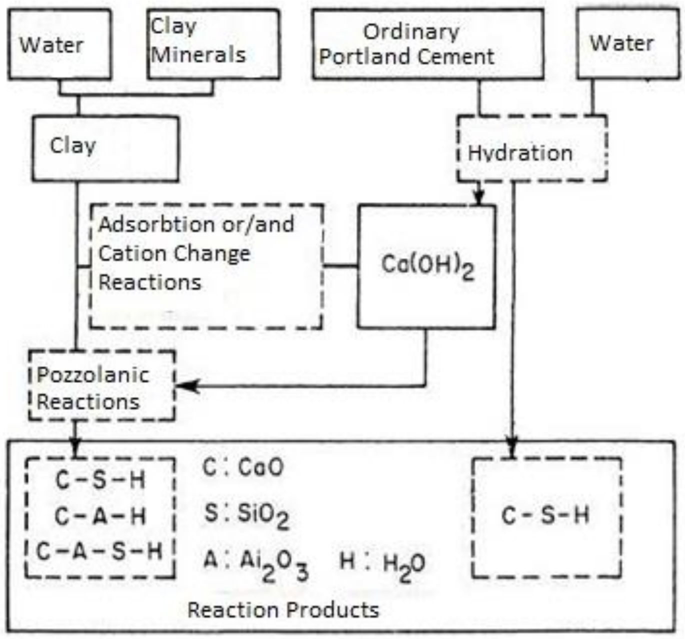

Figure 1.6 Mechanism of soil-cement reaction

Cement stabilization should be applied in specific conditions if used for durability and strength. These are; having maximum 25% passing No.200 sieve and having unconfined compression strength value at least 17.5 kg/cm^2 (7 days cured and with CBR mold). Proper cement ratio should be selected between 5%-15% of dry weight. There should be at least 3 samples with cement ratio under and over of selected ratio. Ideally 5 samples with cement should be subjected into unconfined compression test and durability tests in order to decide minimum cement ratio. Samples should be prepared at optimum water content with same compression level. Samples should be cured before testing.

Generally, cement stabilization steps contain adding cement that 5-15% of dry mass, proper mixing, compacting and testing except pure cohesive and organic soils. Cement binds soil grains with each other. Compaction should be applied to cement added and properly mixed soil. Water in the mixture should be sufficient for setting of cement as well. If soil contains fine grains, water content should be a little higher then optimum content. Cement-soil mixtures should be cured with water similar to concrete. Fly ash or other additives could be added to soil in order to reduce cement quantity for economical purposes (Uzuner, 1990).

1.3.2.3 Literature work regarding the performance of cement stabilization

In this section laboratory studies conducted by different researchers are summarized and presented related to soil stabilization using cement.

Haeri et al. (2005) performed a study about cement stabilization for sandy, gravely alluvial soil in Tahran. Grain size distribution, density and cement contents were selected as control factors. Consolidated undrained triaxial compression test were conducted on samples. Prepared samples having 100mm diameter and 200mm height contained 1.5%, 3%, 4.5%, 6%, 9% Portland cement. Samples were prepared at optimum water content with two different densities. Samples cured for 28 days. As a result; untreated soils occurred plastic failure, soils with cement occurred diagonal failure similar to stiff soils. Increase in cement ratio and density results in an increase in strength. Samples treated with lime compared with samples treated with same content of cement and obtained not significant difference in lower contents. However, increase in additive contents increase the difference between lime and cement. Cement contribution was higher in higher contents of additives.

Asgari et. al. (2003) performed tests for soil from Tahran. He conducted drained and undrained triaxial tests on treated and untreated soil samples. Diagonal and plastic failures were clearly observed as in study of Haeri et.al. (2005).

In this thesis, studied materials contain a large amount of marine water (i.e. 200%). The salinity and the amount of this water involve two different negative effects. It should be noted that re-using these materials without dewatering the high-water content of them in embankments is inappropriate. In practice, the water contents of the materials generally used in this area are not greater than 20%. The high salinity of marine water has a negative effect on mechanical strength increment of cement-based materials, as shown in studies (Kamon, 1989). That phenomenon was observed in a preliminary study when the materials were dried at 105ºC and then mixed with water and 8% amount of dry weight of materials with Portland cement (Kamali et al., 2005). The mechanical characteristics obtained were very low because of the presence of salt. In fact, the observation on the tested cylinders using an environmental scanning electronic microscope highlighted the presence of a white product. The elementary analysis of this material showed that it is composed of Na and Cl elements; that corresponds to salt. Usually, salt has a cubic form. The less common form obtained on the samples is probably due to the presence of organic matter. To conclude presence of high water content and salt simultaneously cause failure in stabilization in terms of strength parameters.

1.4 Experimental part of the study

In this study, methods of soil stabilizations and solidification, importance of reusing dredged materials are examined. Quantities and types of soil agents are also mentioned. Test procedures explained in materials and methods section. All the test results given and correlated with previous researches that related to this subject in results and discussion section.

As the experimental part of this study, soil samples were taken from Izmir Bay, were treated with different chemical additives with different proportions in order to obtain strength values for the possible use of the dredge material as a raw material for geotechnical construction purposes. Sieve analysis, hydrometer tests and Atterberg limits tests were performed for the classification of the dredge material. Specific gravity tests and organic content determination were also performed. pH value of several soil binder mixtures was determined in order to decide the optimum binder ratio. Standard Proctor tests were performed to understand the compaction behavior of dredge materials. Lastly, unconfined compression tests were performed for the verification of the determination of the optimum binder content for the stabilization process. Different curing periods are also applied in order to investigate the influence of short and long-term reactions of gains of soil in terms of stabilization. Total 5 curing periods selected. For short termed 7,14,21 days, for long termed 28 and 42 days were decided in this study. For each UCS two samples were conducted to test and results were averaged.

CHAPTER TWO
MATERIALS AND METHODS

2.1 Site description and sampling

Dredging operations, performed in İzmir Bay, required a storage site. The excavated dredged marine sediments are stored in a quite large area in the North of the Izmir Gulf (Figure 2.1, 2.2).

Figure 2.1 Dredging site, Alsancak Harbor, İzmir

Figure 2.2 Store site, Çiğli, İzmir

Dredged materials were distributed uniformly probably by heavy equipment and left under sunlight without any protection. Studied soil samples used in this study were taken from this site with a shovel and transferred to laboratory in sacks. From Figure

2.3 and 2.4 site conditions and sampling can be observed. Materials could be defined as air-dried due to the site conditions explained above. After soil samples were taken to the laboratory, samples are grinded and homogenized.

Figure 2.3 Soil sampling (Personal archive, 2018)

Figure 2.4 Site conditions (Personal archive, 2018)

2.2. Characterization of dredged sediments

2.2.1 Particle size distribution

Sieve analysis was performed in accordance with ASTM D422. This method covers the quantitative determination of the distribution of particles in soils. The distribution of particle sizes larger than 0.075 mm (retained on the No.200 sieve) was determined. Distribution of smaller particles less than 0.075 mm can be obtained by using hydrometer analysis. Sieves with different opening size were used (No.4, No.10, No.16, No.20, No.40, No.60, No.80, No.140, No.200, respectively) for sieve analysis and followed by hydrometer test due to standards to determine particle size distribution. It is obtained that the sediments are fine grained.

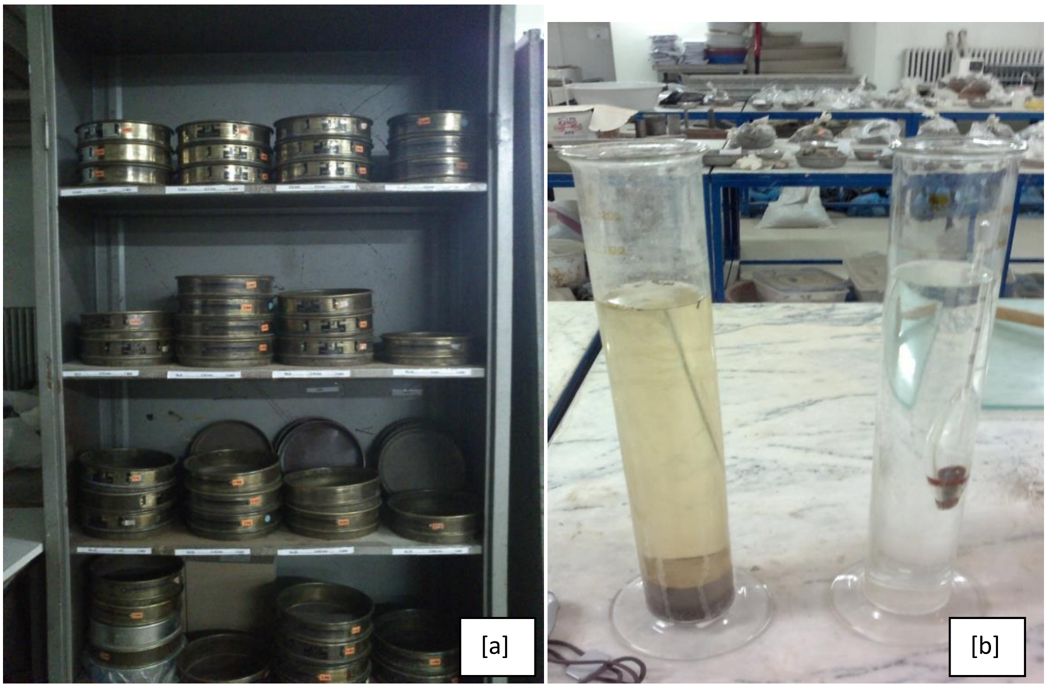

Figure 2.5 Particle size distribution test materials (sieves[a] and hydrometer[b])(Personal archive, 2018)

2.2.2 Specific gravity determination

Specific gravity can be defined as a ratio of mass of soil grains in specific volume divided by mass of water in same volume. In order to obtain this ratio specific gravity test was performed with water pycnometer in accordance with ASTM D854.

Figure 2.6 Specific gravity test material (water pycnometer) (Personal archive, 2018)

2.2.3 Organic content determination

In this study, quantity of organic matter was determined with ignition method in accordance with ASTM D2974. In this standard; organic matter was subjected to water content test. Generally, organic content is determined by igniting oven dried sample in a furnace as shown in Figure 2.7 at 440 ± 40°C. According to Edil, (1997) organic soils may be classified in four groups.

1) When the organic content is less than 5 %, organic content has negligible effect on soil behavior so that this soil is considered as inorganic.

2) When the organic content remains between 6 to 20 %, these soils' behaviors are slightly influenced by organic content. However, they still behave like inorganic soil. (Example: organic clay)

3) When the organic contents exist between 21 to 74 %, organic particles have control on the behavior of soil rather than soil properties. Nevertheless, soil mechanics is applicable. (Example: clayey organic soil)

4) When the organic content is over 75 %, conventional soil mechanics cannot be applied specially at lower stress levels. (Example: peat)

According to results, the dredged sediments can be considered as moderately organic.

Figure 2.7 Furnace that used in organic content determination (Personal archive, 2018)

2.2.4 Dry unit weight determination

Maximum dry unit weight and optimum water content were determined in order to investigate the compaction characteristics of the dredged material. These parameters give some prior knowledge about compaction behavior of soils. Compaction can be defined as compression of soil under an applied dynamic stress. Compaction causes reduction in void ratio. Thus, soil becomes compacted. Dry unit weight of soil reaches a maximum point at a certain water content which is called optimum water content and dry unit weight at the highest compaction level is called as maximum dry unit weight. Standard Proctor test was performed in accordance with ASTM D698 in order to determine the compaction behavior of dredged soil.

Figure 2.8 Standard Proctor test mold (Personal archive, 2018)

2.2.5 Atterberg limits determination

Atterberg limits are defined as changes in physical properties of fine grained soils based on water content. Existing water in the soil determines the consistency behavior of material. Liquid and plastic limits tests were conducted on dredged soil in accordance with ASTM D4318. Casagrande and fall cone methods were conducted for liquid limit determination. Plasticity index, defined as the difference between the liquid and the plastic limits was calculated after plastic limit test which were conducted with rolling method. In Figure 2.9 both limit test apparatuses are shown.

Liquid limit of a soil, containing substantial amounts of organic matter, decreases dramatically when the soil is oven-dried (ASTM D4318). Dredged material used in this study contains organic matter, therefore; Atterberg limit tests are repeated with oven-dried and air-dried samples in order to compare the results.

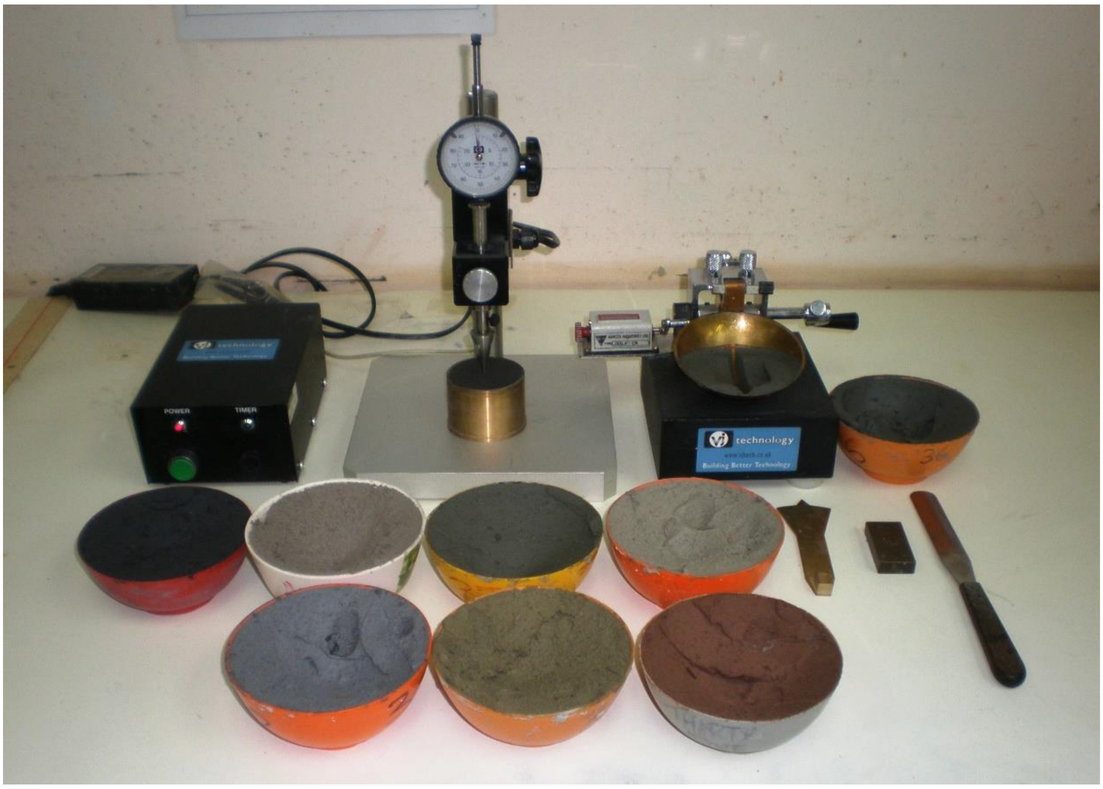

Figure 2.9 Representative Atterberg limits test materials (Personal archive, 2018)

2.3 Binders used in stabilization

Two different binders with various ratio were used in this study in order to investigate improvements on soil samples. Lime, cement and lime + cement was used as agents for stabilization. High calcium quicklime (CaO) was used as lime and it was supplied from Turkish Lime Producers Association. CEM II 42.5R Ordinary Portland Cement was used as cement and it is obtained from local contraction material markets.

2.4 Initial estimation for optimum lime percentage

According to ASTM pH test is performed to estimate the soil-lime proportion requirement for soil stabilization. The optimum lime content is approximated with the Eades and Grim (1966) pH procedure as explained in ASTM D6276. This test identifies the lime content needed to satisfy soil-lime reactions and provide the amount of calcium and residual high pH required to provide the necessary conditions for the long-term pozzolanic reactions. These reactions are necessary for stabilization and durability. The lime content obtained by the pH test is an indicator of optimum lime percentage. However, the result should be verified by strength tests. Accumet XL-500 type bench-top pH meter (Figure 2.10) was used for this purpose in order the define optimum lime content for stabilization. For this test, five samples with different lime percentages (containing no lime, 2% lime, 4% lime, 6% lime, 8% lime) were prepared.

Addition of lime to soil affects its physical properties such as Atterberg limits. In order to investigate this effect, Atterberg limit tests were repeated until obtaining a graph that liquid limit and plastic limits became stable due to lime addition. According to this graph liquid and plastic limit values should approach and become stable in a certain percentage of lime.

After evaluation of these two approaches (can be defined as physical and chemical) to determine optimum lime content, proper lime quantities were estimated.

Figure 2.10 pH test apparatus (Personal archive, 2018)

2.5 Strength tests after stabilization

Strength of the soil can be defined as the maximum shear stress that the soil can sustain before failure. Classical theory of soil mechanics states simple elastic and rigid plastic models that lead to site investigation effort on searching the stiffness and the strength of the soil (Muir Wood, 1990; Atkinson, 2007). The unconfined compressive strength (UCS) is the key parameter for the current design practice. Shear strength and modulus of elasticity can be correlated with reasonable accuracy to the compressive strength.

The unconfined compression test is the most popular method of soil shear testing because it is one of the fastest and cheapest methods of measuring undrained shear strength of soils. The method is conducted primarily on saturated, cohesive soils recovered from thin-walled sampling tubes. In this manner, by assuming saturation as 1, the unconfined compression test is an unconsodalited undrained (UU) test in which σ_3 is equal to zero. To obey no drainage condition in UU test the unconfined compression test must be performed in a rather short period. The unconfined compression test is inappropriate for dry sands or crumbly clays because the materials would fall apart in the absence of lateral confinement. Also, no drainage condition cannot be fulfilled in sands or fissured clays. Unconfined compression test apparatus was shown in Figure 2.11(a)

Figure 2.11 Unconfined comp. test apparatus (a), preparing molds (b) (Personal archive, 2018)

According to ASTM D2166 standards samples should be prepared as L/D ratio is 2. In this study; all mold sizes prepared as length=90 mm (L) and diameter=45 mm (D).

2.6 Preparing molds, placing of laboratory specimens

Before preparing molds for required test, curing type and the method of placing the soil mixture into the mold should be decided first. In this study, compaction has not been applied to the mixtures. For the curing of the specimens, prepared samples have been submerged into the sea water tanks. For this propose, sea water was gathered from Karşıyaka Shore (Figure 2.12).

Figure 2.12 Sampling sea water from Karşıyaka Shore (Personal archive, 2018)

For the preparation of the test samples, PVC tubes were cut as proper measurements to supply required L/D ratio. Then, filter papers were cut for inner surface of mold and pasted with sticky tape. It was important to make these papers taller than the mold in order to make sure that the excess part of the filter paper has contact to the curing salty water in the curing tank. After that, another filter paper was cut in rounded to make it bottom of mold, wrapped by piece of nylon and fasten by an O-ring. (Figure 2.11(b)) The soil specimen preparation procedure implemented in this study was firstly introduced by Önal and Sarıavcı in 2014.

Placing and removing without disturbing the soil mixtures was very important. Therefore, premium care has been spent in order to not disturb the cured specimens while removing from their molds. In laboratory, conditions such as temperature, moisture content, mixing method, and pre-loading must represent the conditions at site. In this study, it is aimed to apply stabilization after dredging from sea. The stabilized dredged material planned to use immediately in possible re-use area like pavement fill, embankments or road construction. Therefore, soil samples are prepared and mixed with binding agents in liquid state in order to represent similar conditions to simulate this scenario. So that, samples have been prepared at water content corresponding to their liquid limit and no compaction have been performed after mixing the soil in situ. Therefore, soil placed to molds by tapping. In order to supply these conditions, all samples placed as 3 layers and 30 times tapped and 15 times stabbed in each layer (Figure 2.13).

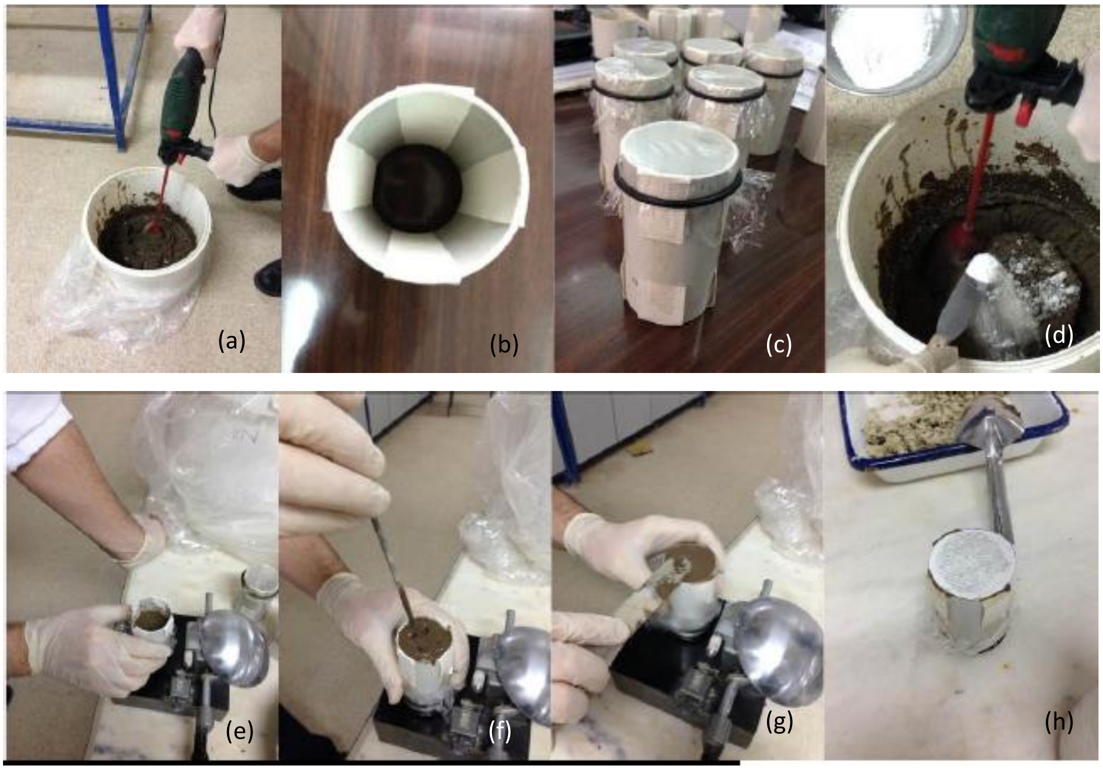

Figure 2.13 Preparation and placing of specimens (Önal and Sarıavcı,2014)

2.7 Procedures

After examinations of lime contents used in literature, mixture designs were determined. Furthermore, addition of cement is investigated in scope of this study. Quantities of 6% and 9% binding agent in terms of dry soil mass were determined for stabilization.

Total 80 soil mixtures were prepared in the same conditions with different additive contents and curing periods. After that, the specimens were subjected to unconfined compression test. List of mixture designs and curing periods are given in Table 2.1.

Table 2.1 All mixture designs and curing periods

List of mixture designs
6 % lime
9 % lime
3% lime + 3% cement
4.5% lime + 4.5 % cement
4 % lime + 2 % cement
2 % lime + 4 % cement
6 % lime + 3 % cement
3 % lime + 6 % cement

Curing Periods of all mixtures
7 days (1 week)
14 days (2 weeks)
21 days (3 weeks)
28 days (4 weeks)
42 days (6 weeks)

Eight different mixture designs and five different curing periods were selected. For each combination, two samples were prepared and average unconfined compression strength (UCS) values were calculated. Additives given in percentages are in terms of dry soil mass.

In the sample preparation procedure, water content of the dry fine grained dredged soil was increased up to liquid limit with tap water. Then, additives were added and soil was mixed with a drill in order to prepare a homogenous soil mixture. Mixing soil with binding agents is shown in Figure 2.14.

Figure 2.14 Soil mixing (Personal archive, 2018)

It must be noted that adding lime to the mixture reduced its water content immediately and mixing process become difficult. After mixing process was completed, soil mixture was protected against moisture loss and left for mellowing process approximately one hour.

Soil mixtures were placed to molds as described above and all samples were submerged in sea water tanks. Surcharge loads were placed at top of all molds in order to prevent any swelling during curing (Figure 2.15).

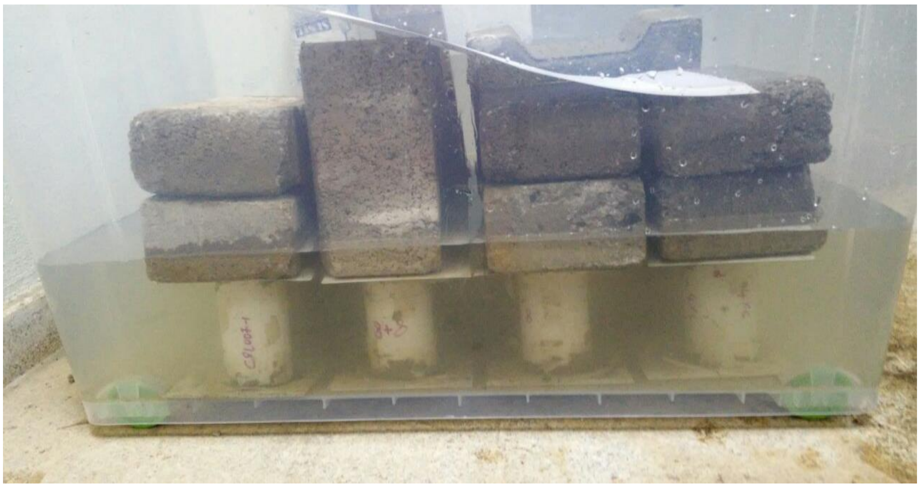

Figure 2.15 Sea water tanks (Personal archive, 2018)

Soil mixtures that completed its curing period, were removed from molds carefully due to the fact that any disturbance on samples could affect the unconfined compression test results. It was decided to use a spiral grinder tool for removing the samples in order to avoid applying any excess force which may disturb the sample (Figure 2.16). Lastly, all soil mixtures were subjected to unconfined compression test within 15 minutes in order to avoid any decrease in water contents of the samples.

Figure 2.16 Removing soil mixture from mold (Personal archive, 2018)

CHAPTER THREE
RESULTS AND DISCUSSION

3.1 Particle size distribution results

After particle size distribution tests (i.e. sieve analysis and hydrometer), grain size distribution curve for dredged sediments were obtained. At this curve; grain size smaller than 0.075 mm indicates fine grained soil particles. The grain size of particles smaller than 0.002 mm indicates clay particles. The grain size of particles between 0.075 mm and 0.002 mm indicate silt particles. After evaluation of grain size distribution curve, dredged material classified as fine grained, due to the fact that the ratio of soil particles which are smaller than 0.075 mm is 99%. Evaluation of hydrometer analysis revealed that, diameter fine grain material was mostly between 0.075 mm and 0.002 mm. In other words, dredged materials consist of silt. Grain size distribution curve of dredged material given in Figure 3.1.

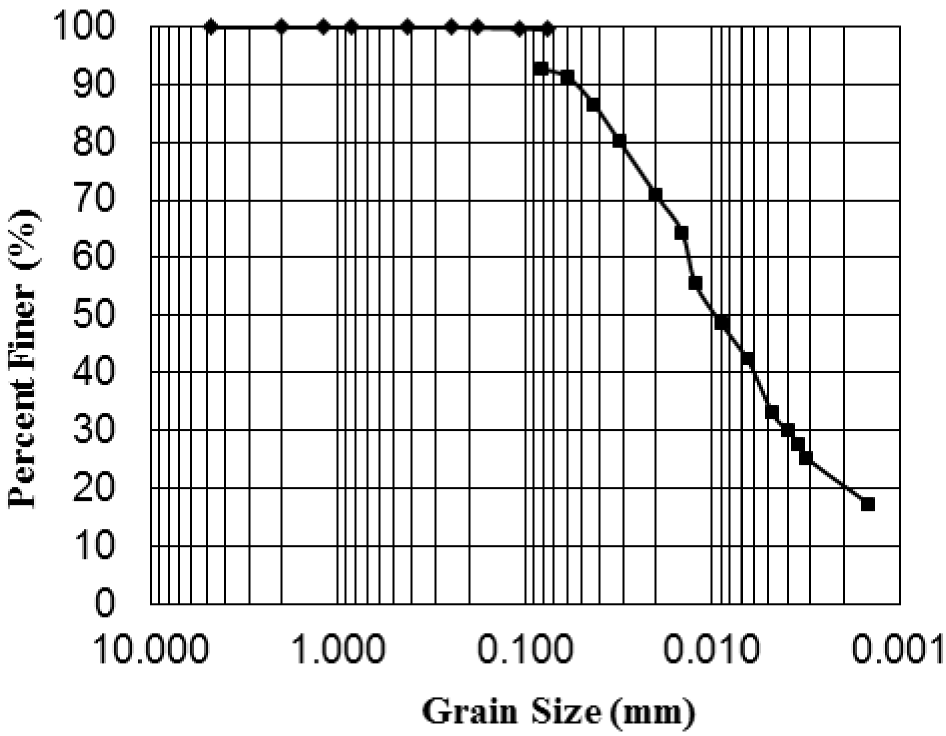

Figure 3.1 Grain size distribution curve for dredged material

3.2 Organic content test results

The organic content of dredged material was determined as 7.8%. This means soil is moderately organic and behavior of soil slightly influenced by organic materials (Edil, 1997).

3.3 Atterberg test results

Consistency limit tests were repeated for both oven-dry and air-dry cases and two different approaches for liquid limit test were conducted so that four different results were obtained. These results were shown on Table 3.1 and plotted on the plasticity chart which is given in Figure 3.2. Slightly varying results have been observed on the consistency limits. For oven-dry case due to the fact that a part of organic matter in the soil has been burnt out. The consistency limits of the dredge material have been determined by averaging the liquid limit values and averaging the plastic limit values, respectively. In this study, liquid limit, plastic limit and plasticity index have been determined as 51.1, 28.6 and 22.6% respectively. The soil has been classified as highly plastic as liquid limit was greater than 50%. According to USCS soil classification, the soil is under the A-line, which means soil particles are silt. This result was also supported by hydrometer analysis. After examination of these classification tests, dredge material was classified as highly plastic organic silt, (**OH)**.

Table 3.1 Consistency limit test results

Drying ; Method	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
Oven-dry ; Cassagrande	49.5	27.2	22.3
Air-dry ; Cassagrande	48.0	29.9	18.1
Oven-dry ; Fall Cone	51.0	27.2	23.8
Air-dry ; Fall Cone	56.0	29.9	26.1

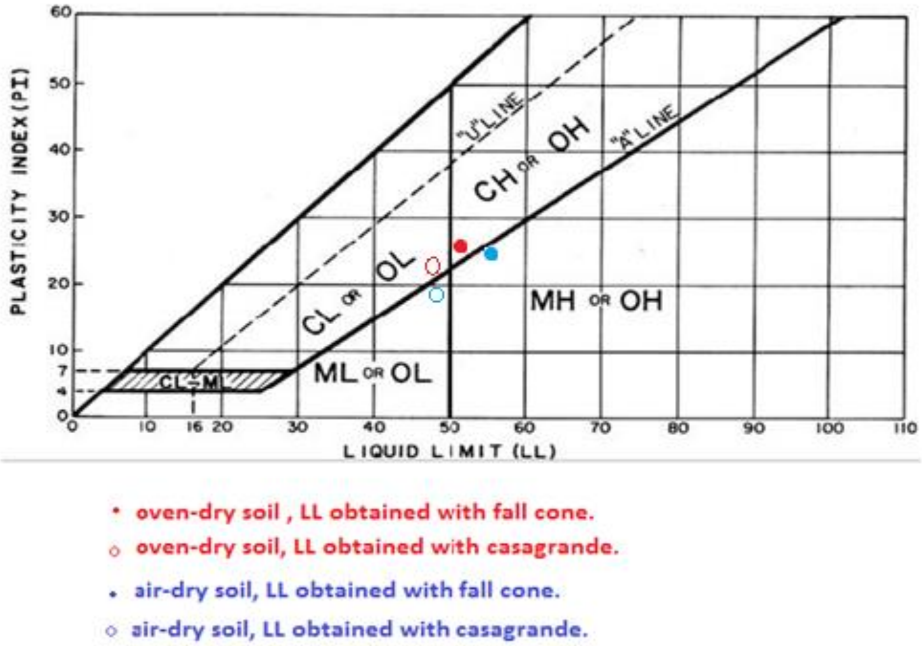

Figure 3.2 Plasticity chart

3.4 Standard Proctor test results

Maximum dry unit weight and optimum water content of dredged material were obtained from standard Proctor test. These values were determined as 14.9 kN/m^3 and 25%, respectively (Figure 3.3). The peak point of the curve in Figure 3.3, refers the fact that soil particles are in strict condition, which yields highest strength and lowest permeability. Although the specimen preparation procedure implemented in this study does not require compaction, compaction parameters were determined using standard Proctor energy in order to have an idea on the compaction characteristic of dredged material.

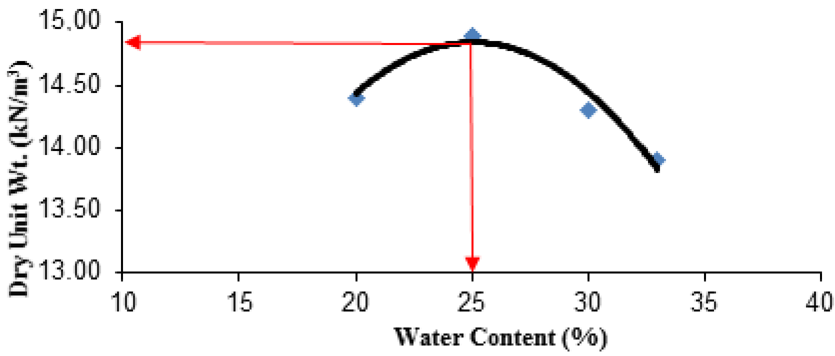

Figure 3.3 Standard Proctor test results

3.5 Summary of the obtained soil parameters

Soil parameters obtained from the characterization tests conducted on samples were summarized below. (Table 3.2)

Table 3.2 Obtained soil parameters

Parameters	***Value***
Fine Content (%)	99
Specific Gravity	2.757
Organic Content (%)	7.8
Optimum Water Content (%)	25
Max. Dry Unit Weight (kN/m^3)	14.9
Liquid Limit	51.1
Plastic Limit	28.6
Plasticity Index	22.6
Raw pH	8.1

3.6 Initial estimation for optimum lime percentage

3.6.1 PH test results

The optimum lime content is approximated with the Eades and Grim (1966) pH procedure in accordance with ASTM D6276. Adding unhydrated lime into soil results increasing in pH value. However, pH/lime content curve should be parallel to lime content axis in a certain point. This point represents the lime content needed to satisfy soil-lime chemical reactions. After the evaluation of pH test for 2%, 4%, 6%, 8% lime contents, it was obtained that at least 3% lime satisfies the procedures for long term stabilization. (Figure 3.4) The proportion for proper lime content is only an estimation obtained from figure. In this regard, the actual performance may only be determined by conducting strength tests.

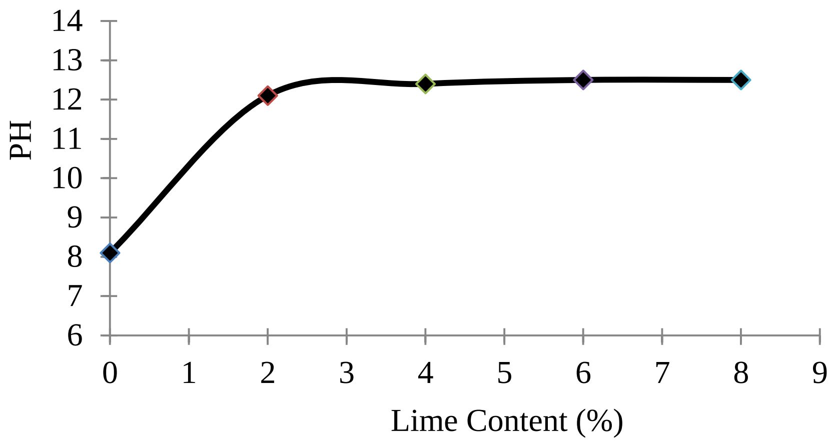

Figure 3.4 pH test results for soil-lime mixtures

3.6.2 Atterberg limit change test results

When lime is added in to soil, its physical properties also changes. This change was expected and observed as decrease in liquid limit and increase in plastic limit. As these two parameters are approaching to each other with increasing lime content and became stable after a certain lime ratio, which represents optimum lime content for long term soil stabilization.

From Atterberg limits tests, it was obtained that at least 6% lime is required for stabilization. (Figure 3.5) Different optimum lime ratios obtained from Atterberg limit change test and pH test. This result can be explained by definitions of two terms such as stabilization and solidification. In other words; chemically 3% lime, psychically 6% lime is required for optimum improvement. Minimum of 6% additive selected for dredged material for stabilization after the evaluation of this results.

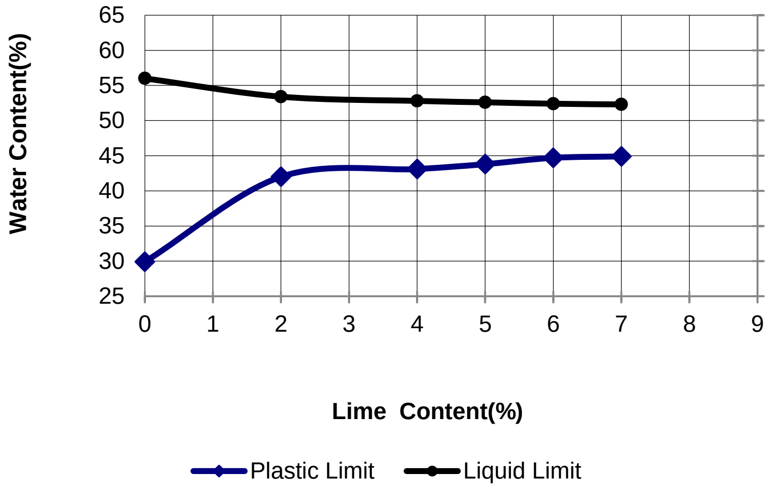

Figure 3.5 Atterberg limits of different soil-lime proportions

3.7 Unconfined compression test results

After all mixtures were cured, unconfined compression test was performed on 80 mixtures. Two samples were prepared for each combination and curing period and then these two UCS results were averaged for the evaluations. Peak values were obtained from stress/strain graphs. For each mixture, prepared samples were conducted to unconfined compression test and average strength values of these samples have been calculated (Table 3.3). Figure 3.8 were prepared for the evaluation of the 6% total binder ratio. This figure contains 6%lime, (3%lime+3%cemet), (4%lime+2%cement) and (2%lime+4%cement). In this manner, the ratio of the ingredients of the chemical binder was examined in terms of stabilization. Also, the same comparison was made for 9% total binder in Figure 3.9. Three different graphs were prepared in order to compare strength gains related to quantity and type of binders with the base of curing time.

After UCS tests, the water contents of the specimens have been determined. These values are also summarized in Table 3.4.

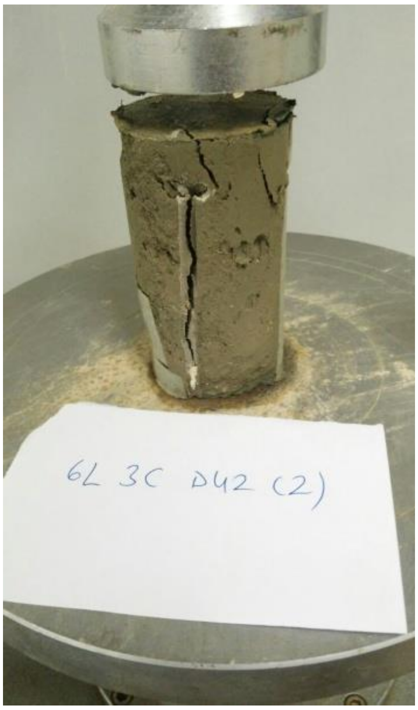

Figure 3.6 Unconfined compression test sample (Personal archive, 2018)

Table 3.3 Unconfined compression test results (kg/cm^2)

Mixture	6% Lime		9%Lime		3% Lime +3% Cement		4.5% Lime + 4.5% Cement	
7 days (1 week)	0.31	0.35	0.46	0.44	0.28	0.29	0.49	0.50
Average	0.33		0.45		0.29		0.50	
14 days (2 weeks)	0.80	0.71	0.96	0.99	0.59	0.50	0.75	0.96
Average	0.76		0.98		0.55		0.85	
21 days (3 weeks)	0.68	1.39	1.85	0.96	0.48	0.53	1.15	1.14
Average	1.03		1.41		0.51		1.15	
28 days (4 weeks)	1.66	2.19	3.65	4.53	0.78	1.06	1.46	1.64
Average	1.93		4.09		0.92		1.55	
42 days (6 weeks)	3.10	2.67	6.16	5.35	1.62	1.57	2.85	2.85
Average	2.89		5.76		1.59		2.85	
Mixture	4%Lime + 2% Cement		2%Lime + 4% Cement		6%Lime + 3% Cement		3%Lime + 6% Cement	
7 days (1 week)	0.53	0.49	0.64	0.61	0.70	0.86	0.88	1.07
Average	0.51		0.62		0.78		0.98	
14 days (2 weeks)	0.61	0.56	0.73	0.89	0.95	1.26	1.53	1.99
Average	0.59		0.81		1.11		1.76	
21 days (3 weeks)	0.68	0.88	0.87	1.06	2.47	2.36	3.37	2.73
Average	0.78		0.96		2.41		3.05	
28 days (4 weeks)	1.51	1.59	1.08	1.33	2.67	3.87	3.12	3.38
Average	1.55		1.21		3.27		3.25	
42 days (6 weeks)	1.76	1.47	1.31	1.19	4.44	4.51	3.99	3.16
Average	1.62		1.25		4.47		3.57	

Table 3.4 Water contents after UCS test (%)

Mixture	6% Lime		9%Lime		3% Lime +3% Cement		4.5% Lime + 4.5% Cement	
7 days (1 week)	68.69	68.45	68.80	70.01	69.32	69.53	65.33	64.57
Average	68.57		69.41		69.43		64.95	
14 days (2 weeks)	67.21	66.37	61.87	61.75	71.13	71.19	65.66	66.53
Average	66.79		61.81		71.16		66.10	
21 days (3 weeks)	69.14	70.35	59.93	60.66	70.91	72.25	64.37	64.62
Average	69.75		60.30		71.58		64.50	
28 days (4 weeks)	66.34	67.15	60.71	59.21	68.72	70.66	65.48	64.45
Average	66.75		59.96		69.69		64.97	
42 days (6 weeks)	66.40	66.36	59.51	60.40	70.76	71.08	69.03	70.09
Average	66.38		59.96		70.92		69.56	
Mixture	4%Lime + 2% Cement		2%Lime + 4% Cement		6%Lime + 3% Cement		3%Lime + 6% Cement	
7 days (1 week)	70.00	67.60	69.11	67.24	70.82	68.91	71.63	68.40
Average	68.80		68.18		69.87		70.02	
14 days (2 weeks)	69.11	67.24	70.82	68.91	71.16	69.41	69.71	69.41
Average	68.18		69.87		70.29		69.56	
21 days (3 weeks)	70.82	68.91	71.63	68.40	69.38	69.87	71.13	69.14
Average	69.87		70.02		69.63		70.14	
28 days (4 weeks)	70.07	69.33	70.14	69.49	70.48	69.94	71.94	69.82

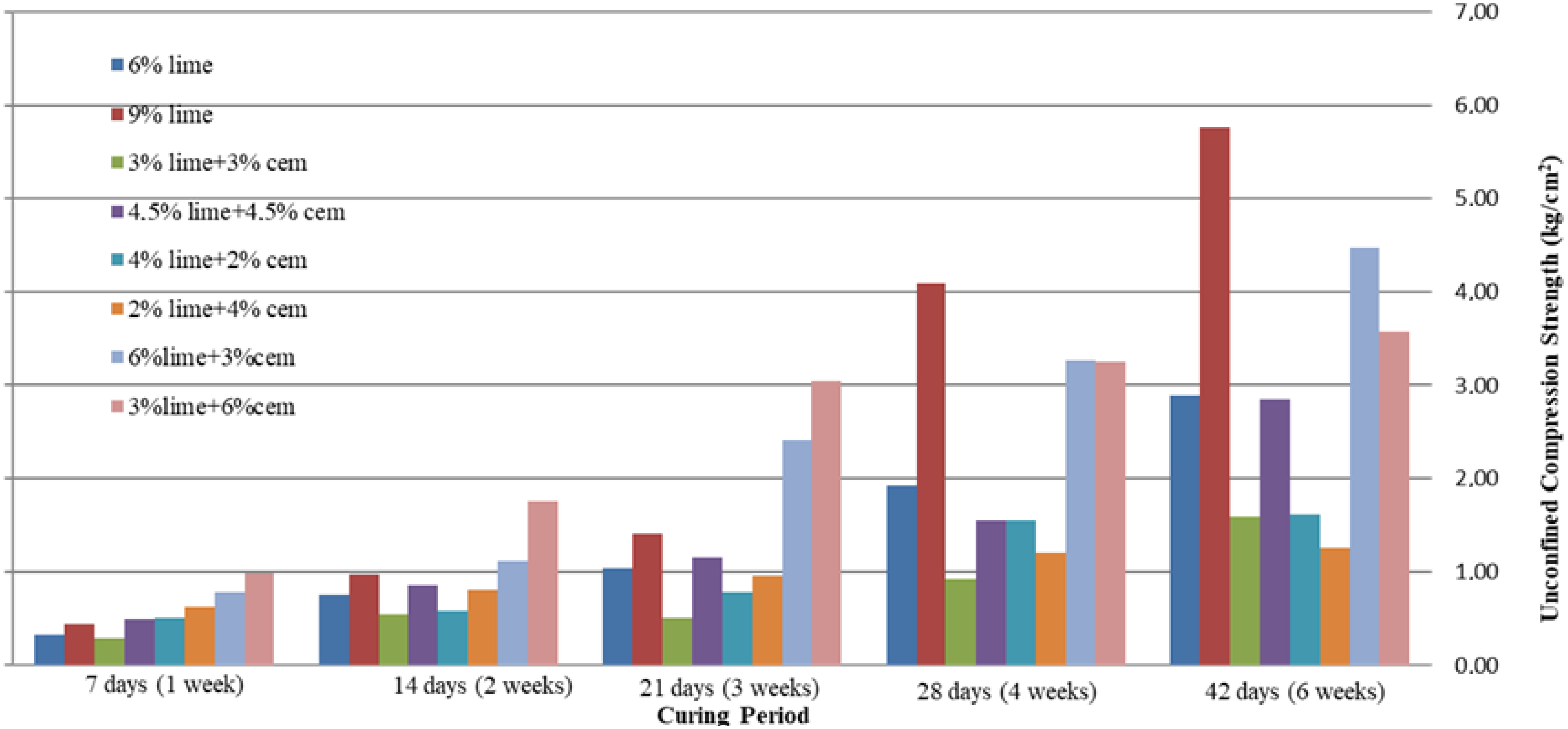

Figure 3.7 All soil mixtures unconfined compression test results

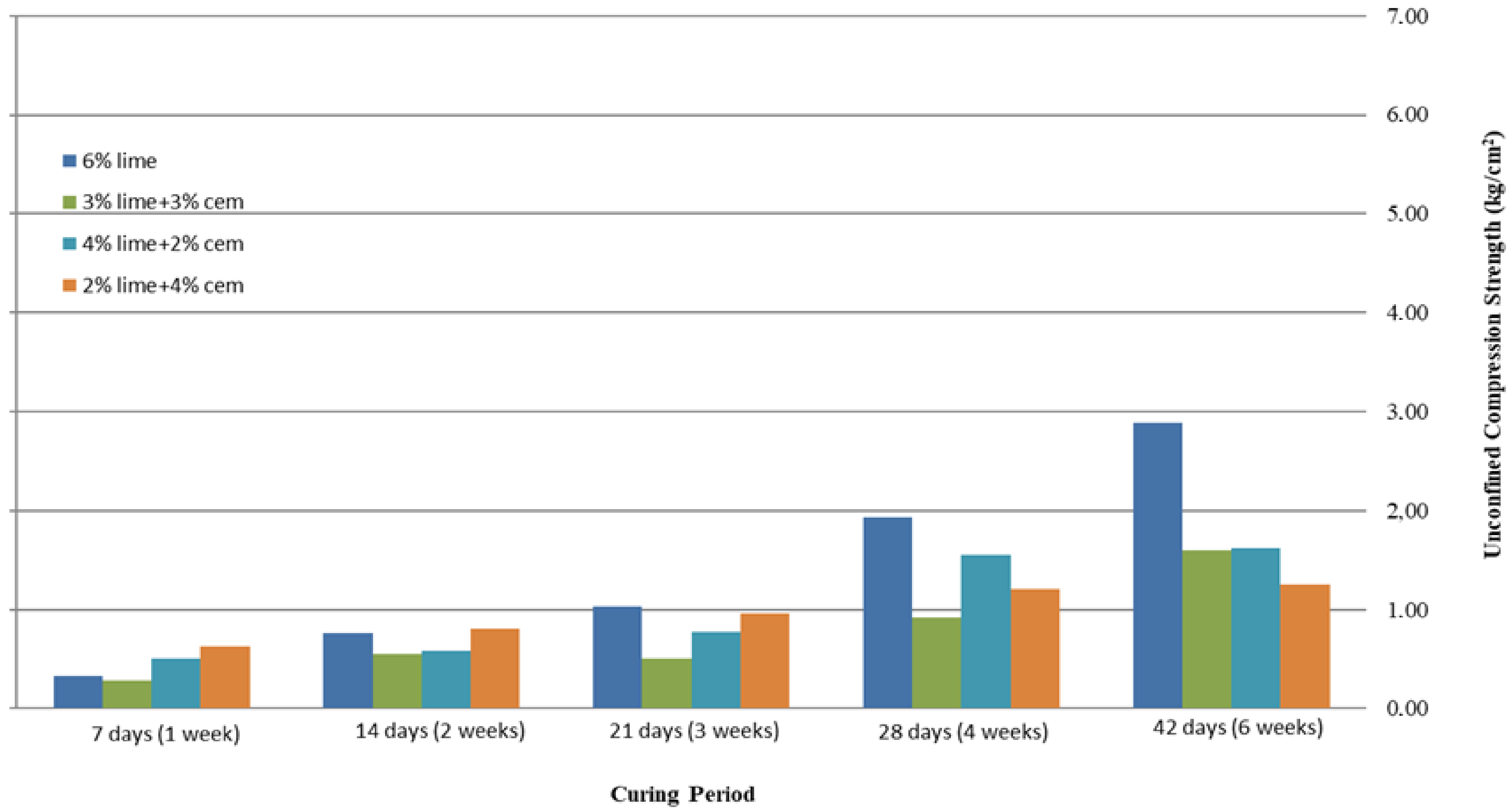

Figure 3.8 Soil mixtures that contain 6% additive

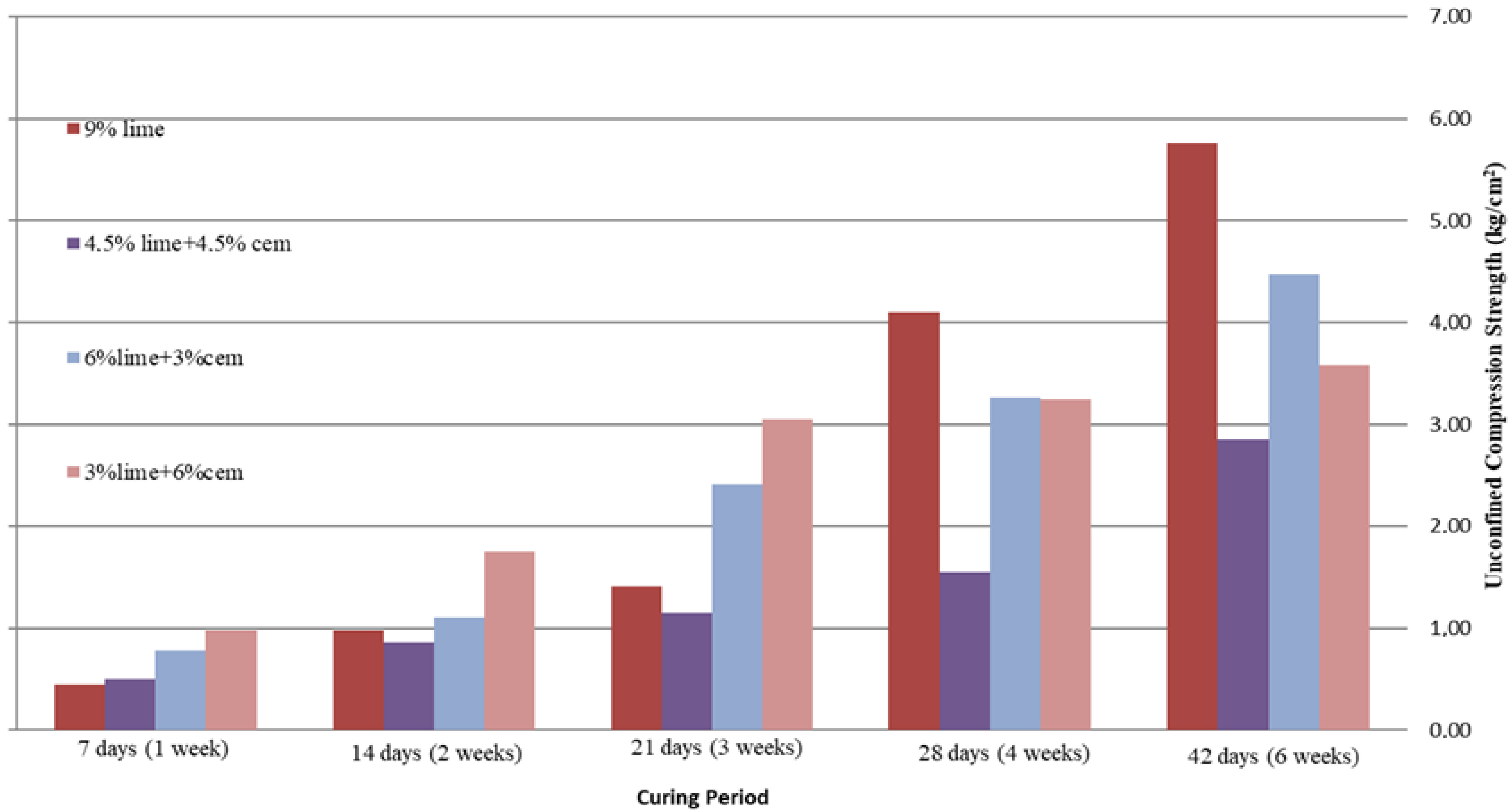

Figure 3.9 Soil mixtures that contain 9% additive

After evaluation of all unconfined compression test, results were interpreted as below.

First and foremost, total additive quantity has a large impact on strength values. Higher strength values were obtained with higher binder contents. Furthermore, when samples with same type of binders but different ratio are considered (i.e. comparing (6%lime) to (9%lime) or (4%lime+2%cement) to (6%lime+3%cement)), increasing binder quantity by 50% yields increasing strength by 180-280% due to different type of binders. Curing period has also large impact on results. Increasing curing time yields increase on unconfined compression strengths. However, this impact varies with type of binders more than quantity.

Maximum and minimum UCS values of samples with same curing time differs with binder type. Considering 7 days curing period UCS values, highest result of 0.98 kg/cm^2 obtained with 3%lime+6%cement mixture. Lowest result of 0.29 kg/cm^2 obtained with 3%lime+3%cement. Similarly considering the 14 days UCS values, highest result of 1.76 kg/cm^2 obtained from 3%lime+6%cement mixture. Lowest result of 0.55 kg/cm^2 obtained with 3%lime+3%cement. For 21 days UCS values, highest result of 3.05 kg/cm^2 obtained with 3%lime+6%cement mixture. Lowest result of 0.51 kg/cm^2 obtained with 3%lime+3%cement. Considering the 28 days UCS values highest result of 4.09 kg/cm^2 obtained with 9%lime mixture. Lowest result of 0.92 kg/cm^2 obtained with 3%lime+3%cement. Similarly, considering 42 days UCS values highest result of 5.76 kg/cm^2 obtained with 9%lime mixture. Lowest result of 1.25 kg/cm^2 obtained with 2%lime+4%cement. All these results are given in graphs in Figure (3.7), (3.8), (3.9). As one can see that, the maximum UCS values were obtained from 3%lime+6%cement mixtures up to 14 days. After 28 days the highest UCS results were obtained from 9% lime mixtures.

By evaluating 6% lime and (6% lime+3% cement), contribution of only 3% cement can be observed. After comparison of these two mixtures, in early times of curing, strength of sample increased by 236% and this contribution decreased to 154% over time. This result shows the early effect of cement. All the unconfined compression strength values increased with all curing times. This result could be explained as increasing quantity of binder, increases the strength. This effect may not be seen if the minimum binder ratios were not been estimated by Eades and Grim (1966) protocol.

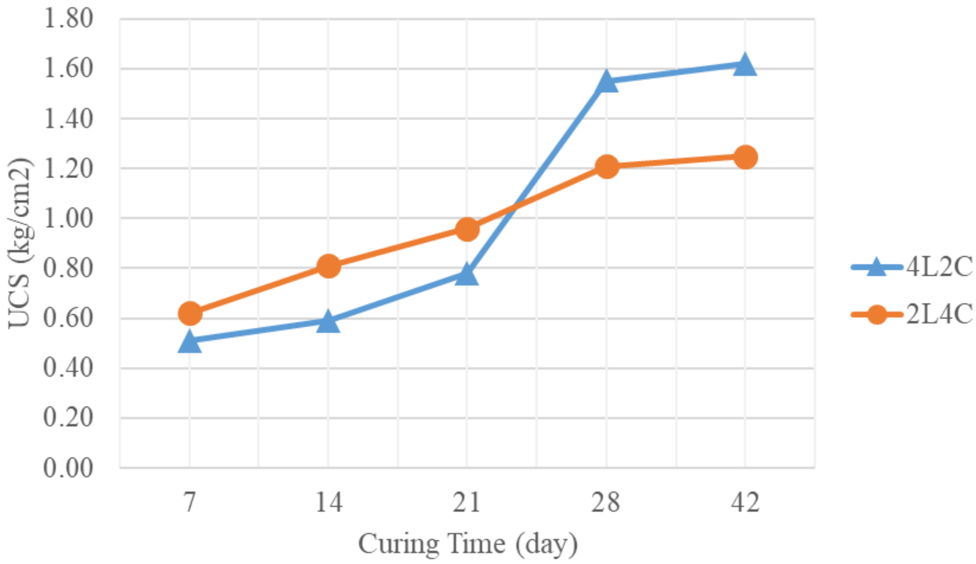

Figure 3.10 Comparing 4%lime+2%cement to 2%lime+4%cement

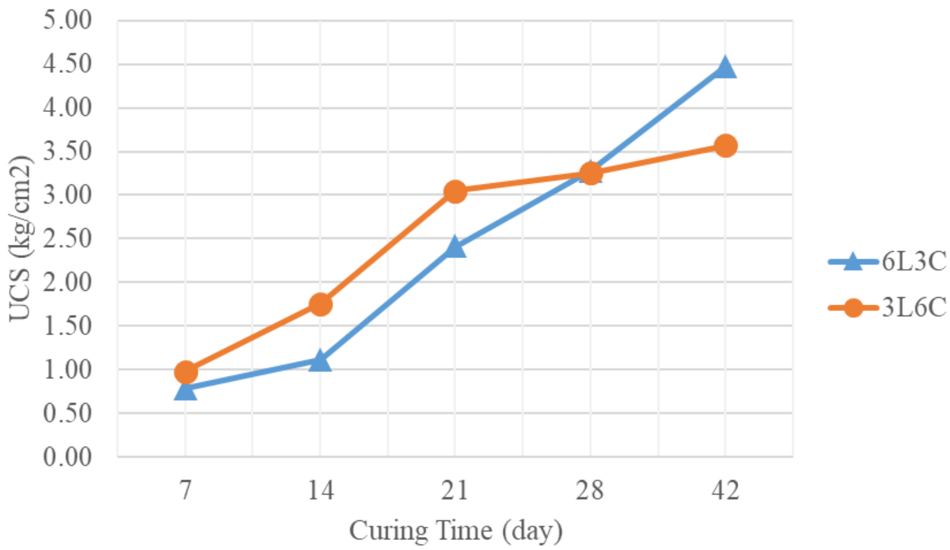

Figure 3.11 Comparing 6%lime+3%cement to 3%lime+6%cement

The evaluation of samples containing equal quantity of binder, but different binder type has been explanatory in terms of early reaction of cement. After comparing the mixtures with each other like (2%lime+4%cement) to (4%lime+2%cement) or

(6%lime+3%cement) to (3%lime+6%cement) consistent results were obtained. At early times of curing (i.e. up to 21 days), cement has increased the strength of the sample more than lime. This may be seen in Figure 3.10 and 3.11 for 6% and 9% total binder ratios respectively. However, this contribute decreased over time and the long time pozzolonic reactions based on lime-soil reactions governed the stabilization after 28 days.

In Figure 3.10 and 3.11, the compared strength gains graphs were intersected between 21, 28 days. Until this point, sample with more cement ratio has developed more unconfined compressive strength than sample with more lime ratio. This shows stabilization of cement was mostly completed in 21-28 days. This result is reasonable when the cementation reactions and its duration considered. After this intersection point, samples with more lime ratio has developed greater UCS values. This shows the long-lasting improvement effect of lime. In other words, lime as a binding agent, has a better improvement on this soil for longer periods.

Lime and cement have had different positive effects on the studied dredged material. When a part of lime content was substituted with cement, it has an effect of increasing in short term results such as 21 days or 28 days. In other words, effect of cement is short termed and decreasingly growing. Likewise, when the lime content evaluated it can be said that lime contributes in long term. Long term results like 42 days are better in samples contain only lime or more lime than others. In other words, effect of lime is long termed and increasingly growing. This behavior of the cement and lime mixtures on stabilization is beneficial in terms of engineering projects. Generally, an immediate increase in strength is expected at the field for sustaining the operations of the construction equipment. The cement ratio is therefore important in order to maintain the early reactions. On the other hand, it is known that lime has a long-term stabilization effect (Kelley, 1977). The literature revealed that lime has an continuous stabilization effect provided that pH of the soil is above 12.4 and enough lime is present for chemical reactions.

Highest results were obtained at maximum curing times and with maximum binder contents as expected. Maximum values are related to lime content and obtained as 5.76

kg/cm^2 in 42 days with 9% lime sample. However, in 21 days highest strength value (3.05 kg/cm^2) obtained from samples with 3%lime+6%cement. For this dredged material, it is better option to use only lime owing to UCS test results and economical reasons. UCS performance of samples with cement is lower than expected. The reason for such result may be attributed to the presence of organic content of the soil the negative effect of salt from sea water on the cementation reactions.

After completing the unconfined compression tests, the sample's water contents were measured. However; no relation observed with additive and curing period changes. All water contents measured in 60% to 70% intervals. As one can see that the initial water contents of the specimens were at liquid limit, normally 51%. The water contents of all specimens were increased during the curing period. The incensements in the water contents of the specimens were originated from the suction of the specimens. In this study the specimens allowed to suck water from the curing tank via filter papers. However, swelling of the specimens were not allowed. The idea behind this was to eliminate the strength gains based on drying. The water content versus UCS relationship was only meaningful for 9% lime mixture.

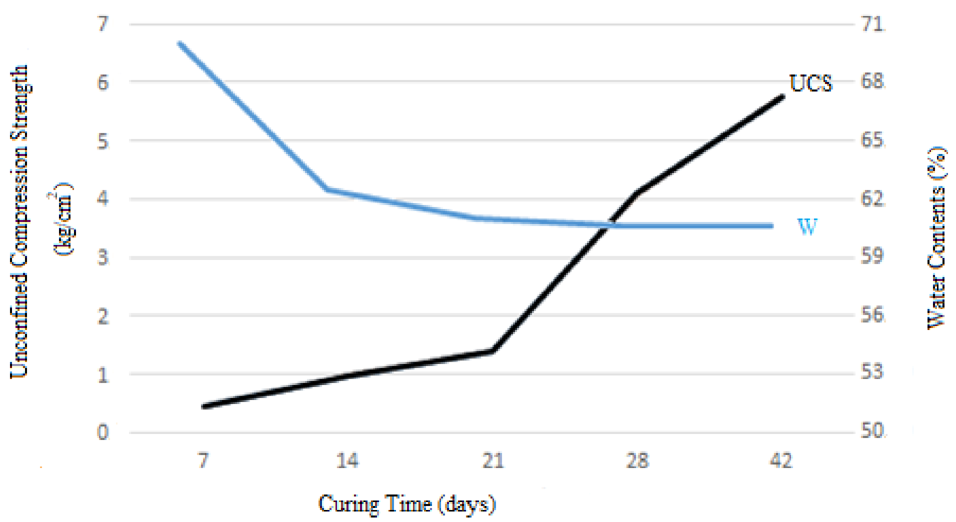

Figure 3.12 UCS and water content change versus curing time for 9% lime

As can be seen from Figure 3.12 the water content was stable after 28 days. The initial water content reduction for 7 to 14 days may be attributed to the hydration of quick lime.

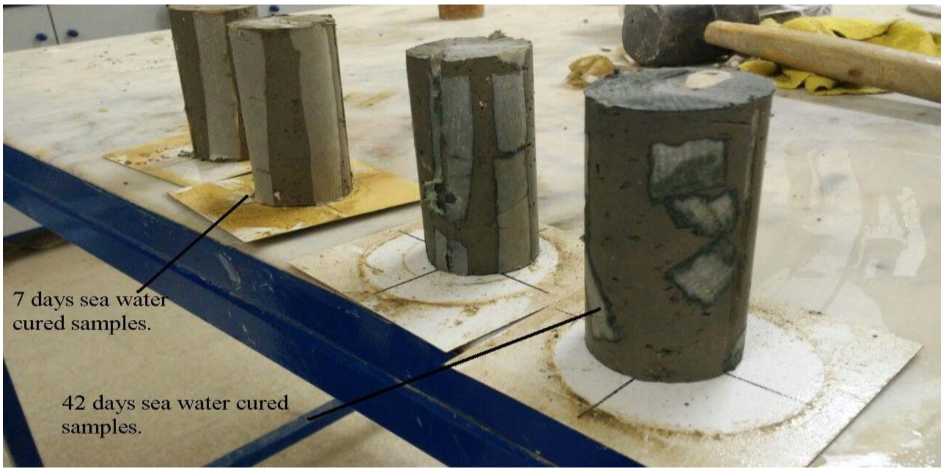

Figure 3.13 Color change in long term sea water curing (Personal archive, 2018)

In this study, the aim was to quantitively evaluate the stabilization of the dredged materials by adding lime only and lime-cement mixtures. Therefore, the curing condition was set as to maintain submerged state stabilization. It is known that at high binder ratios such as 9% and more, the water content of the specimens may be decrease due to the pozzolonic reactions and an artificial strength gain based o suction may be developed. In order to avoid the strength gain based on drying of specimens, the samples were soaked in to the sea water during the curing process. Thus, the pozzolonic reactions were able to develop without drying the specimens. The water contents after the UCS test are shown in Table 3.4.

Color change and bad smell observed in long term sea water cured soil samples. This green color may be attributed the organic matters in sea water. (Figure 3.13)

CHAPTER FOUR
CONCLUSION

Dredged material that excavated from Izmir shore was stabilized by dry mixing method using cement and lime as binding agents. Determination of the proper amount of binder quantity is the main objective of this research. In İzmir, there is not any proper disposal site for 25 million m3 so that excavated dredged material should be used instantly. For this reason, dredged material will not be subjected into any treatment like dewatering or compaction, etc. For this reason, laboratory tests have planned to represent the same conditions. In this manner, in stabilizing process soil mixed with binding agents in liquid state of consistency and stabilized dredged materials submerged into sea water tanks, in order to maintain high water content as it was recently excavated. During the placement of the soil into molds for samples preparations for strength tests, no compaction was applied in order to simulate the site conditions.

In this manner, soil identification tests; Atterberg limits, sieve analysis, hydrometer analysis, standard proctor test, organic matter content, specific gravity test, pH test was performed on dredged material from Izmir. Highly plastic soil which contains moderate amount of organic matter, fine grained material is classified as OH: High plastic organic silt. Unconfined compression test could not be performed to raw material in same water content with treated samples. Because it fell apart without any lateral confinement. It can be said that this material cannot be used in practice without any treatment.

Proper lime content for long term stabilization of dredge material obtained by two methods. Sufficient lime content in terms of chemical and physical property determined by pH and Atterberg limits change tests respectively. After evaluation of results, lime contents selected between 3% and 6% in terms of dry soil mass. Contribution of cement is also investigated. Different binder combinations used to stabilize soil. For this purpose, mixtures prepared with only lime, only cement and with lime and cement together.

Submerging the samples into sea water tanks maintain high water contents and negative effects of sea water in all samples. As a scope of this study its aimed to prepare identical conditions in laboratory like in situ. It is aimed to adjust the water contents between the range of 60%-70% in all samples. Curing periods were selected to investigate for both short and long-term effects of stabilization. 80 samples were subjected to unconfined compression test and their results were compared. Despite negative effects of sea water, significant strength values were observed for all samples. Maximum compressive strength values obtained from 9% lime mixtures in 42 days. However; highest value until 28 days of curing period, maximum compressive strength values obtained from 6% cement + 3% lime mixtures. Mixtures that have more cement ratio than lime ratio have more compressive strength then contains only lime or more lime ratio than cement ratio in short terms. It can be said that effects of cement are short termed. Lime contributed less in short term, greater in long term periods. The reason for this poor mechanical performance of cement-soil mixtures could be attributed to the presence of salt. Color change and bad smell was observed in long term for sea water cured samples. Organic content of sea water and dredged material could be the reason for this result.

Stabilization with cement provides early strength gains and could sustain construction operations. Stabilization with lime provides long lasting and durable improvement with higher strength values. For possible re-use of dredge material, these necessities should be specified.

Considering long term compressive strength values of this study, durability against sea water (considering cement), dewatering effects and the economic cost of lime; it’s clear that 9% unhydrated lime mixture is the best option of this study as an optimum mixture. If any early improvements required in the fieldwork, cement can also be added with lime.

The planned bay transition project of İzmir requires creation of two artificial island between Çiğli and İnciralti. This construction project requires high amount of material to form the islands, which will be constructed on the sea floor. Utilization of the chemically stabilized dredge materials may solve the material resource problem for this project. Also, transportation costs will be very competitive according to the other alternatives. Similarly, in this thesis study, compaction has not applied to the dredged materials and specimens were cured in sea water. As a result of this study, dredged materials may be suggested for the creation of the two islands, provided that, correct chemical stabilization applied to the materials. Also, for the ecological point of view, the reusing of materials and low transportation effort will save large amount of energy.

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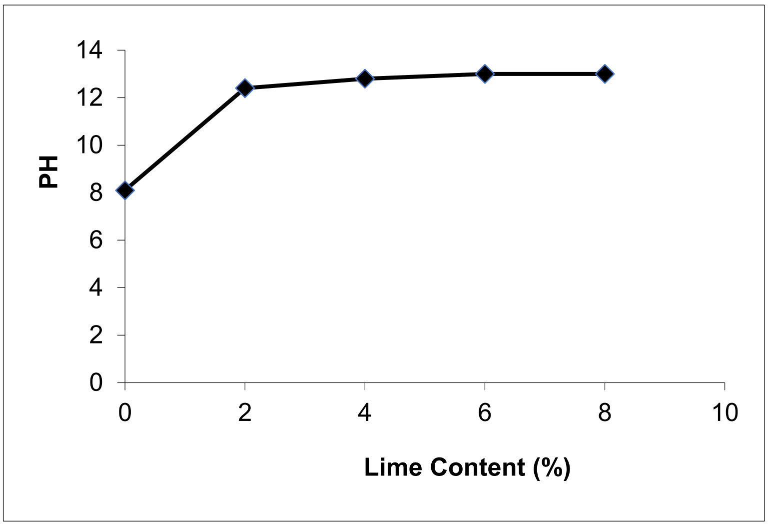
APPENDIX

Specific Gravity Determination

Wt. Of Flask (gr)		164.39
Method of Air Removal		Vacuum
Wt. Of Dry Soil (gr)	A	50.00
Wt. Of Flask+Water+Soil (gr)	B	692.72
Temperature ºC		22.10
Wt. Of Flask+Water (gr)	C	661.39
Can no		k11
Wt. Of Dry Soil+Can (gr)		418.55
Wt. Of Can (gr)		369.40
Wt. Of Dry Soil (gr)		49.15
Specific Gravity	Gs=A/(A+C-B)	2.758
Temp. Coeff.	K	0.99954
Specific Gravity	G=Gs*K	**2.757**

Soil-Lime Propotion Determination with Ph

Lime Cont	0	2	4	6	8
PH	8.1	12.4	12.8	13	13



<u>Hydrometer Analysis</u>

İşin Adı ***(Job Name) :*** İzmir bay dredge material

Özgül Ağırlık (Gs) : 2.7
(Specigic Gravity)

Menüsküs Düzeltmesi : 0.5
(Meniscus Correction)

Başlangıç Kuru Ağırlık (gr) : 50
(Initial Dry Weight)

No.200'den geçen % : 99
(%Passing from No.200)

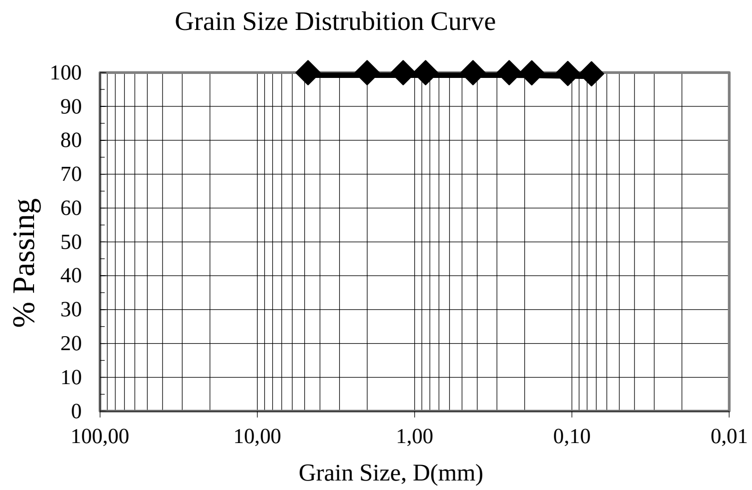
Dinamik Viskozite (g.sn/cm^2): 0.00000954
(Dynamic Viscosity, μ)

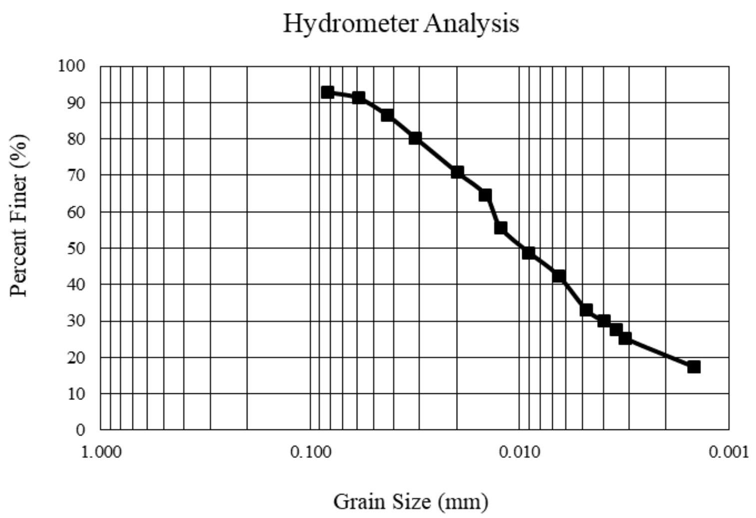
Geçen Zaman	Hidrometre Okuması	Menüsküs Düzeltmesi	Sıcaklık	R-Rw	Nt	L	$(L/t)^{0.5}$	$(18*\mu/(Gs-Gw))^{0.5}$	D	Nt'
Time (t) (min)	*Hydrometer Reading (R)*	*Meniscus Correction (Rw)*	*Temperature (°C)*							
0.25	29.00	-0.50	27.00	29.50	93.7	10.1	6.356	0.0013	0.0825	92.8
0.5	28.50	-0.50	27.00	29.00	92.1	10.3	4.539	0.0013	0.0589	91.2
1	27.00	-0.50	27.00	27.50	87.4	10.9	3.302	0.0013	0.0428	86.5
2	25.00	-0.50	27.00	25.50	81.0	11.7	2.419	0.0013	0.0314	80.2
5	22.00	-0.50	27.00	22.50	71.5	11.7	1.530	0.0013	0.0198	70.8
10	20.00	-0.50	27.00	20.50	65.1	12.5	1.118	0.0013	0.0145	64.5
15	17.20	-0.50	27.00	17.70	56.2	13.6	0.953	0.0013	0.0124	55.7
30	15.00	-0.50	27.00	15.50	49.2	14.5	0.695	0.0013	0.0090	48.7
60	13.00	-0.50	27.00	13.50	42.9	15.3	0.505	0.0013	0.0066	42.5
120	10.00	-0.50	27.30	10.50	33.4	16.5	0.371	0.0013	0.0048	33.0
180	9.00	-0.50	27.30	9.50	30.2	16.9	0.306	0.0013	0.0040	29.9
240	8.30	-0.50	27.50	8.80	28.0	17.2	0.268	0.0013	0.0035	27.7
300	7.50	-0.50	27.50	8.00	25.4	17.5	0.242	0.0013	0.0031	25.2
1440	5.00	-0.50	27.50	5.50	17.5	18.5	0.113	0.0013	0.0015	17.3

Sieve Analysis

Initial Dry Weight (gr): **556.65**

Sieve	***Opening (mm)***	***Weight Retained***	***Cum. Wt. retained (gr)***	***% retained***	***% passing***
No.4	4.75	0.00	0.00	0.00	**100.00**
No.10	2.00	0.06	0.06	0.01	**99.99**
No.16	1.18	0.01	0.07	0.01	**99.99**
No.20	0.85	0.01	0.08	0.01	**99.99**
No.40	0.43	0.01	0.09	0.02	**99.98**
No.60	0.25	0.02	0.11	0.02	**99.98**
No.80	0.18	0.25	0.36	0.06	**99.94**
No.140	0.11	0.98	1.34	0.24	**99.76**
No.200	0.08	0.62	1.96	0.35	**99.65**
Pan	-	0.20	2.16	0.39	**99.61**





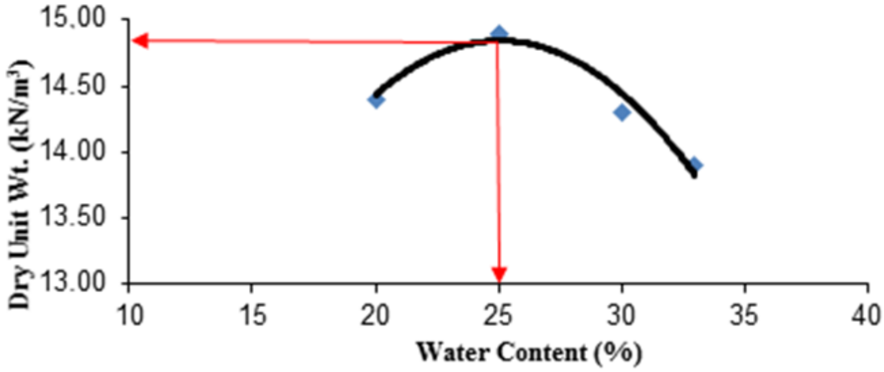
Standard Proctor Compaction Test

Vol.of Mold(cm3): 946.93

Test No	1	2	3	4	5
Wt. Of Mold(gr)	4280	4280	4280	4291	4291
Wt. Of Compacted Soil	1635	1762	1760	1756	1730
Wt. of soil + mold (gr)	5915	6042	6040	6047	6021
Wet Unit Weight(g_n)	1.73	1.86	1.86	1.85	1.83
Water Content (w)	0.20	0.25	0.30	0.33	0.37
Dry Unit Weight. (g_k)	14.42	14.88	14.29	13.90	13.34

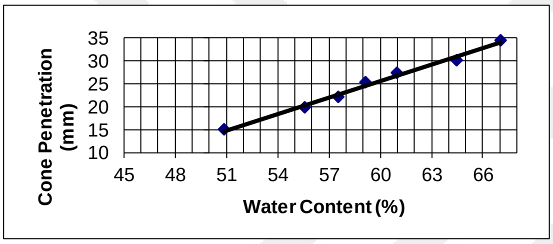
Determination of Water Content

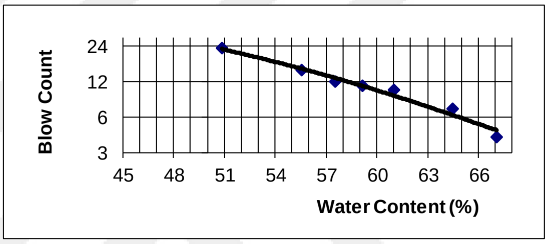
Can No	6	27	f11	B-1	4
Wt. of can + wet soil (gr)	724.28	798.83	27.50	94.78	107.74
Wt. of can + dry soil (gr)	621.61	672.87	23.29	73.37	81.14
Wt. of water(gr)	102.67	125.96	4.21	21.41	26.60
Wt. of can (gr)	102.20	170.02	9.30	9.28	9.13
Wt. Of Dry Soil(gr)	519.41	502.85	13.99	64.09	72.01
Water Content(w%)	19.77	25.05	30.09	33.41	36.94



Liquid Limit Determination for Air-Dry Soil

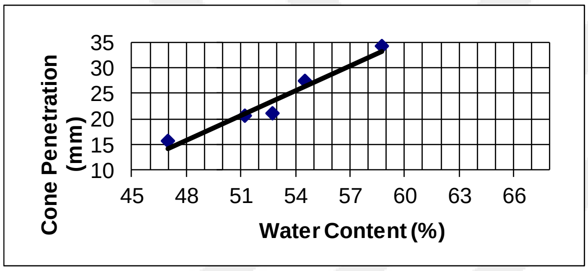
Liquid Limit Determination	1	2	3	4	5	6	7	Plastic Limit Det. 1	Plastic Limit Det. 2
Can No	F11	9	29	k109	k110	k111	12	157	90
Wt. Of wet soil+can(gr)	14.65	24.36	17.31	15.45	19.02	12.68	15.25	20.66	20.89
Wt. Of dry soil+can(gr)	12.46	18.26	13.83	12.77	15.14	11.16	13.01	20.24	20.39
Wt. Of Moisture(gr)	2.19	6.10	3.48	2.68	3.88	1.52	2.24	0.4	0.5
Wt. Of Can(gr)	8.87	8.80	8.64	8.24	8.40	8.17	8.98	18.84	18.71
Wt. Dry Soil(gr)	3.59	9.46	5.19	4.53	6.74	2.99	4.03	1.4	1.7
Water Content(%)	61.0	64.5	67.1	59.2	57.6	50.8	55.6	30.0	29.8
Cone Penatration (mm)	27.5	30.0	34.5	25.3	22.0	15.0	19.8		
Blow count	10.0	7.0	4.0	11.0	12.0	23.0	15.0		

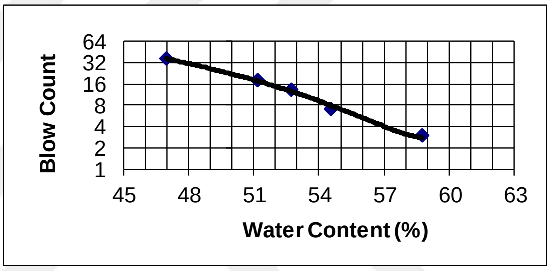




Liquid Limit Determination for Oven-Dry Soil

Liquid Limit Determination	1	2	3	4	5	Plastic Limit Det. 1	Plastic Limit Det. 2
Can No	F11	9	29	k109	k110	157	90
Wt. Of wet soil+can(gr)	30.04	20.69	27.78	19.00	14.62	20.13	20.42
Wt. Of dry soil+can(gr)	26.02	16.19	24.41	15.60	12.82	19.80	19.96
Wt. Of Moisture(gr)	4.02	4.50	3.37	3.40	1.80	0.3	0.5
Wt. Of Can(gr)	18.65	8.53	18.02	8.96	8.99	18.59	18.27
Wt. Dry Soil(gr)	7.37	7.66	6.39	6.64	3.83	1.2	1.7
Water Content(%)	54.5	58.7	52.7	51.2	47.0	27.3	27.2
Cone Penatration (mm)	27.2	34.0	21.0	20.6	15.5		
Blow count	7.0	3.0	13.0	18.0	36.0		





Organic Content Determination

Can No	1
Wt. of can + wet soil (gr)	42.11
Wt. of can + dry soil (gr)	39.87
Wt. of water(gr)	2.24
Wt. of can (gr)	18.70
Wt. Of Dry Soil(gr)	21.17
Water Content(w%)	10.58

After Ignition

Can No	6
Wt. of can + organic soil (gr)	81.38
Wt. of can + ignited soil (gr)	79.87
Wt. of ash(gr)	1.51
Wt. of can (gr)	60.21
Wt. Of Soil(gr)	19.66
Organic Content(%)	**7.68**

DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 1.10.2014

Specimen ID: L6D7 (1)

Admixtures

Lime (%): 6,00 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 237,20

Wt. of can + Wt. of dry soil (gr) = 144,47

Wt. of can (gr) = 9,47

Water content, w (%) = 68,69

Proving Ring Info

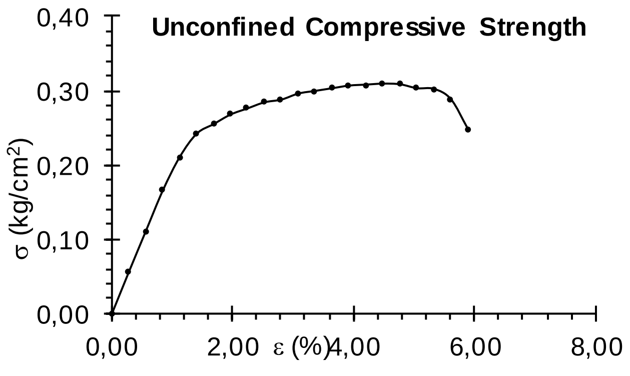
Ring No: 5789

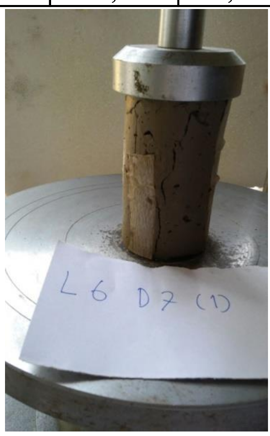
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	505,0	0,010	0,90	15,95	0,056
20	0,508	0,561	517,0	0,034	1,78	15,99	0,111
30	0,762	0,841	529,0	0,058	2,66	16,04	0,166
40	1,016	1,121	539,0	0,078	3,39	16,08	0,211
50	1,270	1,402	546,0	0,092	3,91	16,13	0,242
60	1,524	1,682	549,0	0,098	4,13	16,18	0,255
70	1,778	1,962	552,0	0,104	4,35	16,22	0,268
80	2,032	2,243	554,0	0,108	4,49	16,27	0,276
90	2,286	2,523	556,0	0,112	4,64	16,32	0,284
100	2,540	2,804	557,0	0,114	4,71	16,36	0,288
110	2,794	3,084	559,0	0,118	4,86	16,41	0,296
120	3,048	3,364	560,0	0,120	4,93	16,46	0,300
130	3,302	3,645	561,0	0,122	5,01	16,51	0,303
140	3,556	3,925	562,0	0,124	5,08	16,55	0,307
150	3,810	4,205	562,5	0,125	5,12	16,60	0,308
160	4,064	4,486	563,0	0,126	5,15	16,65	0,310
170	4,318	4,766	563,0	0,126	5,15	16,70	0,309
180	4,572	5,046	562,0	0,124	5,08	16,75	0,303
190	4,826	5,327	562,0	0,124	5,08	16,80	0,302
200	5,080	5,607	559,0	0,118	4,86	16,85	0,288
210	5,334	5,887	550,0	0,100	4,20	16,90	0,249





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 1.10.2014

Specimen ID: L6D7 (2)

Admixtures

Lime (%): 6,00 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,85 L/D = 2,00

Diameter (mm) = 45,50 A_o (mm^2)= 1625,97

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 244,50

Wt. of can + Wt. of dry soil (gr) = 149,43

Wt. of can (gr) = 10,55

Water content, w (%) = 68,45

Proving Ring Info

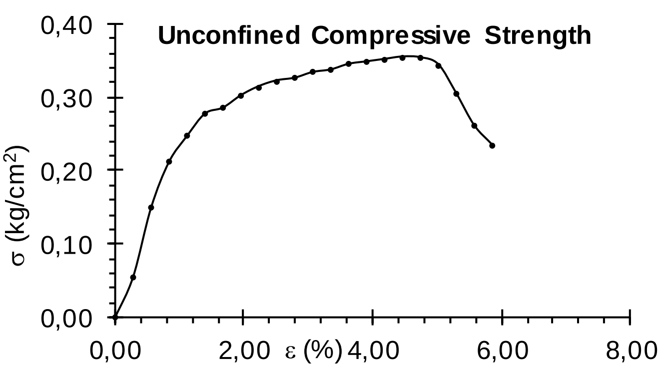
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	16,26	0,000
10	0,254	0,280	505,0	0,010	0,90	16,31	0,055
20	0,508	0,559	526,0	0,052	2,44	16,35	0,149
30	0,762	0,839	540,0	0,080	3,47	16,40	0,211
40	1,016	1,118	548,0	0,096	4,05	16,44	0,246
50	1,270	1,398	555,0	0,110	4,57	16,49	0,277
60	1,524	1,677	557,0	0,114	4,71	16,54	0,285
70	1,778	1,957	561,0	0,122	5,01	16,58	0,302
80	2,032	2,237	564,0	0,128	5,23	16,63	0,314
90	2,286	2,516	566,0	0,132	5,37	16,68	0,322
100	2,540	2,796	567,0	0,134	5,45	16,73	0,326
110	2,794	3,075	569,0	0,138	5,59	16,78	0,333
120	3,048	3,355	570,0	0,140	5,67	16,82	0,337
130	3,302	3,635	572,0	0,144	5,81	16,87	0,345
140	3,556	3,914	573,0	0,146	5,89	16,92	0,348
150	3,810	4,194	574,0	0,148	5,96	16,97	0,351
160	4,064	4,473	575,0	0,150	6,03	17,02	0,355
170	4,318	4,753	575,0	0,150	6,03	17,07	0,353
180	4,572	5,032	573,0	0,146	5,89	17,12	0,344
190	4,826	5,312	564,0	0,128	5,23	17,17	0,304
200	5,080	5,592	554,0	0,108	4,49	17,22	0,261
210	5,334	5,871	548,0	0,096	4,05	17,27	0,235



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UNCONFINED COMPRESSION TEST DATA SHEET

Date: 8.10.2014

Specimen ID: L6D14 (1)

Admixtures

Lime (%): 6,00 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 235,20

Wt. of can + Wt. of dry soil (gr) = 144,47

Wt. of can (gr) = 9,47

Water content, w (%) = 67,21

Proving Ring Info

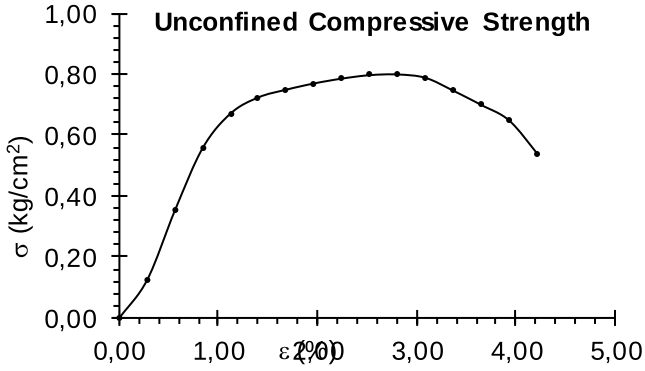
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	570,0	0,140	5,67	15,99	0,354
30	0,762	0,841	615,0	0,230	8,97	16,04	0,559
40	1,016	1,121	640,0	0,280	10,81	16,08	0,672
50	1,270	1,402	652,0	0,304	11,69	16,13	0,724
60	1,524	1,682	658,0	0,316	12,13	16,18	0,750
70	1,778	1,962	663,0	0,326	12,49	16,22	0,770
80	2,032	2,243	667,0	0,334	12,79	16,27	0,786
90	2,286	2,523	670,0	0,340	13,01	16,32	0,797
100	2,540	2,804	671,0	0,342	13,08	16,36	0,799
110	2,794	3,084	669,0	0,338	12,93	16,41	0,788
120	3,048	3,364	660,0	0,320	12,27	16,46	0,746
130	3,302	3,645	650,0	0,300	11,54	16,51	0,699
140	3,556	3,925	639,0	0,278	10,73	16,55	0,648
150	3,810	4,205	615,0	0,230	8,97	16,60	0,540



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UNCONFINED COMPRESSION TEST DATA SHEET

Date: 8.10.2014

Specimen ID: L6D14 (2)

Admixtures

Lime (%): 6,00 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 232,45

Wt. of can + Wt. of dry soil (gr) = 143,47

Wt. of can (gr) = 9,40

Water content, w (%) = 66,37

Proving Ring Info

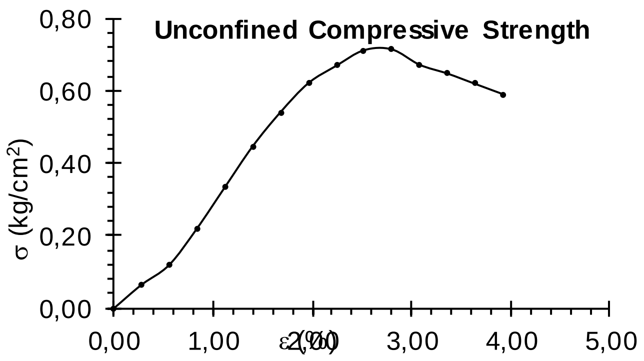
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	507,0	0,014	1,04	15,95	0,065
20	0,508	0,561	519,0	0,038	1,92	15,99	0,120
30	0,762	0,841	541,0	0,082	3,54	16,04	0,221
40	1,016	1,121	566,0	0,132	5,37	16,08	0,334
50	1,270	1,402	591,0	0,182	7,21	16,13	0,447
60	1,524	1,682	612,0	0,224	8,75	16,18	0,541
70	1,778	1,962	630,0	0,260	10,07	16,22	0,621
80	2,032	2,243	641,0	0,282	10,88	16,27	0,669
90	2,286	2,523	651,0	0,302	11,61	16,32	0,712
100	2,540	2,804	652,0	0,304	11,69	16,36	0,714
110	2,794	3,084	643,0	0,286	11,03	16,41	0,672
120	3,048	3,364	638,0	0,276	10,66	16,46	0,648
130	3,302	3,645	632,0	0,264	10,22	16,51	0,619
140	3,556	3,925	626,0	0,252	9,78	16,55	0,591



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 15.10.2014

Specimen ID: L6D21 (1)

Admixtures

Lime (%): 6,00 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 129,39

Wt. of can + Wt. of dry soil (gr) = 80,34

Wt. of can (gr) = 9,40

Water content, w (%) = 69,14

Proving Ring Info

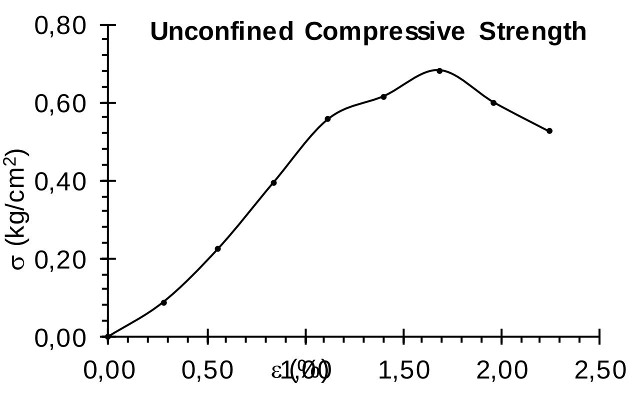
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	512,0	0,024	1,41	15,95	0,088
20	0,508	0,561	542,0	0,084	3,61	15,99	0,226
30	0,762	0,841	579,0	0,158	6,33	16,04	0,395
40	1,016	1,121	615,0	0,230	8,97	16,08	0,558
50	1,270	1,402	628,0	0,256	9,92	16,13	0,615
60	1,524	1,682	643,0	0,286	11,03	16,18	0,682
70	1,778	1,962	625,0	0,250	9,70	16,22	0,598
80	2,032	2,243	609,0	0,218	8,53	16,27	0,524



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 15.10.2014

Specimen ID: L6D21 (2)

Admixtures

Lime (%): 6,00 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 238,80

Wt. of can + Wt. of dry soil (gr) = 144,00

Wt. of can (gr) = 9,25

Water content, w (%) = 70,35

Proving Ring Info

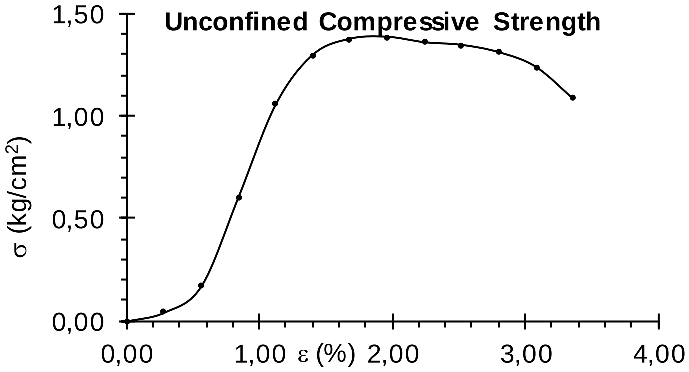
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	502,0	0,004	0,68	15,95	0,042
20	0,508	0,561	530,0	0,060	2,73	15,99	0,171
30	0,762	0,841	625,0	0,250	9,70	16,04	0,605
40	1,016	1,121	724,0	0,448	16,97	16,08	1,055
50	1,270	1,402	778,0	0,556	20,93	16,13	1,298
60	1,524	1,682	796,0	0,592	22,25	16,18	1,376
70	1,778	1,962	799,0	0,598	22,47	16,22	1,385
80	2,032	2,243	794,0	0,588	22,11	16,27	1,359
90	2,286	2,523	792,0	0,584	21,96	16,32	1,346
100	2,540	2,804	785,0	0,570	21,45	16,36	1,311
110	2,794	3,084	770,0	0,540	20,35	16,41	1,240
120	3,048	3,364	736,0	0,472	17,85	16,46	1,085



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L6D28 (1)

Admixtures

Lime (%): 6,00 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,61

Wt. of can + Wt. of dry soil (gr) = 148,42

Wt. of can (gr) = 9,45

Water content, w (%) = 66,34

Proving Ring Info

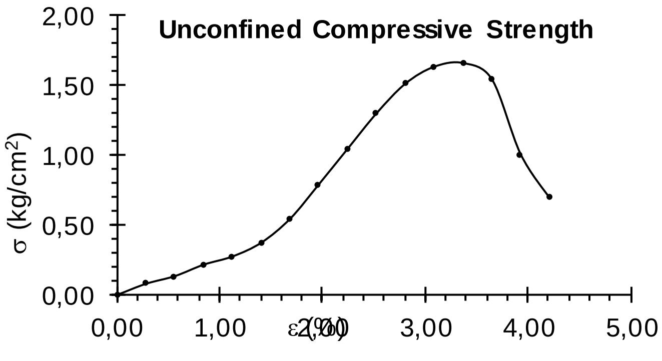
Ring No: 5789

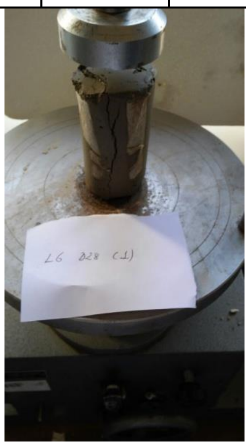
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	522,0	0,044	2,14	15,99	0,134
30	0,762	0,841	540,0	0,080	3,47	16,04	0,216
40	1,016	1,121	553,0	0,106	4,42	16,08	0,275
50	1,270	1,402	575,0	0,150	6,03	16,13	0,374
60	1,524	1,682	613,0	0,226	8,82	16,18	0,545
70	1,778	1,962	668,0	0,336	12,86	16,22	0,793
80	2,032	2,243	725,0	0,450	17,04	16,27	1,048
90	2,286	2,523	782,0	0,564	21,23	16,32	1,301
100	2,540	2,804	830,0	0,660	24,75	16,36	1,513
110	2,794	3,084	858,0	0,716	26,81	16,41	1,633
120	3,048	3,364	865,0	0,730	27,32	16,46	1,660
130	3,302	3,645	840,0	0,680	25,48	16,51	1,544
140	3,556	3,925	720,0	0,440	16,68	16,55	1,007
150	3,810	4,205	650,0	0,300	11,54	16,60	0,695





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L6D28 (2)

Admixtures

Lime (%): 6,00 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 238,53

Wt. of can + Wt. of dry soil (gr) = 146,48

Wt. of can (gr) = 9,40

Water content, w (%) = 67,15

Proving Ring Info

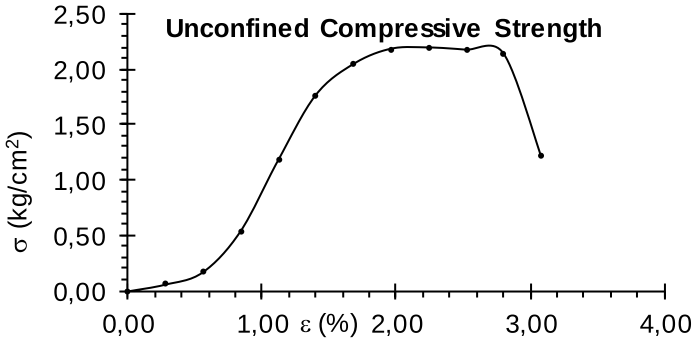
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	506,0	0,012	0,97	15,95	0,061
20	0,508	0,561	530,0	0,060	2,73	15,99	0,171
30	0,762	0,841	610,0	0,220	8,60	16,04	0,536
40	1,016	1,121	750,0	0,500	18,88	16,08	1,174
50	1,270	1,402	880,0	0,760	28,42	16,13	1,762
60	1,524	1,682	943,0	0,886	33,04	16,18	2,043
70	1,778	1,962	975,0	0,950	35,39	16,22	2,182
80	2,032	2,243	979,0	0,958	35,69	16,27	2,193
90	2,286	2,523	976,0	0,952	35,47	16,32	2,174
100	2,540	2,804	970,0	0,940	35,03	16,36	2,141
110	2,794	3,084	765,0	0,530	19,98	16,41	1,217



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6D42 (1)

Admixtures

Lime (%): 6,00 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 236,18

Wt. of can + Wt. of dry soil (gr) = 145,69

Wt. of can (gr) = 9,40

Water content, w (%) = 66,40

Proving Ring Info

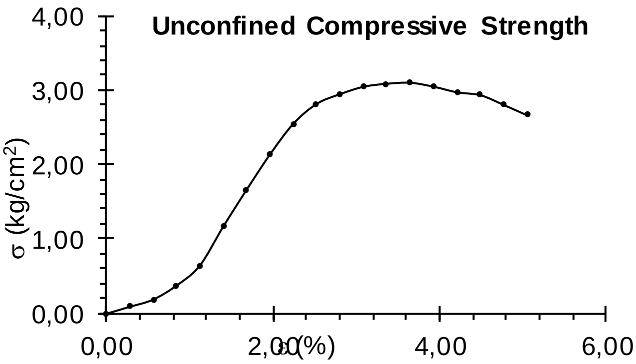
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	513,0	0,026	1,48	15,95	0,093
20	0,508	0,561	534,0	0,068	3,03	15,99	0,189
30	0,762	0,841	575,0	0,150	6,03	16,04	0,376
40	1,016	1,121	634,0	0,268	10,36	16,08	0,644
50	1,270	1,402	749,0	0,498	18,81	16,13	1,166
60	1,524	1,682	859,0	0,718	26,88	16,18	1,662
70	1,778	1,962	965,0	0,930	34,66	16,22	2,136
80	2,032	2,243	1058,0	1,116	41,48	16,27	2,550
90	2,286	2,523	1119,0	1,238	45,96	16,32	2,817
100	2,540	2,804	1150,0	1,300	48,24	16,36	2,948
110	2,794	3,084	1174,0	1,348	50,00	16,41	3,047
120	3,048	3,364	1185,0	1,370	50,80	16,46	3,087
130	3,302	3,645	1190,0	1,380	51,17	16,51	3,100
140	3,556	3,925	1180,0	1,360	50,44	16,55	3,047
150	3,810	4,205	1165,0	1,330	49,34	16,60	2,972
160	4,064	4,486	1158,0	1,316	48,82	16,65	2,932
170	4,318	4,766	1130,0	1,260	46,77	16,70	2,800
180	4,572	5,046	1100,0	1,200	44,57	16,75	2,661



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6D7 (42)

Admixtures

Lime (%): 6,00   Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 246,10

Wt. of can + Wt. of dry soil (gr) = 152,10

Wt. of can (gr) = 10,44

Water content, w (%) = 66,36

Proving Ring Info

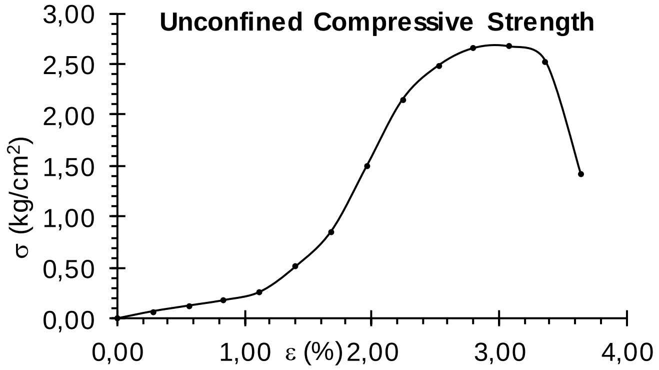
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	508,0	0,016	1,12	15,95	0,070
20	0,508	0,561	520,0	0,040	2,00	15,99	0,125
30	0,762	0,841	532,0	0,064	2,88	16,04	0,179
40	1,016	1,121	550,0	0,100	4,20	16,08	0,261
50	1,270	1,402	605,0	0,210	8,24	16,13	0,511
60	1,524	1,682	682,0	0,364	13,89	16,18	0,859
70	1,778	1,962	825,0	0,650	24,38	16,22	1,503
80	2,032	2,243	970,0	0,940	35,03	16,27	2,153
90	2,286	2,523	1045,0	1,090	40,53	16,32	2,484
100	2,540	2,804	1085,0	1,170	43,47	16,36	2,656
110	2,794	3,084	1090,0	1,180	43,83	16,41	2,671
120	3,048	3,364	1060,0	1,120	41,63	16,46	2,530
130	3,302	3,645	810,0	0,620	23,28	16,51	1,411



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

<u>UNCONFINED COMPRESSION TEST</u> DATA SHEET

Date: 8.10.2014

Specimen ID: L9D7 (1)

<u>Admixtures</u>

Lime (%): 9,00 Curing period (days): 7 days

<u>Specimen dimensions</u>

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

<u>Post-test water content determination</u>

Wt. of can + Wt. of wet soil (gr) = 240,14

Wt. of can + Wt. of dry soil (gr) = 146,12

Wt. of can (gr) = 9,47

Water content, w (%) = 68,80

<u>Proving Ring Info</u>

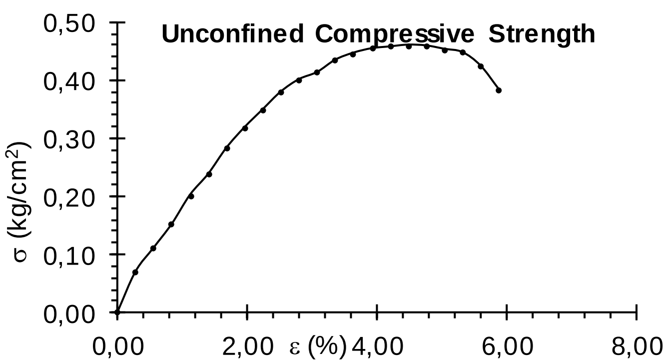
Ring No: 5789

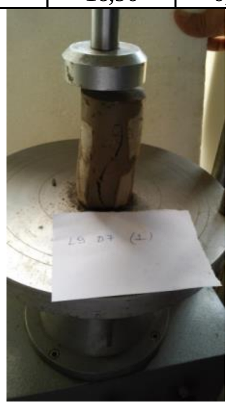
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	508,0	0,016	1,12	15,95	0,070
20	0,508	0,561	517,0	0,034	1,78	15,99	0,111
30	0,762	0,841	526,0	0,052	2,44	16,04	0,152
40	1,016	1,121	537,0	0,074	3,25	16,08	0,202
50	1,270	1,402	545,0	0,090	3,83	16,13	0,238
60	1,524	1,682	555,0	0,110	4,57	16,18	0,282
70	1,778	1,962	563,0	0,126	5,15	16,22	0,318
80	2,032	2,243	570,0	0,140	5,67	16,27	0,348
90	2,286	2,523	577,0	0,154	6,18	16,32	0,379
100	2,540	2,804	582,0	0,164	6,55	16,36	0,400
110	2,794	3,084	585,0	0,170	6,77	16,41	0,412
120	3,048	3,364	590,0	0,180	7,14	16,46	0,434
130	3,302	3,645	593,0	0,186	7,36	16,51	0,446
140	3,556	3,925	595,0	0,190	7,50	16,55	0,453
150	3,810	4,205	596,0	0,192	7,58	16,60	0,456
160	4,064	4,486	597,0	0,194	7,65	16,65	0,459
170	4,318	4,766	597,0	0,194	7,65	16,70	0,458
180	4,572	5,046	596,0	0,192	7,58	16,75	0,452
190	4,826	5,327	595,0	0,190	7,50	16,80	0,447
200	5,080	5,607	590,0	0,180	7,14	16,85	0,423
210	5,334	5,887	581,0	0,162	6,47	16,90	0,383





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 8.10.2014

Specimen ID: L9D7 (2)

Admixtures

Lime (%): 9,00 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,18

Wt. of can + Wt. of dry soil (gr) = 145,17

Wt. of can (gr) = 9,47

Water content, w (%) = 70,01

Proving Ring Info

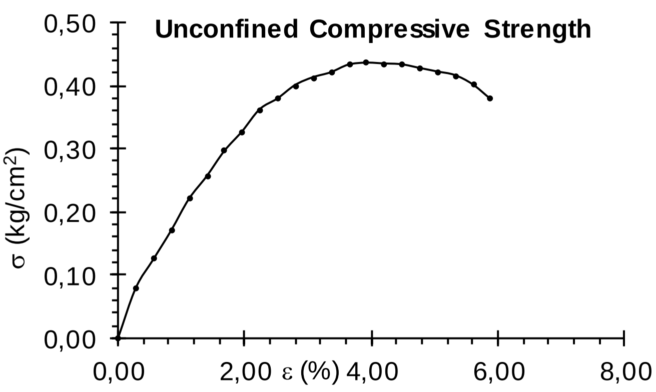
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	520,0	0,040	2,00	15,99	0,125
30	0,762	0,841	530,0	0,060	2,73	16,04	0,170
40	1,016	1,121	541,0	0,082	3,54	16,08	0,220
50	1,270	1,402	549,0	0,098	4,13	16,13	0,256
60	1,524	1,682	558,0	0,116	4,79	16,18	0,296
70	1,778	1,962	565,0	0,130	5,30	16,22	0,327
80	2,032	2,243	573,0	0,146	5,89	16,27	0,362
90	2,286	2,523	577,0	0,154	6,18	16,32	0,379
100	2,540	2,804	582,0	0,164	6,55	16,36	0,400
110	2,794	3,084	585,0	0,170	6,77	16,41	0,412
120	3,048	3,364	587,0	0,174	6,92	16,46	0,420
130	3,302	3,645	590,0	0,180	7,14	16,51	0,432
140	3,556	3,925	591,0	0,182	7,21	16,55	0,435
150	3,810	4,205	591,0	0,182	7,21	16,60	0,434
160	4,064	4,486	591,0	0,182	7,21	16,65	0,433
170	4,318	4,766	590,0	0,180	7,14	16,70	0,427
180	4,572	5,046	589,0	0,178	7,06	16,75	0,422
190	4,826	5,327	588,0	0,176	6,99	16,80	0,416
200	5,080	5,607	585,0	0,170	6,77	16,85	0,402
210	5,334	5,887	580,0	0,160	6,40	16,90	0,379



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 15.10.2014

Specimen ID: L9D14 (1)

Admixtures

Lime (%): 9,00 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 248,07

Wt. of can + Wt. of dry soil (gr) = 157,27

Wt. of can (gr) = 10,51

Water content, w (%) = 61,87

Proving Ring Info

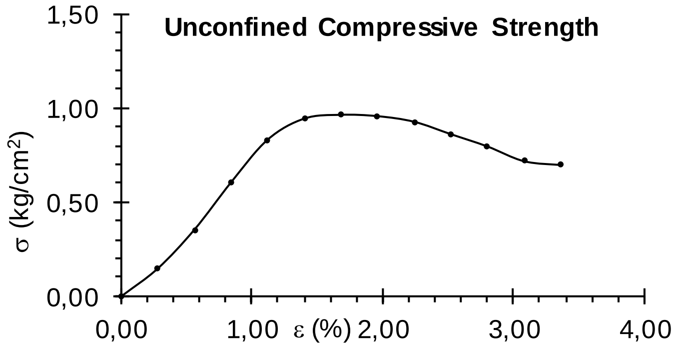
Ring No: 5789

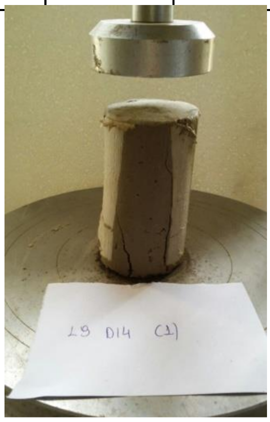
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	525,0	0,050	2,36	15,95	0,148
20	0,508	0,561	570,0	0,140	5,67	15,99	0,354
30	0,762	0,841	625,0	0,250	9,70	16,04	0,605
40	1,016	1,121	675,0	0,350	13,37	16,08	0,831
50	1,270	1,402	700,0	0,400	15,21	16,13	0,943
60	1,524	1,682	705,0	0,410	15,58	16,18	0,963
70	1,778	1,962	704,0	0,408	15,50	16,22	0,956
80	2,032	2,243	698,0	0,396	15,06	16,27	0,926
90	2,286	2,523	684,0	0,368	14,03	16,32	0,860
100	2,540	2,804	670,0	0,340	13,01	16,36	0,795
110	2,794	3,084	653,0	0,306	11,76	16,41	0,717
120	3,048	3,364	649,0	0,298	11,47	16,46	0,697





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 15.10.2014

Specimen ID: L9D14 (2)

Admixtures

Lime (%): 9,00 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 243,37

Wt. of can + Wt. of dry soil (gr) = 153,96

Wt. of can (gr) = 9,16

Water content, w (%) = 61,75

Proving Ring Info

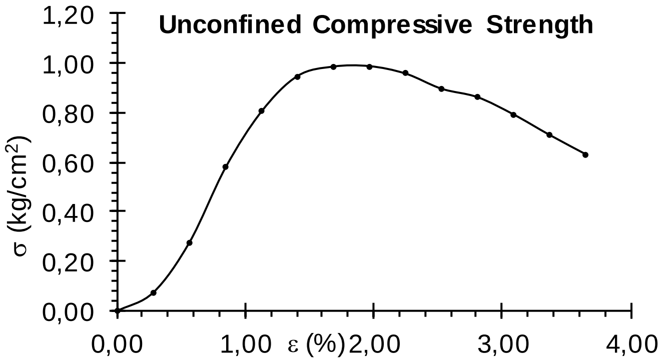
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	509,0	0,018	1,19	15,95	0,075
20	0,508	0,561	553,0	0,106	4,42	15,99	0,276
30	0,762	0,841	619,0	0,238	9,26	16,04	0,578
40	1,016	1,121	669,0	0,338	12,93	16,08	0,804
50	1,270	1,402	701,0	0,402	15,28	16,13	0,947
60	1,524	1,682	710,0	0,420	15,94	16,18	0,986
70	1,778	1,962	711,0	0,422	16,02	16,22	0,987
80	2,032	2,243	705,0	0,410	15,58	16,27	0,957
90	2,286	2,523	692,0	0,384	14,62	16,32	0,896
100	2,540	2,804	685,0	0,370	14,11	16,36	0,862
110	2,794	3,084	670,0	0,340	13,01	16,41	0,793
120	3,048	3,364	652,0	0,304	11,69	16,46	0,710
130	3,302	3,645	635,0	0,270	10,44	16,51	0,632



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L9D21 (1)

Admixtures

Lime (%): 9,00 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 255,26

Wt. of can + Wt. of dry soil (gr) = 163,11

Wt. of can (gr) = 9,36

Water content, w (%) = 59,93

Proving Ring Info

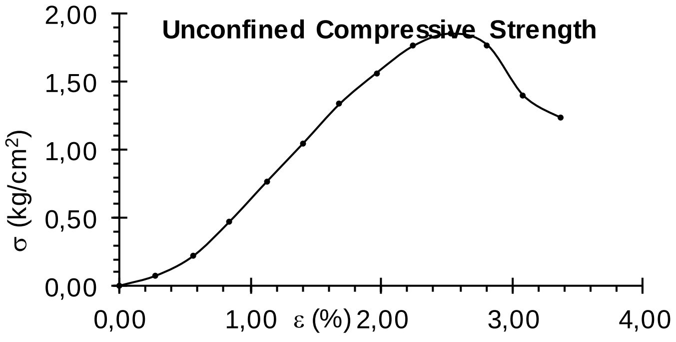
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	509,0	0,018	1,19	15,95	0,075
20	0,508	0,561	540,0	0,080	3,47	15,99	0,217
30	0,762	0,841	596,0	0,192	7,58	16,04	0,472
40	1,016	1,121	660,0	0,320	12,27	16,08	0,763
50	1,270	1,402	723,0	0,446	16,90	16,13	1,048
60	1,524	1,682	788,0	0,576	21,67	16,18	1,339
70	1,778	1,962	839,0	0,678	25,41	16,22	1,566
80	2,032	2,243	884,0	0,768	28,71	16,27	1,765
90	2,286	2,523	905,0	0,810	30,25	16,32	1,854
100	2,540	2,804	888,0	0,776	29,01	16,36	1,773
110	2,794	3,084	805,0	0,610	22,92	16,41	1,396
120	3,048	3,364	770,0	0,540	20,35	16,46	1,236



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L9D21 (2)

Admixtures

Lime (%): 9,00 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 250,27

Wt. of can + Wt. of dry soil (gr) = 159,23

Wt. of can (gr) = 9,14

Water content, w (%) = 60,66

Proving Ring Info

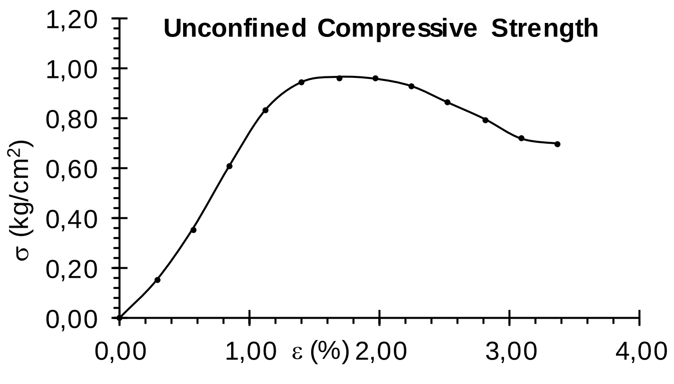
Ring No: 5789

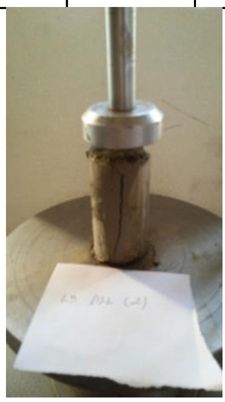
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	525,0	0,050	2,36	15,95	0,148
20	0,508	0,561	570,0	0,140	5,67	15,99	0,354
30	0,762	0,841	625,0	0,250	9,70	16,04	0,605
40	1,016	1,121	675,0	0,350	13,37	16,08	0,831
50	1,270	1,402	700,0	0,400	15,21	16,13	0,943
60	1,524	1,682	705,0	0,410	15,58	16,18	0,963
70	1,778	1,962	704,0	0,408	15,50	16,22	0,956
80	2,032	2,243	698,0	0,396	15,06	16,27	0,926
90	2,286	2,523	684,0	0,368	14,03	16,32	0,860
100	2,540	2,804	670,0	0,340	13,01	16,36	0,795
110	2,794	3,084	653,0	0,306	11,76	16,41	0,717
120	3,048	3,364	649,0	0,298	11,47	16,46	0,697





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 30.10.2014

Specimen ID: L9D28 (1)

Admixtures

Lime (%): 9,00 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 250,01

Wt. of can + Wt. of dry soil (gr) = 159,00

Wt. of can (gr) = 9,08

Water content, w (%) = 60,71

Proving Ring Info

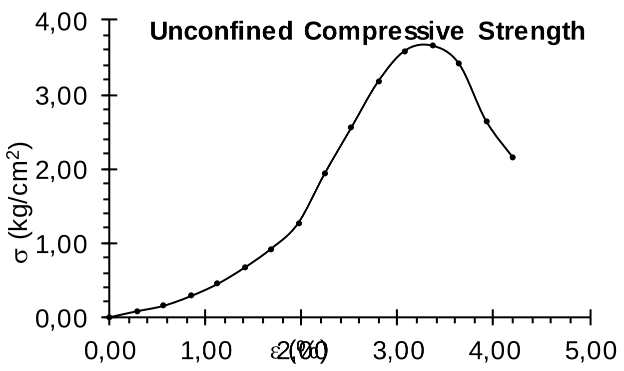
Ring No: 5789

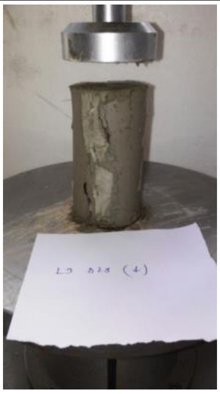
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	526,0	0,052	2,44	15,99	0,152
30	0,762	0,841	554,0	0,108	4,49	16,04	0,280
40	1,016	1,121	590,0	0,180	7,14	16,08	0,444
50	1,270	1,402	638,0	0,276	10,66	16,13	0,661
60	1,524	1,682	695,0	0,390	14,84	16,18	0,917
70	1,778	1,962	770,0	0,540	20,35	16,22	1,254
80	2,032	2,243	920,0	0,840	31,36	16,27	1,927
90	2,286	2,523	1060,0	1,120	41,63	16,32	2,552
100	2,540	2,804	1200,0	1,400	51,91	16,36	3,172
110	2,794	3,084	1295,0	1,590	58,88	16,41	3,588
120	3,048	3,364	1312,0	1,624	60,13	16,46	3,653
130	3,302	3,645	1260,0	1,520	56,31	16,51	3,411
140	3,556	3,925	1090,0	1,180	43,83	16,55	2,648
150	3,810	4,205	980,0	0,960	35,76	16,60	2,154





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 30.10.2014

Specimen ID: L9D28 (2)

Admixtures

Lime (%): 9,00 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 230,04

Wt. of can + Wt. of dry soil (gr) = 148,39

Wt. of can (gr) = 10,48

Water content, w (%) = 59,21

Proving Ring Info

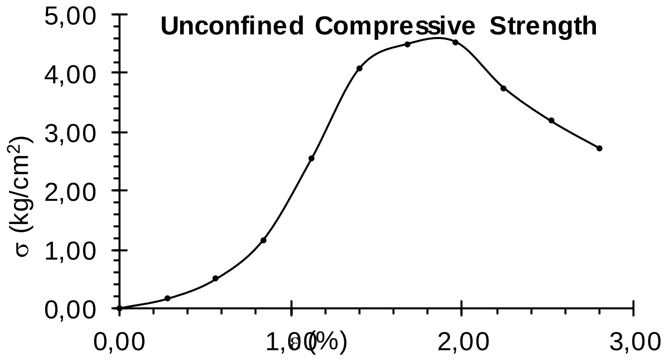
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	528,0	0,056	2,59	15,95	0,162
20	0,508	0,561	600,0	0,200	7,87	15,99	0,492
30	0,762	0,841	748,0	0,496	18,73	16,04	1,168
40	1,016	1,121	1050,0	1,100	40,90	16,08	2,543
50	1,270	1,402	1390,0	1,780	65,85	16,13	4,082
60	1,524	1,682	1484,0	1,968	72,75	16,18	4,497
70	1,778	1,962	1495,0	1,990	73,56	16,22	4,534
80	2,032	2,243	1325,0	1,650	61,08	16,27	3,754
90	2,286	2,523	1200,0	1,400	51,91	16,32	3,181
100	2,540	2,804	1100,0	1,200	44,57	16,36	2,724



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L9D42(1)

Admixtures

Lime (%): 9,00 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 251,29

Wt. of can + Wt. of dry soil (gr) = 160,96

Wt. of can (gr) = 9,16

Water content, w (%) = 59,51

Proving Ring Info

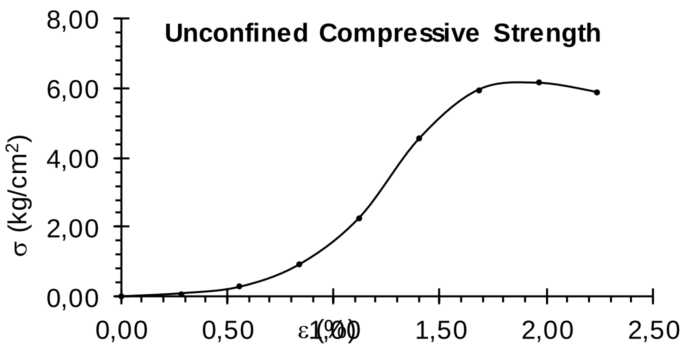
Ring No: 5789

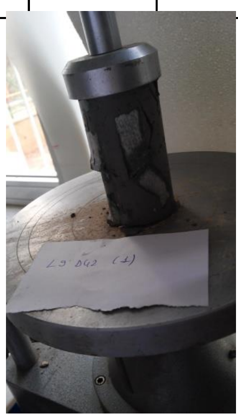
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	512,0	0,024	1,41	15,95	0,088
20	0,508	0,561	554,0	0,108	4,49	15,99	0,281
30	0,762	0,841	696,0	0,392	14,92	16,04	0,930
40	1,016	1,121	990,0	0,980	36,49	16,08	2,269
50	1,270	1,402	1490,0	1,980	73,19	16,13	4,537
60	1,524	1,682	1806,0	2,612	96,38	16,18	5,958
70	1,778	1,962	1855,0	2,710	99,98	16,22	6,163
80	2,032	2,243	1800,0	2,600	95,94	16,27	5,897





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L9D42 (2)

Admixtures

Lime (%): 9,00 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 151,46

Wt. of can + Wt. of dry soil (gr) = 97,92

Wt. of can (gr) = 9,28

Water content, w (%) = 60,40

Proving Ring Info

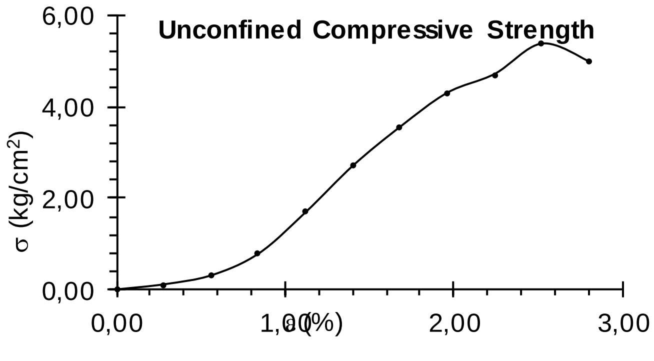
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	517,0	0,034	1,78	15,95	0,111
20	0,508	0,561	560,0	0,120	4,93	15,99	0,308
30	0,762	0,841	664,0	0,328	12,57	16,04	0,783
40	1,016	1,121	863,0	0,726	27,17	16,08	1,689
50	1,270	1,402	1086,0	1,172	43,54	16,13	2,699
60	1,524	1,682	1274,0	1,548	57,34	16,18	3,544
70	1,778	1,962	1440,0	1,880	69,52	16,22	4,285
80	2,032	2,243	1533,0	2,066	76,35	16,27	4,693
90	2,286	2,523	1683,0	2,366	87,36	16,32	5,354
100	2,540	2,804	1600,0	2,200	81,26	16,36	4,966



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L3C3D7 (1)

Admixtures

Lime+cem (%): 3 + 3   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,33

Wt. of can + Wt. of dry soil (gr) = 145,81

Wt. of can (gr) = 9,45

Water content, w (%) = 69,32

Proving Ring Info

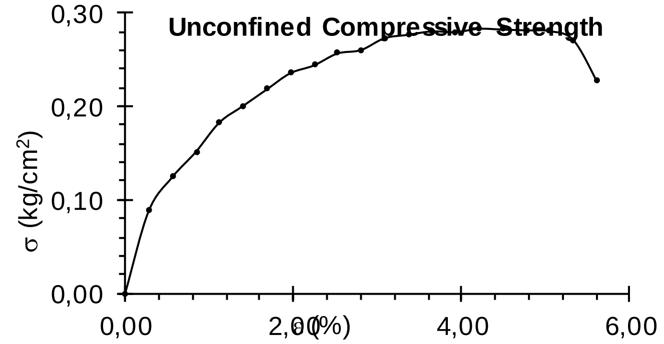
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	512,0	0,024	1,41	15,95	0,088
20	0,508	0,561	520,0	0,040	2,00	15,99	0,125
30	0,762	0,841	526,0	0,052	2,44	16,04	0,152
40	1,016	1,121	533,0	0,066	2,95	16,08	0,184
50	1,270	1,402	537,0	0,074	3,25	16,13	0,201
60	1,524	1,682	541,0	0,082	3,54	16,18	0,219
70	1,778	1,962	545,0	0,090	3,83	16,22	0,236
80	2,032	2,243	547,0	0,094	3,98	16,27	0,245
90	2,286	2,523	550,0	0,100	4,20	16,32	0,257
100	2,540	2,804	551,0	0,102	4,27	16,36	0,261
110	2,794	3,084	554,0	0,108	4,49	16,41	0,274
120	3,048	3,364	555,0	0,110	4,57	16,46	0,277
130	3,302	3,645	556,0	0,112	4,64	16,51	0,281
140	3,556	3,925	556,0	0,112	4,64	16,55	0,280
150	3,810	4,205	557,0	0,114	4,71	16,60	0,284
160	4,064	4,486	557,0	0,114	4,71	16,65	0,283
170	4,318	4,766	557,0	0,114	4,71	16,70	0,282
180	4,572	5,046	557,0	0,114	4,71	16,75	0,281
190	4,826	5,327	555,0	0,110	4,57	16,80	0,272
200	5,080	5,607	545,0	0,090	3,83	16,85	0,227



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L3C3D7 (2)

Admixtures

Lime+cem (%): 3 + 3 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 226,17

Wt. of can + Wt. of dry soil (gr) = 137,17

Wt. of can (gr) = 9,17

Water content, w (%) = 69,53

Proving Ring Info

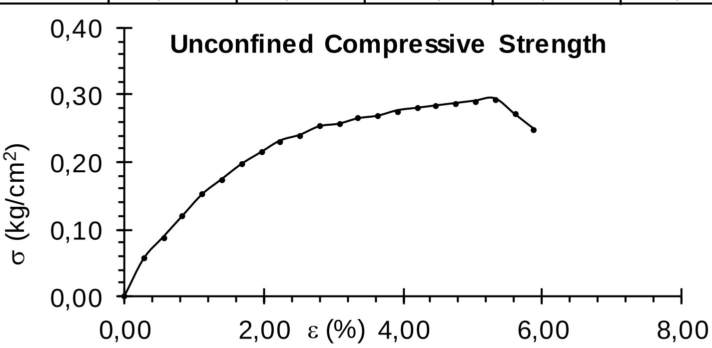
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	505,0	0,010	0,90	15,95	0,056
20	0,508	0,561	512,0	0,024	1,41	15,99	0,088
30	0,762	0,841	519,0	0,038	1,92	16,04	0,120
40	1,016	1,121	526,0	0,052	2,44	16,08	0,152
50	1,270	1,402	531,0	0,062	2,81	16,13	0,174
60	1,524	1,682	536,0	0,072	3,17	16,18	0,196
70	1,778	1,962	540,0	0,080	3,47	16,22	0,214
80	2,032	2,243	544,0	0,088	3,76	16,27	0,231
90	2,286	2,523	546,0	0,092	3,91	16,32	0,239
100	2,540	2,804	549,0	0,098	4,13	16,36	0,252
110	2,794	3,084	550,0	0,100	4,20	16,41	0,256
120	3,048	3,364	552,0	0,104	4,35	16,46	0,264
130	3,302	3,645	553,0	0,106	4,42	16,51	0,268
140	3,556	3,925	555,0	0,110	4,57	16,55	0,276
150	3,810	4,205	556,0	0,112	4,64	16,60	0,279
160	4,064	4,486	557,0	0,114	4,71	16,65	0,283
170	4,318	4,766	558,0	0,116	4,79	16,70	0,287
180	4,572	5,046	559,0	0,118	4,86	16,75	0,290
190	4,826	5,327	560,0	0,120	4,93	16,80	0,294
200	5,080	5,607	555,0	0,110	4,57	16,85	0,271
210	5,334	5,887	550,0	0,100	4,20	16,90	0,249



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L3C3D14 (1)

Admixtures

Lime+cem (%): 3 + 3 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 242,08

Wt. of can + Wt. of dry soil (gr) = 145,84

Wt. of can (gr) = 10,53

Water content, w (%) = 71,13

Proving Ring Info

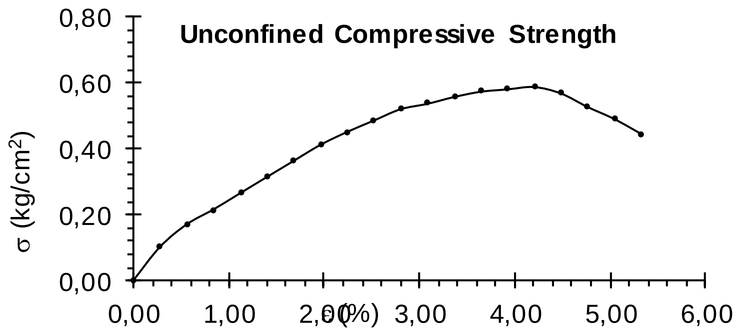
Ring No: 5789

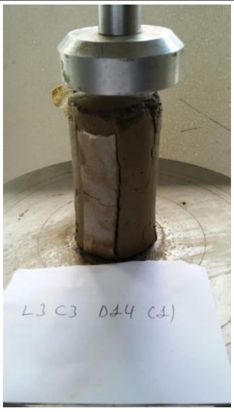
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	515,0	0,030	1,63	15,95	0,102
20	0,508	0,561	530,0	0,060	2,73	15,99	0,171
30	0,762	0,841	540,0	0,080	3,47	16,04	0,216
40	1,016	1,121	551,0	0,102	4,27	16,08	0,266
50	1,270	1,402	562,0	0,124	5,08	16,13	0,315
60	1,524	1,682	573,0	0,146	5,89	16,18	0,364
70	1,778	1,962	584,0	0,168	6,70	16,22	0,413
80	2,032	2,243	593,0	0,186	7,36	16,27	0,452
90	2,286	2,523	601,0	0,202	7,94	16,32	0,487
100	2,540	2,804	609,0	0,218	8,53	16,36	0,521
110	2,794	3,084	613,0	0,226	8,82	16,41	0,538
120	3,048	3,364	618,0	0,236	9,19	16,46	0,558
130	3,302	3,645	622,0	0,244	9,48	16,51	0,575
140	3,556	3,925	624,0	0,248	9,63	16,55	0,582
150	3,810	4,205	626,0	0,252	9,78	16,60	0,589
160	4,064	4,486	622,0	0,244	9,48	16,65	0,570
170	4,318	4,766	613,0	0,226	8,82	16,70	0,528
180	4,572	5,046	605,0	0,210	8,24	16,75	0,492
190	4,826	5,327	595,0	0,190	7,50	16,80	0,447





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L3C3D14 (2)

Admixtures

Lime+cem (%): 3 + 3 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 238,43

Wt. of can + Wt. of dry soil (gr) = 143,13

Wt. of can (gr) = 9,26

Water content, w (%) = 71,19

Proving Ring Info

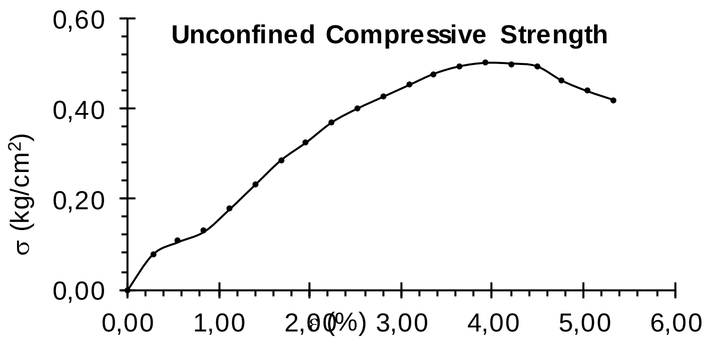
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	516,0	0,032	1,70	15,99	0,107
30	0,762	0,841	521,0	0,042	2,07	16,04	0,129
40	1,016	1,121	532,0	0,064	2,88	16,08	0,179
50	1,270	1,402	544,0	0,088	3,76	16,13	0,233
60	1,524	1,682	556,0	0,112	4,64	16,18	0,287
70	1,778	1,962	565,0	0,130	5,30	16,22	0,327
80	2,032	2,243	575,0	0,150	6,03	16,27	0,371
90	2,286	2,523	582,0	0,164	6,55	16,32	0,401
100	2,540	2,804	588,0	0,176	6,99	16,36	0,427
110	2,794	3,084	594,0	0,188	7,43	16,41	0,453
120	3,048	3,364	600,0	0,200	7,87	16,46	0,478
130	3,302	3,645	604,0	0,208	8,16	16,51	0,495
140	3,556	3,925	606,0	0,212	8,31	16,55	0,502
150	3,810	4,205	606,0	0,212	8,31	16,60	0,501
160	4,064	4,486	605,0	0,210	8,24	16,65	0,495
170	4,318	4,766	598,0	0,196	7,72	16,70	0,462
180	4,572	5,046	593,0	0,186	7,36	16,75	0,439
190	4,826	5,327	589,0	0,178	7,06	16,80	0,420



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 30.10.2014

Specimen ID: L3C3D21 (1)

Admixtures

Lime+cem (%): 3 + 3   Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 176,13

Wt. of can + Wt. of dry soil (gr) = 106,85

Wt. of can (gr) = 9,15

Water content, w (%) = 70,91

Proving Ring Info

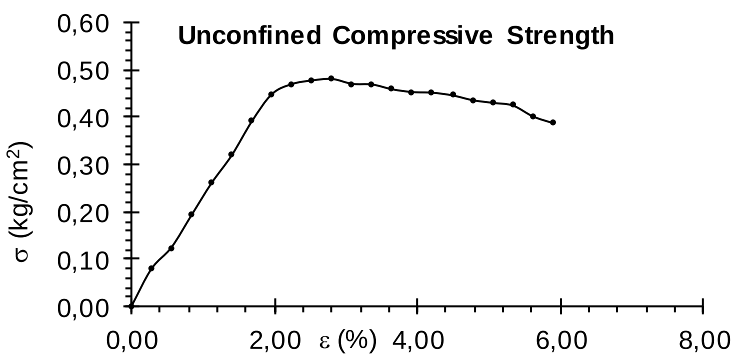
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	520,0	0,040	2,00	15,99	0,125
30	0,762	0,841	535,0	0,070	3,10	16,04	0,193
40	1,016	1,121	550,0	0,100	4,20	16,08	0,261
50	1,270	1,402	563,0	0,126	5,15	16,13	0,320
60	1,524	1,682	579,0	0,158	6,33	16,18	0,391
70	1,778	1,962	592,0	0,184	7,28	16,22	0,449
80	2,032	2,243	597,0	0,194	7,65	16,27	0,470
90	2,286	2,523	599,0	0,198	7,80	16,32	0,478
100	2,540	2,804	600,0	0,200	7,87	16,36	0,481
110	2,794	3,084	598,0	0,196	7,72	16,41	0,471
120	3,048	3,364	598,0	0,196	7,72	16,46	0,469
130	3,302	3,645	596,0	0,192	7,58	16,51	0,459
140	3,556	3,925	595,0	0,190	7,50	16,55	0,453
150	3,810	4,205	595,0	0,190	7,50	16,60	0,452
160	4,064	4,486	594,0	0,188	7,43	16,65	0,446
170	4,318	4,766	592,0	0,184	7,28	16,70	0,436
180	4,572	5,046	591,0	0,182	7,21	16,75	0,430
190	4,826	5,327	590,0	0,180	7,14	16,80	0,425
200	5,080	5,607	585,0	0,170	6,77	16,85	0,402
210	5,334	5,887	582,0	0,164	6,55	16,90	0,387



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 30.10.2014

Specimen ID: L3C3D21 (2)

Admixtures

Lime+cem (%): 3 + 3 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 152,16

Wt. of can + Wt. of dry soil (gr) = 92,30

Wt. of can (gr) = 9,45

Water content, w (%) = 72,25

Proving Ring Info

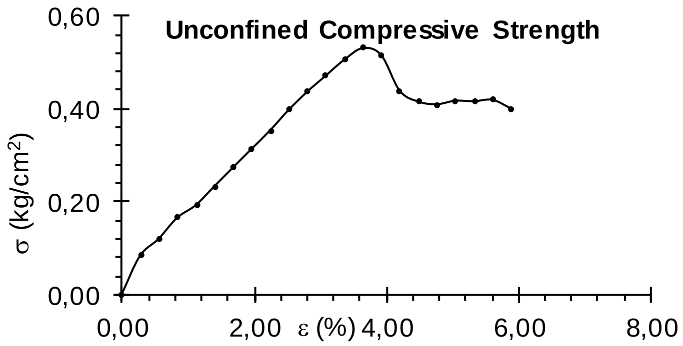
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	511,0	0,022	1,34	15,95	0,084
20	0,508	0,561	519,0	0,038	1,92	15,99	0,120
30	0,762	0,841	529,0	0,058	2,66	16,04	0,166
40	1,016	1,121	535,0	0,070	3,10	16,08	0,193
50	1,270	1,402	544,0	0,088	3,76	16,13	0,233
60	1,524	1,682	553,0	0,106	4,42	16,18	0,273
70	1,778	1,962	562,0	0,124	5,08	16,22	0,313
80	2,032	2,243	571,0	0,142	5,74	16,27	0,353
90	2,286	2,523	581,0	0,162	6,47	16,32	0,397
100	2,540	2,804	590,0	0,180	7,14	16,36	0,436
110	2,794	3,084	598,0	0,196	7,72	16,41	0,471
120	3,048	3,364	606,0	0,212	8,31	16,46	0,505
130	3,302	3,645	612,0	0,224	8,75	16,51	0,530
140	3,556	3,925	609,0	0,218	8,53	16,55	0,515
150	3,810	4,205	592,0	0,184	7,28	16,60	0,439
160	4,064	4,486	587,0	0,174	6,92	16,65	0,415
170	4,318	4,766	586,0	0,172	6,84	16,70	0,410
180	4,572	5,046	588,0	0,176	6,99	16,75	0,417
190	4,826	5,327	588,0	0,176	6,99	16,80	0,416
200	5,080	5,607	589,0	0,178	7,06	16,85	0,419
210	5,334	5,887	585,0	0,170	6,77	16,90	0,401



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C3D28 (1)

Admixtures

Lime+cem (%): 3 + 3 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 227,18

Wt. of can + Wt. of dry soil (gr) = 138,38

Wt. of can (gr) = 9,16

Water content, w (%) = 68,72

Proving Ring Info

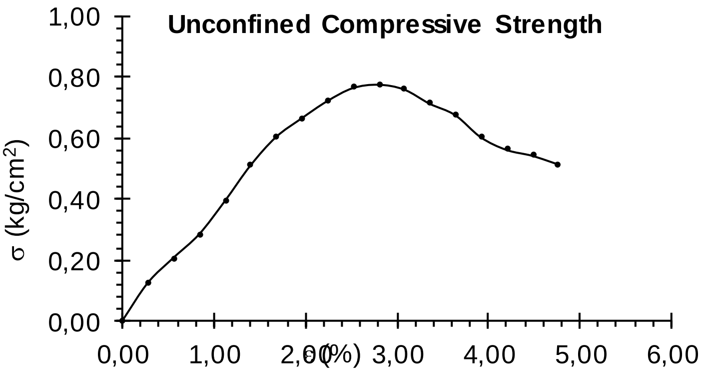
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	538,0	0,076	3,32	15,99	0,208
30	0,762	0,841	555,0	0,110	4,57	16,04	0,285
40	1,016	1,121	579,0	0,158	6,33	16,08	0,393
50	1,270	1,402	605,0	0,210	8,24	16,13	0,511
60	1,524	1,682	626,0	0,252	9,78	16,18	0,604
70	1,778	1,962	640,0	0,280	10,81	16,22	0,666
80	2,032	2,243	653,0	0,306	11,76	16,27	0,723
90	2,286	2,523	663,0	0,326	12,49	16,32	0,766
100	2,540	2,804	666,0	0,332	12,71	16,36	0,777
110	2,794	3,084	663,0	0,326	12,49	16,41	0,761
120	3,048	3,364	653,0	0,306	11,76	16,46	0,715
130	3,302	3,645	645,0	0,290	11,17	16,51	0,677
140	3,556	3,925	629,0	0,258	10,00	16,55	0,604
150	3,810	4,205	620,0	0,240	9,34	16,60	0,562
160	4,064	4,486	616,0	0,232	9,04	16,65	0,543
170	4,318	4,766	610,0	0,220	8,60	16,70	0,515



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C3D28 (2)

Admixtures

Lime+cem (%): 3 + 3 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 237,09

Wt. of can + Wt. of dry soil (gr) = 141,66

Wt. of can (gr) = 6,60

Water content, w (%) = 70,66

Proving Ring Info

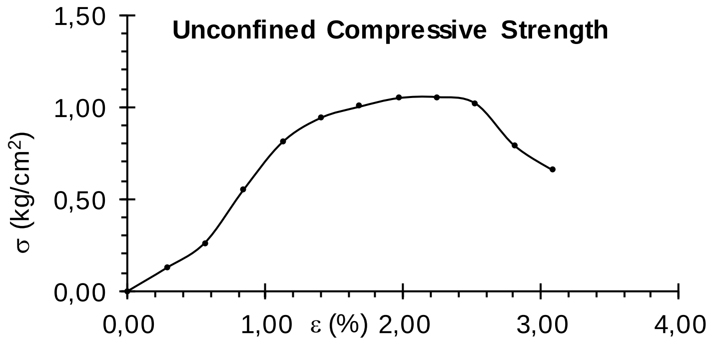
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	550,0	0,100	4,20	15,99	0,263
30	0,762	0,841	613,0	0,226	8,82	16,04	0,550
40	1,016	1,121	670,0	0,340	13,01	16,08	0,809
50	1,270	1,402	700,0	0,400	15,21	16,13	0,943
60	1,524	1,682	714,0	0,428	16,24	16,18	1,004
70	1,778	1,962	725,0	0,450	17,04	16,22	1,051
80	2,032	2,243	727,0	0,454	17,19	16,27	1,057
90	2,286	2,523	720,0	0,440	16,68	16,32	1,022
100	2,540	2,804	670,0	0,340	13,01	16,36	0,795
110	2,794	3,084	640,0	0,280	10,81	16,41	0,658



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L3C3D42 (1)

Admixtures

Lime+cem (%): 3+3 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 246,24

Wt. of can + Wt. of dry soil (gr) = 148,08

Wt. of can (gr) = 9,36

Water content, w (%) = 70,76

Proving Ring Info

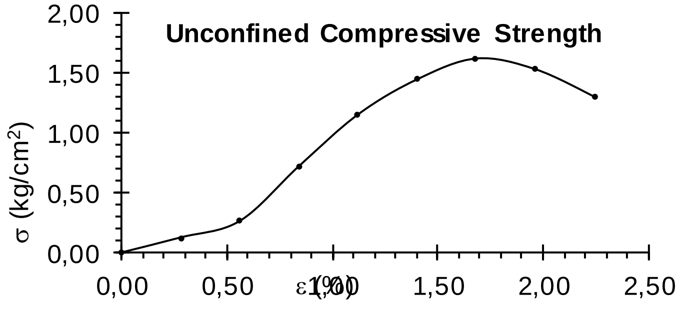
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	550,0	0,100	4,20	15,99	0,263
30	0,762	0,841	650,0	0,300	11,54	16,04	0,719
40	1,016	1,121	745,0	0,490	18,51	16,08	1,151
50	1,270	1,402	810,0	0,620	23,28	16,13	1,443
60	1,524	1,682	849,0	0,698	26,14	16,18	1,616
70	1,778	1,962	830,0	0,660	24,75	16,22	1,526
80	2,032	2,243	780,0	0,560	21,08	16,27	1,296



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L3C3D42 (2)

Admixtures

Lime+cem (%): 3+3 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,56

Wt. of can + Wt. of dry soil (gr) = 144,46

Wt. of can (gr) = 9,26

Water content, w (%) = 71,08

Proving Ring Info

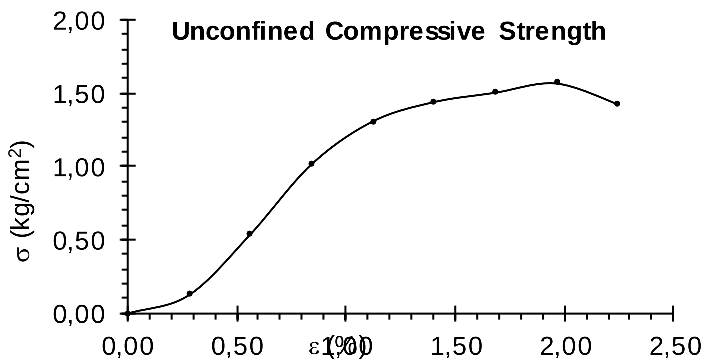
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	610,0	0,220	8,60	15,99	0,538
30	0,762	0,841	715,0	0,430	16,31	16,04	1,017
40	1,016	1,121	780,0	0,560	21,08	16,08	1,311
50	1,270	1,402	810,0	0,620	23,28	16,13	1,443
60	1,524	1,682	825,0	0,650	24,38	16,18	1,507
70	1,778	1,962	840,0	0,680	25,48	16,22	1,571
80	2,032	2,243	810,0	0,620	23,28	16,27	1,431



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L4,5C4,5D7(1)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 241,77

Wt. of can + Wt. of dry soil (gr) = 149,83

Wt. of can (gr) = 9,10

Water content, w (%) = 65,33

Proving Ring Info

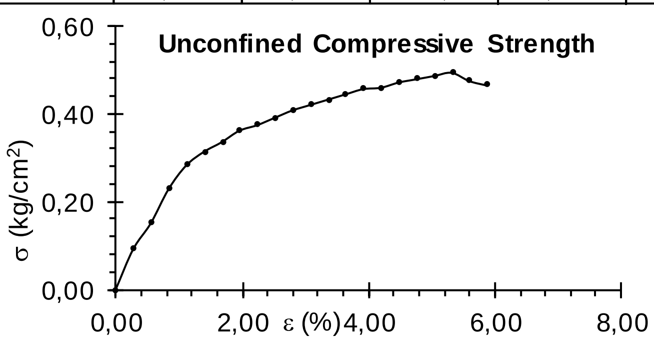
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	513,0	0,026	1,48	15,95	0,093
20	0,508	0,561	526,0	0,052	2,44	15,99	0,152
30	0,762	0,841	543,0	0,086	3,69	16,04	0,230
40	1,016	1,121	555,0	0,110	4,57	16,08	0,284
50	1,270	1,402	562,0	0,124	5,08	16,13	0,315
60	1,524	1,682	567,0	0,134	5,45	16,18	0,337
70	1,778	1,962	573,0	0,146	5,89	16,22	0,363
80	2,032	2,243	576,0	0,152	6,11	16,27	0,375
90	2,286	2,523	580,0	0,160	6,40	16,32	0,392
100	2,540	2,804	584,0	0,168	6,70	16,36	0,409
110	2,794	3,084	587,0	0,174	6,92	16,41	0,421
120	3,048	3,364	590,0	0,180	7,14	16,46	0,434
130	3,302	3,645	593,0	0,186	7,36	16,51	0,446
140	3,556	3,925	596,0	0,192	7,58	16,55	0,458
150	3,810	4,205	597,0	0,194	7,65	16,60	0,461
160	4,064	4,486	600,0	0,200	7,87	16,65	0,473
170	4,318	4,766	602,0	0,204	8,02	16,70	0,480
180	4,572	5,046	604,0	0,208	8,16	16,75	0,487
190	4,826	5,327	606,0	0,212	8,31	16,80	0,495
200	5,080	5,607	602,0	0,204	8,02	16,85	0,476
210	5,334	5,887	600,0	0,200	7,87	16,90	0,466



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 22.10.2014

Specimen ID: L4,5C4,5D7(2)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 243,28

Wt. of can + Wt. of dry soil (gr) = 150,42

Wt. of can (gr) = 6,60

Water content, w (%) = 64,57

Proving Ring Info

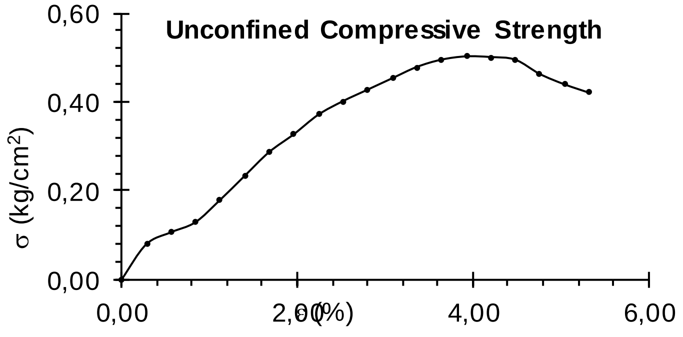
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	516,0	0,032	1,70	15,99	0,107
30	0,762	0,841	521,0	0,042	2,07	16,04	0,129
40	1,016	1,121	532,0	0,064	2,88	16,08	0,179
50	1,270	1,402	544,0	0,088	3,76	16,13	0,233
60	1,524	1,682	556,0	0,112	4,64	16,18	0,287
70	1,778	1,962	565,0	0,130	5,30	16,22	0,327
80	2,032	2,243	575,0	0,150	6,03	16,27	0,371
90	2,286	2,523	582,0	0,164	6,55	16,32	0,401
100	2,540	2,804	588,0	0,176	6,99	16,36	0,427
110	2,794	3,084	594,0	0,188	7,43	16,41	0,453
120	3,048	3,364	600,0	0,200	7,87	16,46	0,478
130	3,302	3,645	604,0	0,208	8,16	16,51	0,495
140	3,556	3,925	606,0	0,212	8,31	16,55	0,502
150	3,810	4,205	606,0	0,212	8,31	16,60	0,501
160	4,064	4,486	605,0	0,210	8,24	16,65	0,495
170	4,318	4,766	598,0	0,196	7,72	16,70	0,462
180	4,572	5,046	593,0	0,186	7,36	16,75	0,439
190	4,826	5,327	589,0	0,178	7,06	16,80	0,420



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 30.10.2014

Specimen ID: L4,5C4,5D14(1)

Admixtures

Lime+cem (%): 4,5 + 4,5   Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 206,45

Wt. of can + Wt. of dry soil (gr) = 128,29

Wt. of can (gr) = 9,26

Water content, w (%) = 65,66

Proving Ring Info

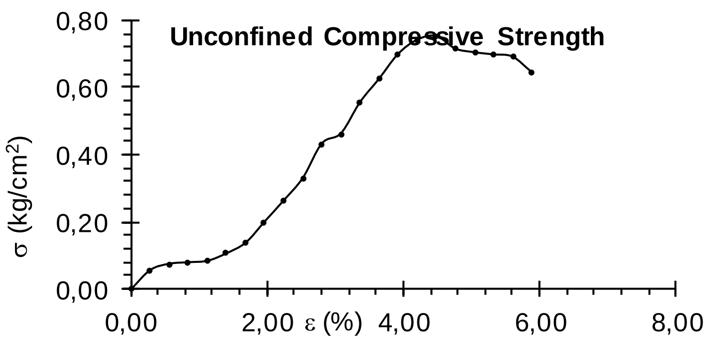
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	505,0	0,010	0,90	15,95	0,056
20	0,508	0,561	509,0	0,018	1,19	15,99	0,074
30	0,762	0,841	510,0	0,020	1,26	16,04	0,079
40	1,016	1,121	511,0	0,022	1,34	16,08	0,083
50	1,270	1,402	516,0	0,032	1,70	16,13	0,106
60	1,524	1,682	523,0	0,046	2,22	16,18	0,137
70	1,778	1,962	537,0	0,074	3,25	16,22	0,200
80	2,032	2,243	551,0	0,102	4,27	16,27	0,263
90	2,286	2,523	566,0	0,132	5,37	16,32	0,329
100	2,540	2,804	589,0	0,178	7,06	16,36	0,432
110	2,794	3,084	596,0	0,192	7,58	16,41	0,462
120	3,048	3,364	617,0	0,234	9,12	16,46	0,554
130	3,302	3,645	633,0	0,266	10,29	16,51	0,623
140	3,556	3,925	650,0	0,300	11,54	16,55	0,697
150	3,810	4,205	660,0	0,320	12,27	16,60	0,739
160	4,064	4,486	663,0	0,326	12,49	16,65	0,750
170	4,318	4,766	655,0	0,310	11,91	16,70	0,713
180	4,572	5,046	653,0	0,306	11,76	16,75	0,702
190	4,826	5,327	652,0	0,304	11,69	16,80	0,696
200	5,080	5,607	651,0	0,302	11,61	16,85	0,689
210	5,334	5,887	641,0	0,282	10,88	16,90	0,644



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 30.10.2014

Specimen ID: L4,5C4,5D14(2)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 14 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 167,51

Wt. of can + Wt. of dry soil (gr) = 103,22

Wt. of can (gr) = 6,58

Water content, w (%) = 66,53

Proving Ring Info

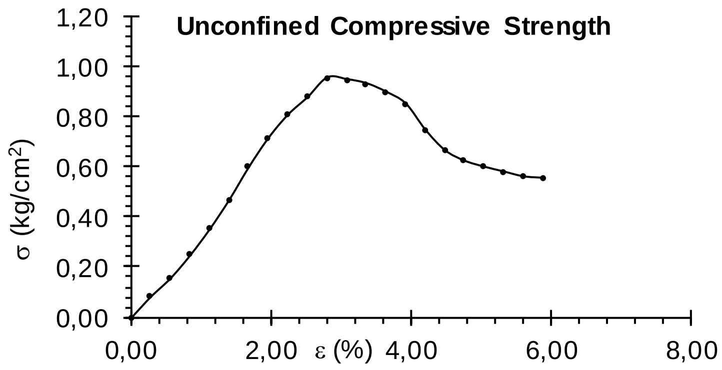
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	511,0	0,022	1,34	15,95	0,084
20	0,508	0,561	527,0	0,054	2,51	15,99	0,157
30	0,762	0,841	547,0	0,094	3,98	16,04	0,248
40	1,016	1,121	570,0	0,140	5,67	16,08	0,352
50	1,270	1,402	596,0	0,192	7,58	16,13	0,470
60	1,524	1,682	625,0	0,250	9,70	16,18	0,600
70	1,778	1,962	651,0	0,302	11,61	16,22	0,716
80	2,032	2,243	672,0	0,344	13,15	16,27	0,809
90	2,286	2,523	688,0	0,376	14,33	16,32	0,878
100	2,540	2,804	706,0	0,412	15,65	16,36	0,956
110	2,794	3,084	705,0	0,410	15,58	16,41	0,949
120	3,048	3,364	702,0	0,404	15,36	16,46	0,933
130	3,302	3,645	695,0	0,390	14,84	16,51	0,899
140	3,556	3,925	685,0	0,370	14,11	16,55	0,852
150	3,810	4,205	662,0	0,324	12,42	16,60	0,748
160	4,064	4,486	644,0	0,288	11,10	16,65	0,667
170	4,318	4,766	635,0	0,270	10,44	16,70	0,625
180	4,572	5,046	630,0	0,260	10,07	16,75	0,601
190	4,826	5,327	626,0	0,252	9,78	16,80	0,582
200	5,080	5,607	622,0	0,244	9,48	16,85	0,563
210	5,334	5,887	621,0	0,242	9,41	16,90	0,557



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4,5C4,5D21(1)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 242,70

Wt. of can + Wt. of dry soil (gr) = 151,28

Wt. of can (gr) = 9,25

Water content, w (%) = 64,37

Proving Ring Info

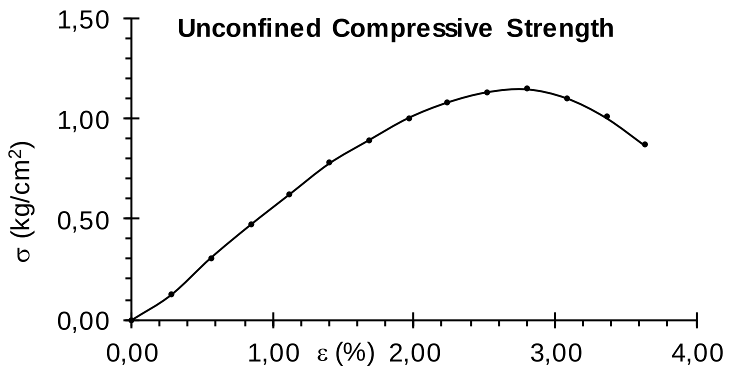
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	560,0	0,120	4,93	15,99	0,308
30	0,762	0,841	596,0	0,192	7,58	16,04	0,472
40	1,016	1,121	630,0	0,260	10,07	16,08	0,626
50	1,270	1,402	664,0	0,328	12,57	16,13	0,779
60	1,524	1,682	690,0	0,380	14,47	16,18	0,895
70	1,778	1,962	715,0	0,430	16,31	16,22	1,005
80	2,032	2,243	733,0	0,466	17,63	16,27	1,084
90	2,286	2,523	745,0	0,490	18,51	16,32	1,135
100	2,540	2,804	749,0	0,498	18,81	16,36	1,149
110	2,794	3,084	740,0	0,480	18,14	16,41	1,106
120	3,048	3,364	719,0	0,438	16,60	16,46	1,009
130	3,302	3,645	688,0	0,376	14,33	16,51	0,868



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4,5C4,5D21(2)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 235,62

Wt. of can + Wt. of dry soil (gr) = 146,69

Wt. of can (gr) = 9,07

Water content, w (%) = 64,62

Proving Ring Info

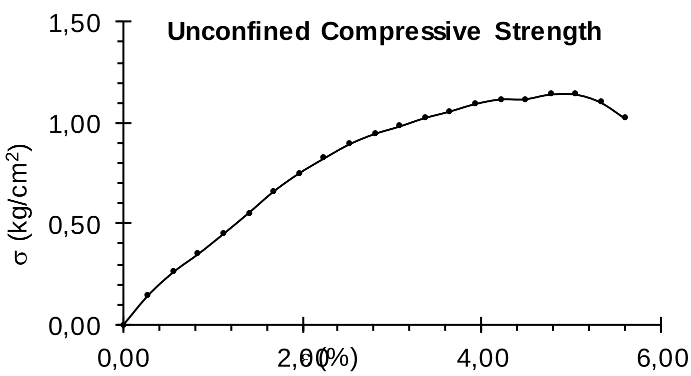
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	525,0	0,050	2,36	15,95	0,148
20	0,508	0,561	550,0	0,100	4,20	15,99	0,263
30	0,762	0,841	570,0	0,140	5,67	16,04	0,353
40	1,016	1,121	592,0	0,184	7,28	16,08	0,453
50	1,270	1,402	615,0	0,230	8,97	16,13	0,556
60	1,524	1,682	639,0	0,278	10,73	16,18	0,663
70	1,778	1,962	659,0	0,318	12,20	16,22	0,752
80	2,032	2,243	676,0	0,352	13,45	16,27	0,827
90	2,286	2,523	692,0	0,384	14,62	16,32	0,896
100	2,540	2,804	704,0	0,408	15,50	16,36	0,947
110	2,794	3,084	713,0	0,426	16,16	16,41	0,985
120	3,048	3,364	723,0	0,446	16,90	16,46	1,027
130	3,302	3,645	731,0	0,462	17,48	16,51	1,059
140	3,556	3,925	740,0	0,480	18,14	16,55	1,096
150	3,810	4,205	746,0	0,492	18,58	16,60	1,119
160	4,064	4,486	747,0	0,494	18,66	16,65	1,121
170	4,318	4,766	753,0	0,506	19,10	16,70	1,144
180	4,572	5,046	754,0	0,508	19,17	16,75	1,145
190	4,826	5,327	746,0	0,492	18,58	16,80	1,106
200	5,080	5,607	728,0	0,456	17,26	16,85	1,025



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4,5C4,5D28(1)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 249,50

Wt. of can + Wt. of dry soil (gr) = 154,90

Wt. of can (gr) = 10,42

Water content, w (%) = 65,48

Proving Ring Info

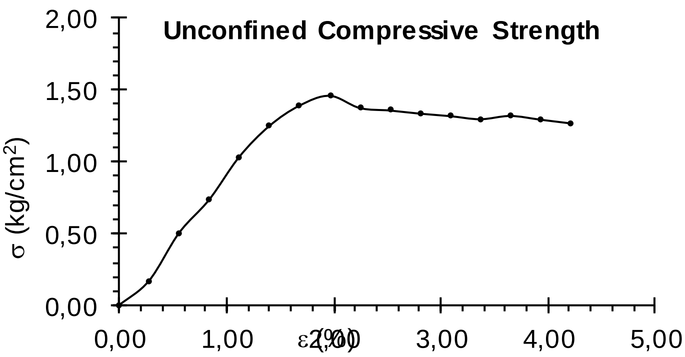
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	530,0	0,060	2,73	15,95	0,171
20	0,508	0,561	603,0	0,206	8,09	15,99	0,506
30	0,762	0,841	654,0	0,308	11,83	16,04	0,738
40	1,016	1,121	720,0	0,440	16,68	16,08	1,037
50	1,270	1,402	768,0	0,536	20,20	16,13	1,252
60	1,524	1,682	800,0	0,600	22,55	16,18	1,394
70	1,778	1,962	816,0	0,632	23,72	16,22	1,462
80	2,032	2,243	798,0	0,596	22,40	16,27	1,377
90	2,286	2,523	795,0	0,590	22,18	16,32	1,359
100	2,540	2,804	791,0	0,582	21,89	16,36	1,338
110	2,794	3,084	788,0	0,576	21,67	16,41	1,320
120	3,048	3,364	784,0	0,568	21,37	16,46	1,299
130	3,302	3,645	790,0	0,580	21,81	16,51	1,322
140	3,556	3,925	785,0	0,570	21,45	16,55	1,296
150	3,810	4,205	780,0	0,560	21,08	16,60	1,270



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4,5C4,5D28(2)

Admixtures

Lime+cem (%): 4,5 + 4,5   Curing period (days): 28 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 199,37

Wt. of can + Wt. of dry soil (gr) = 124,90

Wt. of can (gr) = 9,36

Water content, w (%) = 64,45

Proving Ring Info

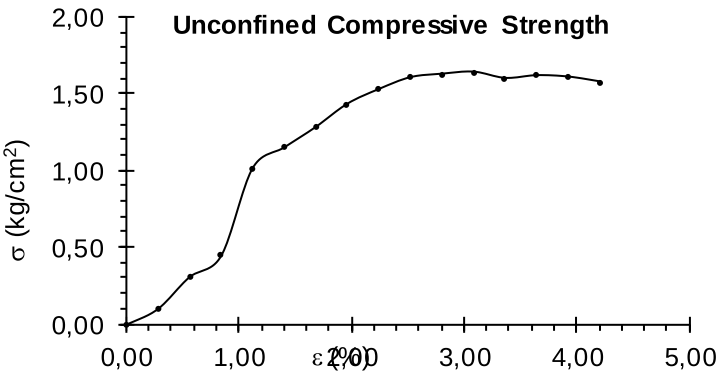
Ring No: 5789

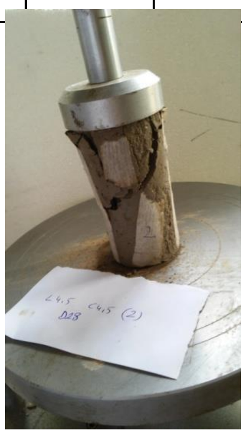
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	515,0	0,030	1,63	15,95	0,102
20	0,508	0,561	560,0	0,120	4,93	15,99	0,308
30	0,762	0,841	590,0	0,180	7,14	16,04	0,445
40	1,016	1,121	715,0	0,430	16,31	16,08	1,014
50	1,270	1,402	745,0	0,490	18,51	16,13	1,148
60	1,524	1,682	775,0	0,550	20,71	16,18	1,280
70	1,778	1,962	809,0	0,618	23,21	16,22	1,431
80	2,032	2,243	831,0	0,662	24,82	16,27	1,526
90	2,286	2,523	849,0	0,698	26,14	16,32	1,602
100	2,540	2,804	855,0	0,710	26,58	16,36	1,625
110	2,794	3,084	859,0	0,718	26,88	16,41	1,638
120	3,048	3,364	851,0	0,702	26,29	16,46	1,597
130	3,302	3,645	856,0	0,712	26,66	16,51	1,615
140	3,556	3,925	855,0	0,710	26,58	16,55	1,606
150	3,810	4,205	849,0	0,698	26,14	16,60	1,575





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4,5C4,5D42(1)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 239,97

Wt. of can + Wt. of dry soil (gr) = 145,78

Wt. of can (gr) = 9,33

Water content, w (%) = 69,03

Proving Ring Info

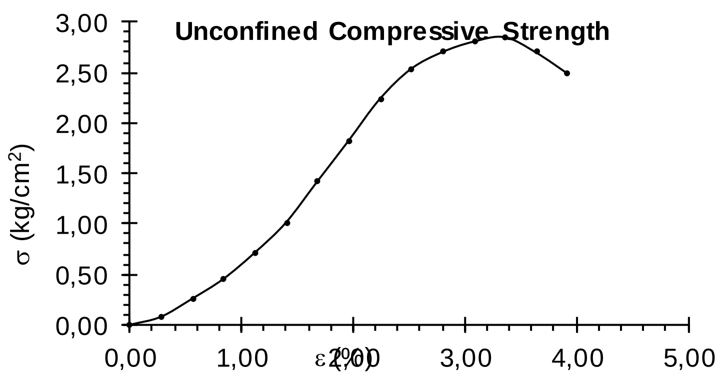
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	549,0	0,098	4,13	15,99	0,258
30	0,762	0,841	592,0	0,184	7,28	16,04	0,454
40	1,016	1,121	649,0	0,298	11,47	16,08	0,713
50	1,270	1,402	715,0	0,430	16,31	16,13	1,011
60	1,524	1,682	805,0	0,610	22,92	16,18	1,417
70	1,778	1,962	895,0	0,790	29,52	16,22	1,820
80	2,032	2,243	988,0	0,976	36,35	16,27	2,234
90	2,286	2,523	1056,0	1,112	41,34	16,32	2,534
100	2,540	2,804	1095,0	1,190	44,20	16,36	2,701
110	2,794	3,084	1120,0	1,240	46,03	16,41	2,805
120	3,048	3,364	1132,0	1,264	46,92	16,46	2,851
130	3,302	3,645	1100,0	1,200	44,57	16,51	2,700
140	3,556	3,925	1055,0	1,110	41,26	16,55	2,493



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4,5C4,5D42(2)

Admixtures

Lime+cem (%): 4,5 + 4,5 Curing period (days): 42 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 241,64

Wt. of can + Wt. of dry soil (gr) = 145,88

Wt. of can (gr) = 9,25

Water content, w (%) = 70,09

Proving Ring Info

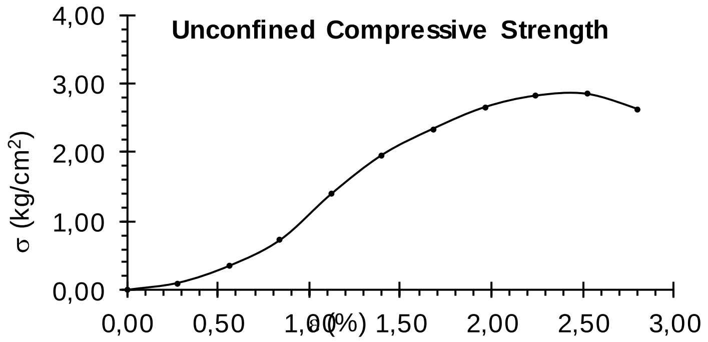
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	515,0	0,030	1,63	15,95	0,102
20	0,508	0,561	569,0	0,138	5,59	15,99	0,350
30	0,762	0,841	652,0	0,304	11,69	16,04	0,729
40	1,016	1,121	799,0	0,598	22,47	16,08	1,397
50	1,270	1,402	925,0	0,850	31,72	16,13	1,967
60	1,524	1,682	1010,0	1,020	37,96	16,18	2,347
70	1,778	1,962	1080,0	1,160	43,10	16,22	2,657
80	2,032	2,243	1119,0	1,238	45,96	16,27	2,825
90	2,286	2,523	1127,0	1,254	46,55	16,32	2,853
100	2,540	2,804	1080,0	1,160	43,10	16,36	2,634



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L2C4D7(1)

Admixtures

Lime+cem (%): 2 + 4   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,30

Wt. of can + Wt. of dry soil (gr) = 145,88

Wt. of can (gr) = 9,25

Water content, w (%) = 69,11

Proving Ring Info

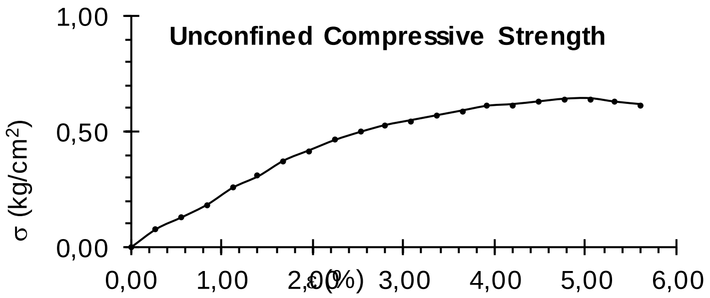
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	521,0	0,042	2,07	15,99	0,130
30	0,762	0,841	533,0	0,066	2,95	16,04	0,184
40	1,016	1,121	549,0	0,098	4,13	16,08	0,257
50	1,270	1,402	560,0	0,120	4,93	16,13	0,306
60	1,524	1,682	575,0	0,150	6,03	16,18	0,373
70	1,778	1,962	585,0	0,170	6,77	16,22	0,417
80	2,032	2,243	595,0	0,190	7,50	16,27	0,461
90	2,286	2,523	603,0	0,206	8,09	16,32	0,496
100	2,540	2,804	610,0	0,220	8,60	16,36	0,526
110	2,794	3,084	615,0	0,230	8,97	16,41	0,547
120	3,048	3,364	620,0	0,240	9,34	16,46	0,567
130	3,302	3,645	625,0	0,250	9,70	16,51	0,588
140	3,556	3,925	630,0	0,260	10,07	16,55	0,608
150	3,810	4,205	632,0	0,264	10,22	16,60	0,615
160	4,064	4,486	635,0	0,270	10,44	16,65	0,627
170	4,318	4,766	638,0	0,276	10,66	16,70	0,638
180	4,572	5,046	639,0	0,278	10,73	16,75	0,641
190	4,826	5,327	636,0	0,272	10,51	16,80	0,626
200	5,080	5,607	634,0	0,268	10,36	16,85	0,615



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L2C4D7(2)

Admixtures

Lime+cem (%): 2 + 4   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 241,64

Wt. of can + Wt. of dry soil (gr) = 148,21

Wt. of can (gr) = 9,25

Water content, w (%) = 67,24

Proving Ring Info

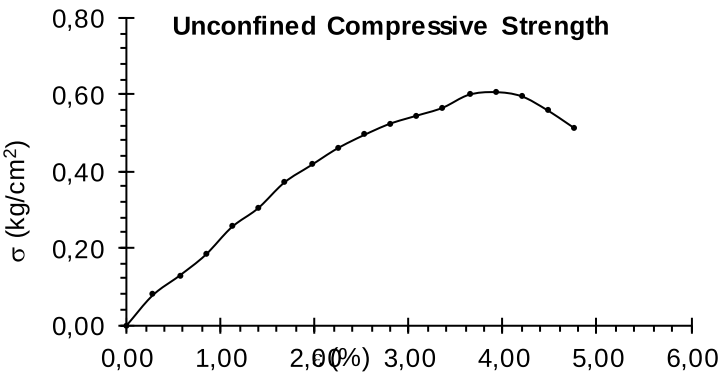
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	521,0	0,042	2,07	15,99	0,130
30	0,762	0,841	533,0	0,066	2,95	16,04	0,184
40	1,016	1,121	549,0	0,098	4,13	16,08	0,257
50	1,270	1,402	560,0	0,120	4,93	16,13	0,306
60	1,524	1,682	575,0	0,150	6,03	16,18	0,373
70	1,778	1,962	585,0	0,170	6,77	16,22	0,417
80	2,032	2,243	595,0	0,190	7,50	16,27	0,461
90	2,286	2,523	603,0	0,206	8,09	16,32	0,496
100	2,540	2,804	610,0	0,220	8,60	16,36	0,526
110	2,794	3,084	615,0	0,230	8,97	16,41	0,547
120	3,048	3,364	620,0	0,240	9,34	16,46	0,567
130	3,302	3,645	628,0	0,256	9,92	16,51	0,601
140	3,556	3,925	630,0	0,260	10,07	16,55	0,608
150	3,810	4,205	628,0	0,256	9,92	16,60	0,598
160	4,064	4,486	620,0	0,240	9,34	16,65	0,561
170	4,318	4,766	610,0	0,220	8,60	16,70	0,515



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L2C4D21(1)

Admixtures

Lime+cem (%): 2 + 4 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 247,89

Wt. of can + Wt. of dry soil (gr) = 148,29

Wt. of can (gr) = 9,25

Water content, w (%) = 71,63

Proving Ring Info

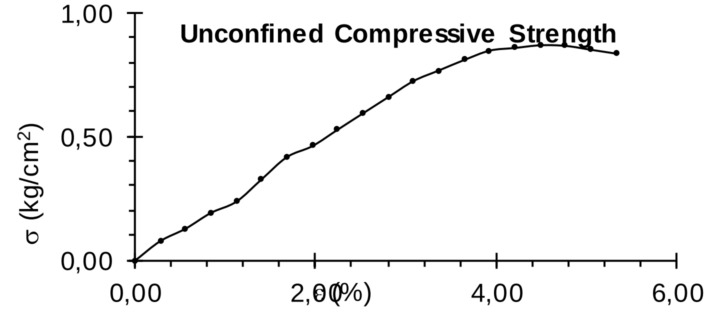
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	521,0	0,042	2,07	15,99	0,130
30	0,762	0,841	535,0	0,070	3,10	16,04	0,193
40	1,016	1,121	545,0	0,090	3,83	16,08	0,238
50	1,270	1,402	565,0	0,130	5,30	16,13	0,329
60	1,524	1,682	585,0	0,170	6,77	16,18	0,418
70	1,778	1,962	595,0	0,190	7,50	16,22	0,462
80	2,032	2,243	610,0	0,220	8,60	16,27	0,529
90	2,286	2,523	625,0	0,250	9,70	16,32	0,595
100	2,540	2,804	640,0	0,280	10,81	16,36	0,660
110	2,794	3,084	655,0	0,310	11,91	16,41	0,726
120	3,048	3,364	665,0	0,330	12,64	16,46	0,768
130	3,302	3,645	675,0	0,350	13,37	16,51	0,810
140	3,556	3,925	684,0	0,368	14,03	16,55	0,848
150	3,810	4,205	687,0	0,374	14,25	16,60	0,859
160	4,064	4,486	690,0	0,380	14,47	16,65	0,869
170	4,318	4,766	690,0	0,380	14,47	16,70	0,867
180	4,572	5,046	687,0	0,374	14,25	16,75	0,851
190	4,826	5,327	684,0	0,368	14,03	16,80	0,835



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L2C4D21(2)

Admixtures

Lime+cem (%): 2 + 4 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 241,89

Wt. of can + Wt. of dry soil (gr) = 147,40

Wt. of can (gr) = 9,25

Water content, w (%) = 68,40

Proving Ring Info

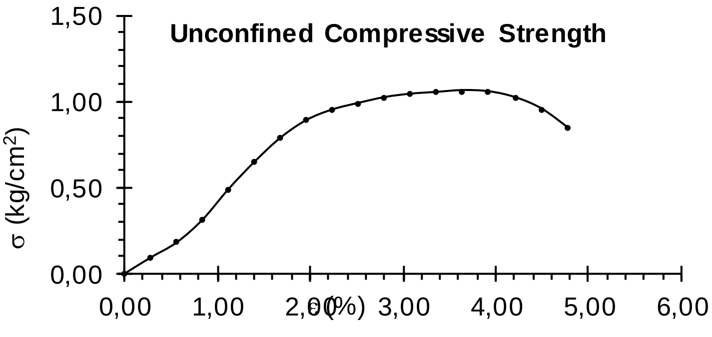
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	513,0	0,026	1,48	15,95	0,093
20	0,508	0,561	532,0	0,064	2,88	15,99	0,180
30	0,762	0,841	561,0	0,122	5,01	16,04	0,312
40	1,016	1,121	600,0	0,200	7,87	16,08	0,489
50	1,270	1,402	635,0	0,270	10,44	16,13	0,647
60	1,524	1,682	666,0	0,332	12,71	16,18	0,786
70	1,778	1,962	689,0	0,378	14,40	16,22	0,888
80	2,032	2,243	703,0	0,406	15,43	16,27	0,948
90	2,286	2,523	712,0	0,424	16,09	16,32	0,986
100	2,540	2,804	720,0	0,440	16,68	16,36	1,019
110	2,794	3,084	725,0	0,450	17,04	16,41	1,039
120	3,048	3,364	728,0	0,456	17,26	16,46	1,049
130	3,302	3,645	731,0	0,462	17,48	16,51	1,059
140	3,556	3,925	730,0	0,460	17,41	16,55	1,052
150	3,810	4,205	723,0	0,446	16,90	16,60	1,018
160	4,064	4,486	709,0	0,418	15,87	16,65	0,953
170	4,318	4,766	685,0	0,370	14,11	16,70	0,845



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4C2D7(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,32

Wt. of can + Wt. of dry soil (gr) = 145,17

Wt. of can (gr) = 9,25

Water content, w (%) = 70,00

Proving Ring Info

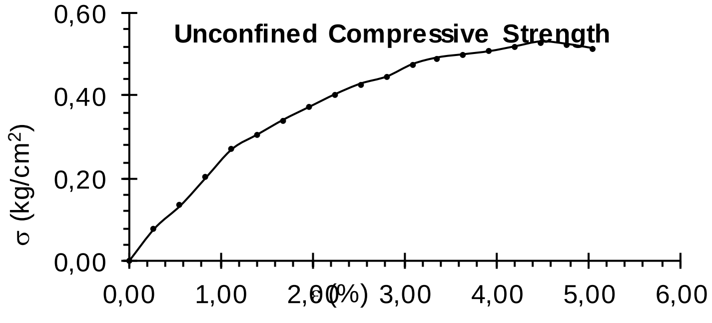
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	522,0	0,044	2,14	15,99	0,134
30	0,762	0,841	537,0	0,074	3,25	16,04	0,202
40	1,016	1,121	552,0	0,104	4,35	16,08	0,270
50	1,270	1,402	560,0	0,120	4,93	16,13	0,306
60	1,524	1,682	568,0	0,136	5,52	16,18	0,341
70	1,778	1,962	575,0	0,150	6,03	16,22	0,372
80	2,032	2,243	582,0	0,164	6,55	16,27	0,402
90	2,286	2,523	588,0	0,176	6,99	16,32	0,428
100	2,540	2,804	592,0	0,184	7,28	16,36	0,445
110	2,794	3,084	599,0	0,198	7,80	16,41	0,475
120	3,048	3,364	603,0	0,206	8,09	16,46	0,492
130	3,302	3,645	605,0	0,210	8,24	16,51	0,499
140	3,556	3,925	607,0	0,214	8,38	16,55	0,506
150	3,810	4,205	610,0	0,220	8,60	16,60	0,518
160	4,064	4,486	613,0	0,226	8,82	16,65	0,530
170	4,318	4,766	612,0	0,224	8,75	16,70	0,524
180	4,572	5,046	610,0	0,220	8,60	16,75	0,514



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4C2D7(2)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,65

Wt. of can + Wt. of dry soil (gr) = 135,98

Wt. of can (gr) = 9,25

Water content, w (%) = 67,60

Proving Ring Info

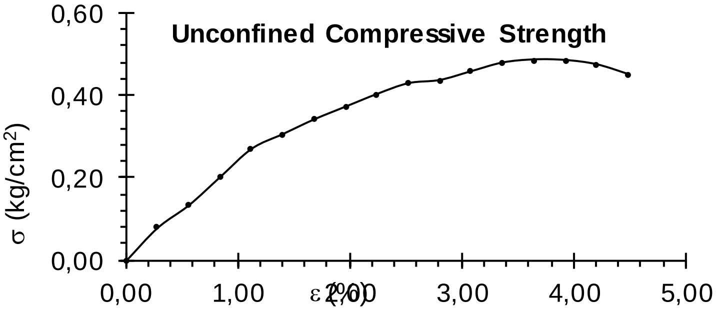
Ring No: 5789

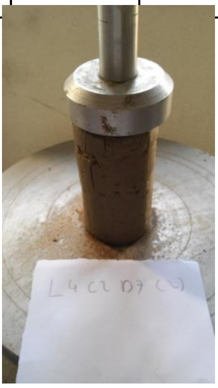
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	522,0	0,044	2,14	15,99	0,134
30	0,762	0,841	537,0	0,074	3,25	16,04	0,202
40	1,016	1,121	552,0	0,104	4,35	16,08	0,270
50	1,270	1,402	560,0	0,120	4,93	16,13	0,306
60	1,524	1,682	568,0	0,136	5,52	16,18	0,341
70	1,778	1,962	575,0	0,150	6,03	16,22	0,372
80	2,032	2,243	582,0	0,164	6,55	16,27	0,402
90	2,286	2,523	588,0	0,176	6,99	16,32	0,428
100	2,540	2,804	590,0	0,180	7,14	16,36	0,436
110	2,794	3,084	595,0	0,190	7,50	16,41	0,457
120	3,048	3,364	600,0	0,200	7,87	16,46	0,478
130	3,302	3,645	602,0	0,204	8,02	16,51	0,486
140	3,556	3,925	602,0	0,204	8,02	16,55	0,484
150	3,810	4,205	600,0	0,200	7,87	16,60	0,474
160	4,064	4,486	595,0	0,190	7,50	16,65	0,451





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4C2D21(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 21days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,05

Wt. of can + Wt. of dry soil (gr) = 133,24

Wt. of can (gr) = 9,25

Water content, w (%) = 70,82

Proving Ring Info

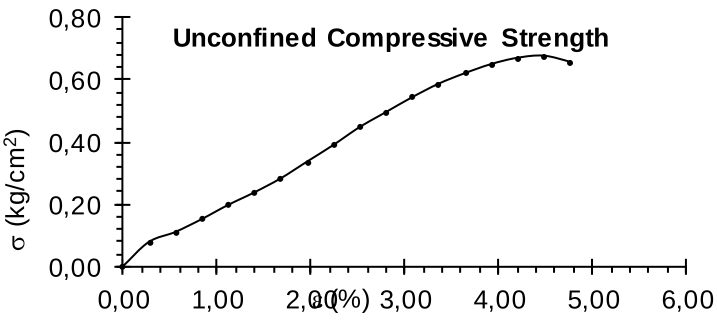
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	517,0	0,034	1,78	15,99	0,111
30	0,762	0,841	526,0	0,052	2,44	16,04	0,152
40	1,016	1,121	536,0	0,072	3,17	16,08	0,197
50	1,270	1,402	545,0	0,090	3,83	16,13	0,238
60	1,524	1,682	555,0	0,110	4,57	16,18	0,282
70	1,778	1,962	567,0	0,134	5,45	16,22	0,336
80	2,032	2,243	579,0	0,158	6,33	16,27	0,389
90	2,286	2,523	592,0	0,184	7,28	16,32	0,446
100	2,540	2,804	603,0	0,206	8,09	16,36	0,494
110	2,794	3,084	614,0	0,228	8,90	16,41	0,542
120	3,048	3,364	624,0	0,248	9,63	16,46	0,585
130	3,302	3,645	632,0	0,264	10,22	16,51	0,619
140	3,556	3,925	639,0	0,278	10,73	16,55	0,648
150	3,810	4,205	644,0	0,288	11,10	16,60	0,668
160	4,064	4,486	646,0	0,292	11,25	16,65	0,675
170	4,318	4,766	642,0	0,284	10,95	16,70	0,656



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Specimen ID: L4C2D21(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 21 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,79

Wt. of can + Wt. of dry soil (gr) = 135,08

Wt. of can (gr) = 9,25

Water content, w (%) = 68,91

Proving Ring Info

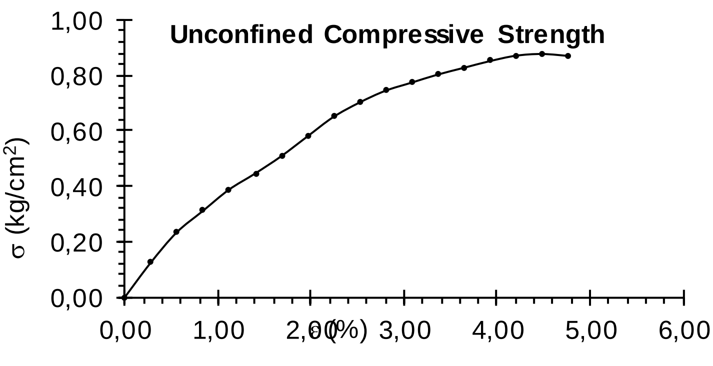
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	520,0	0,040	2,00	15,95	0,125
20	0,508	0,561	544,0	0,088	3,76	15,99	0,235
30	0,762	0,841	561,0	0,122	5,01	16,04	0,312
40	1,016	1,121	578,0	0,156	6,25	16,08	0,389
50	1,270	1,402	591,0	0,182	7,21	16,13	0,447
60	1,524	1,682	605,0	0,210	8,24	16,18	0,509
70	1,778	1,962	621,0	0,242	9,41	16,22	0,580
80	2,032	2,243	637,0	0,274	10,58	16,27	0,651
90	2,286	2,523	649,0	0,298	11,47	16,32	0,703
100	2,540	2,804	659,0	0,318	12,20	16,36	0,746
110	2,794	3,084	666,0	0,332	12,71	16,41	0,775
120	3,048	3,364	673,0	0,346	13,23	16,46	0,804
130	3,302	3,645	679,0	0,358	13,67	16,51	0,828
140	3,556	3,925	685,0	0,370	14,11	16,55	0,852
150	3,810	4,205	690,0	0,380	14,47	16,60	0,872
160	4,064	4,486	692,0	0,384	14,62	16,65	0,878
170	4,318	4,766	691,0	0,382	14,55	16,70	0,871



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D14(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 222,79

Wt. of can + Wt. of dry soil (gr) = 135,08

Wt. of can (gr) = 9,25

Water content, w (%) = 69,71

Proving Ring Info

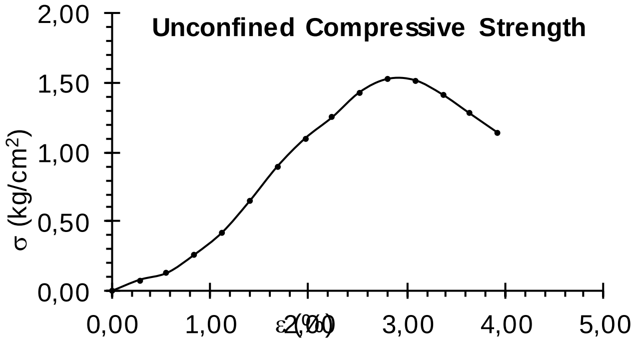
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	521,0	0,042	2,07	15,99	0,130
30	0,762	0,841	550,0	0,100	4,20	16,04	0,262
40	1,016	1,121	585,0	0,170	6,77	16,08	0,421
50	1,270	1,402	635,0	0,270	10,44	16,13	0,647
60	1,524	1,682	690,0	0,380	14,47	16,18	0,895
70	1,778	1,962	735,0	0,470	17,78	16,22	1,096
80	2,032	2,243	770,0	0,540	20,35	16,27	1,251
90	2,286	2,523	811,0	0,622	23,36	16,32	1,431
100	2,540	2,804	833,0	0,666	24,97	16,36	1,526
110	2,794	3,084	832,0	0,664	24,90	16,41	1,517
120	3,048	3,364	810,0	0,620	23,28	16,46	1,415
130	3,302	3,645	780,0	0,560	21,08	16,51	1,277
140	3,556	3,925	750,0	0,500	18,88	16,55	1,140



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D14(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

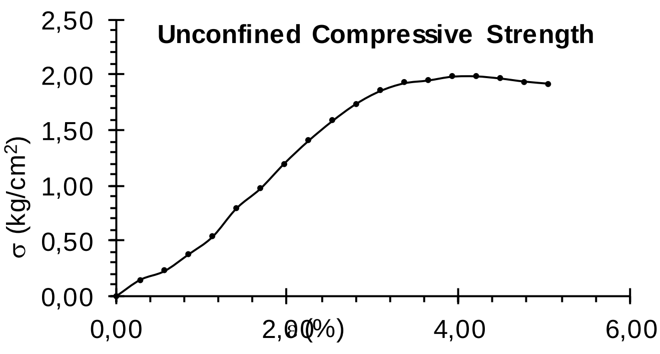
Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 223,99
Wt. of can + Wt. of dry soil (gr) = 136,01
Wt. of can (gr) = 9,25
Water content, w (%) = 69,41

Proving Ring Info

Ring No: 5789
Y = ax + b (Y: load in kg, x: def. in mm)
a = 36,6970
b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	525,0	0,050	2,36	15,95	0,148
20	0,508	0,561	542,0	0,084	3,61	15,99	0,226
30	0,762	0,841	575,0	0,150	6,03	16,04	0,376
40	1,016	1,121	610,0	0,220	8,60	16,08	0,535
50	1,270	1,402	667,0	0,334	12,79	16,13	0,793
60	1,524	1,682	707,0	0,414	15,72	16,18	0,972
70	1,778	1,962	758,0	0,516	19,47	16,22	1,200
80	2,032	2,243	804,0	0,608	22,84	16,27	1,404
90	2,286	2,523	845,0	0,690	25,85	16,32	1,584
100	2,540	2,804	881,0	0,762	28,49	16,36	1,741
110	2,794	3,084	908,0	0,816	30,47	16,41	1,857
120	3,048	3,364	925,0	0,850	31,72	16,46	1,927
130	3,302	3,645	932,0	0,864	32,24	16,51	1,953
140	3,556	3,925	941,0	0,882	32,90	16,55	1,987
150	3,810	4,205	943,0	0,886	33,04	16,60	1,990
160	4,064	4,486	940,0	0,880	32,82	16,65	1,971
170	4,318	4,766	935,0	0,870	32,46	16,70	1,943
180	4,572	5,046	932,0	0,864	32,24	16,75	1,925



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D14(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,99

Wt. of can + Wt. of dry soil (gr) = 133,54

Wt. of can (gr) = 9,25

Water content, w (%) = 71,16

Proving Ring Info

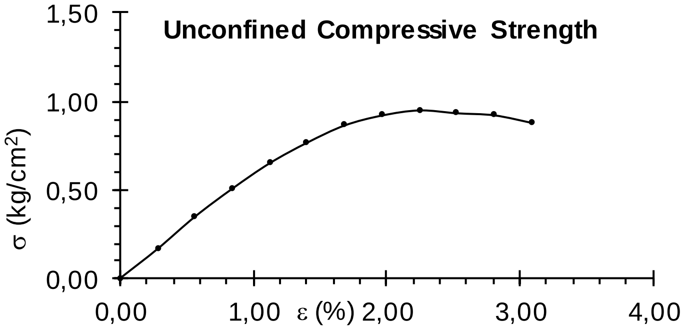
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	529,0	0,058	2,66	15,95	0,167
20	0,508	0,561	569,0	0,138	5,59	15,99	0,350
30	0,762	0,841	604,0	0,208	8,16	16,04	0,509
40	1,016	1,121	636,0	0,272	10,51	16,08	0,654
50	1,270	1,402	662,0	0,324	12,42	16,13	0,770
60	1,524	1,682	684,0	0,368	14,03	16,18	0,868
70	1,778	1,962	697,0	0,394	14,99	16,22	0,924
80	2,032	2,243	704,0	0,408	15,50	16,27	0,953
90	2,286	2,523	701,0	0,402	15,28	16,32	0,937
100	2,540	2,804	699,0	0,398	15,14	16,36	0,925
110	2,794	3,084	690,0	0,380	14,47	16,41	0,882



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D14(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 223,99

Wt. of can + Wt. of dry soil (gr) = 136,01

Wt. of can (gr) = 9,25

Water content, w (%) = 69,41

Proving Ring Info

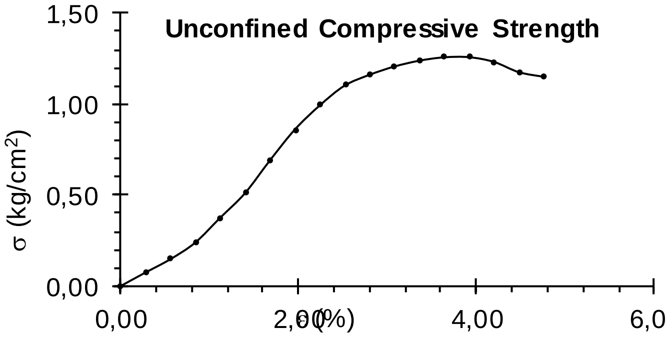
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	509,0	0,018	1,19	15,95	0,075
20	0,508	0,561	525,0	0,050	2,36	15,99	0,148
30	0,762	0,841	545,0	0,090	3,83	16,04	0,239
40	1,016	1,121	575,0	0,150	6,03	16,08	0,375
50	1,270	1,402	605,0	0,210	8,24	16,13	0,511
60	1,524	1,682	645,0	0,290	11,17	16,18	0,691
70	1,778	1,962	683,0	0,366	13,96	16,22	0,861
80	2,032	2,243	713,0	0,426	16,16	16,27	0,993
90	2,286	2,523	738,0	0,476	18,00	16,32	1,103
100	2,540	2,804	752,0	0,504	19,03	16,36	1,163
110	2,794	3,084	763,0	0,526	19,83	16,41	1,209
120	3,048	3,364	771,0	0,542	20,42	16,46	1,241
130	3,302	3,645	776,0	0,552	20,79	16,51	1,259
140	3,556	3,925	777,0	0,554	20,86	16,55	1,260
150	3,810	4,205	772,0	0,544	20,49	16,60	1,234
160	4,064	4,486	760,0	0,520	19,61	16,65	1,178
170	4,318	4,766	755,0	0,510	19,25	16,70	1,152



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L2C4D28(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 234,99

Wt. of can + Wt. of dry soil (gr) = 142,01

Wt. of can (gr) = 9,45

Water content, w (%) = 70,14

Proving Ring Info

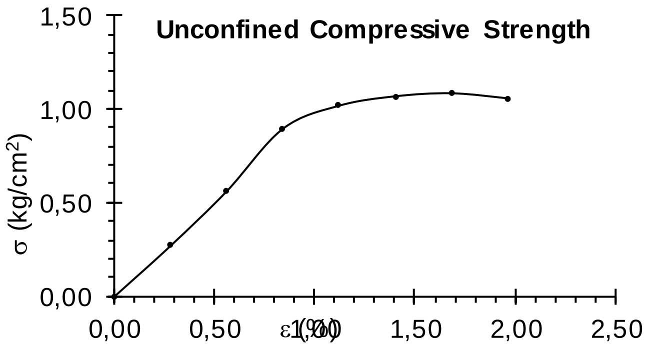
Ring No: 5737

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	145,0	0,090	4,32	15,95	0,271
20	0,508	0,561	205,0	0,210	8,99	15,99	0,562
30	0,762	0,841	274,0	0,348	14,36	16,04	0,895
40	1,016	1,121	300,0	0,400	16,38	16,08	1,018
50	1,270	1,402	311,0	0,422	17,24	16,13	1,069
60	1,524	1,682	315,0	0,430	17,55	16,18	1,085
70	1,778	1,962	310,0	0,420	17,16	16,22	1,058



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L2C4D28(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 245,99

Wt. of can + Wt. of dry soil (gr) = 149,01

Wt. of can (gr) = 9,45

Water content, w (%) = 69,49

Proving Ring Info

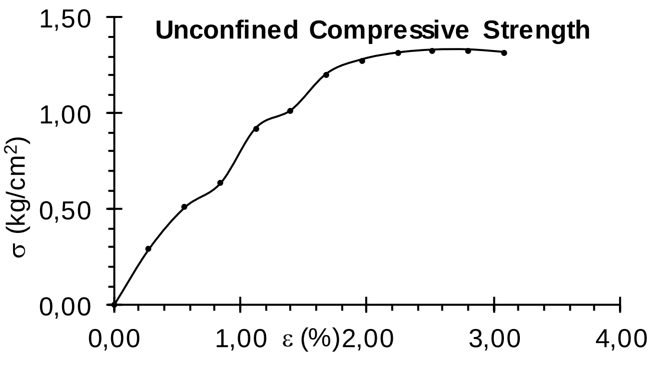
Ring No: 5737

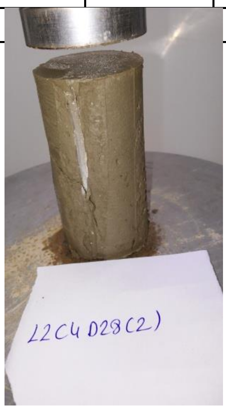
Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	150,0	0,100	4,71	15,95	0,295
20	0,508	0,561	194,0	0,188	8,13	15,99	0,508
30	0,762	0,841	220,0	0,240	10,15	16,04	0,633
40	1,016	1,121	280,0	0,360	14,83	16,08	0,922
50	1,270	1,402	300,0	0,400	16,38	16,13	1,016
60	1,524	1,682	340,0	0,480	19,50	16,18	1,205
70	1,778	1,962	356,0	0,512	20,74	16,22	1,279
80	2,032	2,243	364,0	0,528	21,36	16,27	1,313
90	2,286	2,523	368,0	0,536	21,68	16,32	1,328
100	2,540	2,804	369,0	0,538	21,75	16,36	1,329
110	2,794	3,084	367,0	0,534	21,60	16,41	1,316





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

<u>UNCONFINED COMPRESSION TEST</u> DATA SHEET

Date: 5.11.2014

Specimen ID: L2C4D42(1)

<u>Admixtures</u>

Lime+cem (%): 4 + 2 Curing period (days): 7 days

<u>Specimen dimensions</u>

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

<u>Post-test water content determination</u>

Wt. of can + Wt. of wet soil (gr) = 230,47

Wt. of can + Wt. of dry soil (gr) = 138,01

Wt. of can (gr) = 9,45

Water content, w (%) = 71,92

<u>Proving Ring Info</u>

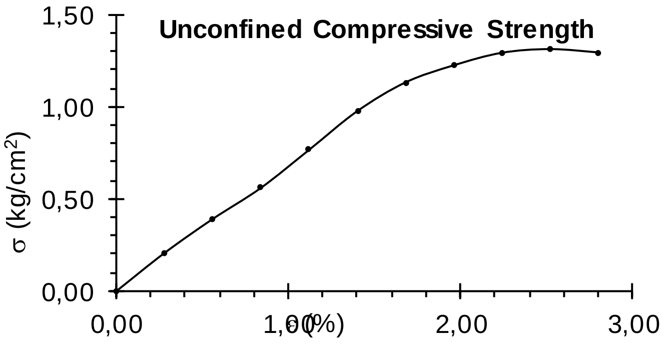
Ring No: 5737

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	132,0	0,064	3,30	15,95	0,207
20	0,508	0,561	170,0	0,140	6,26	15,99	0,392
30	0,762	0,841	205,0	0,210	8,99	16,04	0,560
40	1,016	1,121	248,0	0,296	12,33	16,08	0,767
50	1,270	1,402	292,0	0,384	15,76	16,13	0,977
60	1,524	1,682	325,0	0,450	18,33	16,18	1,133
70	1,778	1,962	345,0	0,490	19,88	16,22	1,226
80	2,032	2,243	360,0	0,520	21,05	16,27	1,294
90	2,286	2,523	365,0	0,530	21,44	16,32	1,314
100	2,540	2,804	362,0	0,524	21,21	16,36	1,296



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L2C4D42(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 214,77

Wt. of can + Wt. of dry soil (gr) = 130,01

Wt. of can (gr) = 9,45

Water content, w (%) = 70,31

Proving Ring Info

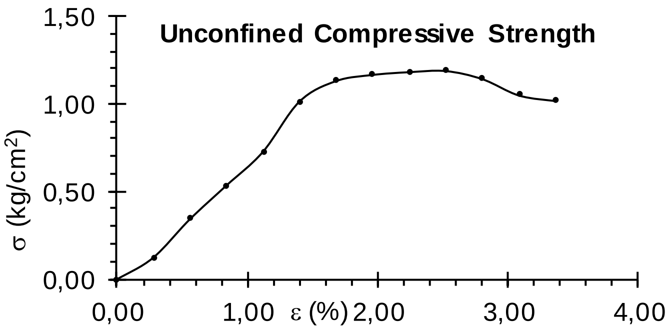
Ring No: 5737

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	115,0	0,030	1,98	15,95	0,124
20	0,508	0,561	160,0	0,120	5,48	15,99	0,343
30	0,762	0,841	200,0	0,200	8,60	16,04	0,536
40	1,016	1,121	240,0	0,280	11,71	16,08	0,728
50	1,270	1,402	300,0	0,400	16,38	16,13	1,016
60	1,524	1,682	325,0	0,450	18,33	16,18	1,133
70	1,778	1,962	333,0	0,466	18,95	16,22	1,168
80	2,032	2,243	337,0	0,474	19,26	16,27	1,184
90	2,286	2,523	339,0	0,478	19,42	16,32	1,190
100	2,540	2,804	330,0	0,460	18,72	16,36	1,144
110	2,794	3,084	311,0	0,422	17,24	16,41	1,050
120	3,048	3,364	305,0	0,410	16,77	16,46	1,019



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4C2D28(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 234,99

Wt. of can + Wt. of dry soil (gr) = 142,01

Wt. of can (gr) = 9,32

Water content, w (%) = 70,07

Proving Ring Info

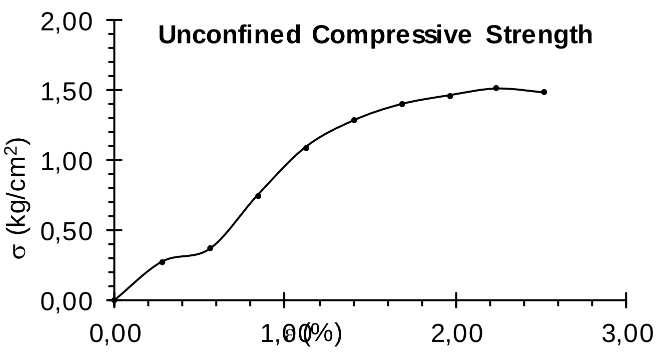
Ring No: 5737

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	146,0	0,092	4,39	15,95	0,276
20	0,508	0,561	165,0	0,130	5,87	15,99	0,367
30	0,762	0,841	244,0	0,288	12,02	16,04	0,750
40	1,016	1,121	315,0	0,430	17,55	16,08	1,091
50	1,270	1,402	355,0	0,510	20,66	16,13	1,281
60	1,524	1,682	380,0	0,560	22,61	16,18	1,398
70	1,778	1,962	394,0	0,588	23,70	16,22	1,461
80	2,032	2,243	405,0	0,610	24,56	16,27	1,509
90	2,286	2,523	400,0	0,600	24,17	16,32	1,481



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4C2D28(2)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 245,99

Wt. of can + Wt. of dry soil (gr) = 149,01

Wt. of can (gr) = 9,12

Water content, w (%) = 69,33

Proving Ring Info

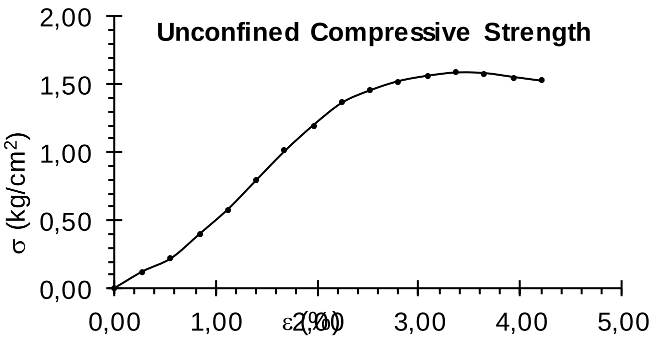
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	115,0	0,030	1,98	15,95	0,124
20	0,508	0,561	135,0	0,070	3,54	15,99	0,221
30	0,762	0,841	172,0	0,144	6,42	16,04	0,400
40	1,016	1,121	210,0	0,220	9,38	16,08	0,583
50	1,270	1,402	255,0	0,310	12,88	16,13	0,798
60	1,524	1,682	300,0	0,400	16,38	16,18	1,013
70	1,778	1,962	340,0	0,480	19,50	16,22	1,202
80	2,032	2,243	375,0	0,550	22,22	16,27	1,366
90	2,286	2,523	395,0	0,590	23,78	16,32	1,457
100	2,540	2,804	410,0	0,620	24,94	16,36	1,524
110	2,794	3,084	419,0	0,638	25,64	16,41	1,563
120	3,048	3,364	425,0	0,650	26,11	16,46	1,587
130	3,302	3,645	425,0	0,650	26,11	16,51	1,582
140	3,556	3,925	420,0	0,640	25,72	16,55	1,554
150	3,810	4,205	415,0	0,630	25,33	16,60	1,526



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4C2D42(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 245,99

Wt. of can + Wt. of dry soil (gr) = 150,01

Wt. of can (gr) = 9,12

Water content, w (%) = 68,12

Proving Ring Info

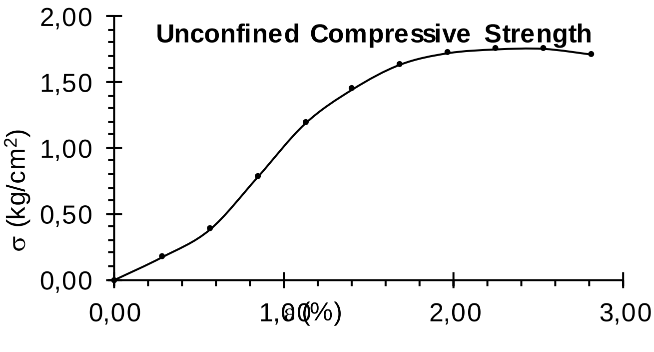
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	125,0	0,050	2,76	15,95	0,173
20	0,508	0,561	168,0	0,136	6,11	15,99	0,382
30	0,762	0,841	250,0	0,300	12,49	16,04	0,779
40	1,016	1,121	335,0	0,470	19,11	16,08	1,188
50	1,270	1,402	390,0	0,580	23,39	16,13	1,450
60	1,524	1,682	430,0	0,660	26,50	16,18	1,638
70	1,778	1,962	449,0	0,698	27,98	16,22	1,725
80	2,032	2,243	456,0	0,712	28,53	16,27	1,753
90	2,286	2,523	458,0	0,716	28,68	16,32	1,758
100	2,540	2,804	450,0	0,700	28,06	16,36	1,715



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4C2D42(2)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 246,74

Wt. of can + Wt. of dry soil (gr) = 150,71

Wt. of can (gr) = 9,32

Water content, w (%) = 67,92

Proving Ring Info

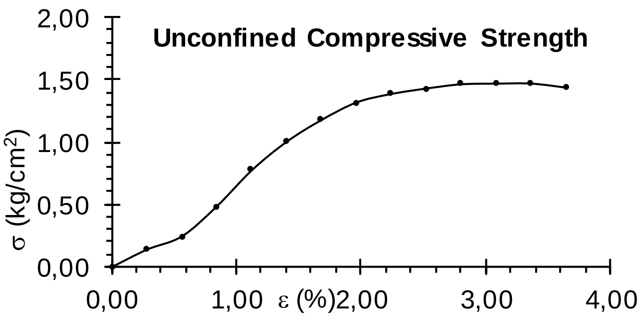
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	118,0	0,036	2,22	15,95	0,139
20	0,508	0,561	140,0	0,080	3,93	15,99	0,246
30	0,762	0,841	190,0	0,180	7,82	16,04	0,488
40	1,016	1,121	250,0	0,300	12,49	16,08	0,777
50	1,270	1,402	298,0	0,396	16,23	16,13	1,006
60	1,524	1,682	335,0	0,470	19,11	16,18	1,181
70	1,778	1,962	365,0	0,530	21,44	16,22	1,322
80	2,032	2,243	380,0	0,560	22,61	16,27	1,390
90	2,286	2,523	390,0	0,580	23,39	16,32	1,433
100	2,540	2,804	398,0	0,596	24,01	16,36	1,467
110	2,794	3,084	400,0	0,600	24,17	16,41	1,473
120	3,048	3,364	401,0	0,602	24,24	16,46	1,473
130	3,302	3,645	395,0	0,590	23,78	16,51	1,441



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D21(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 232,48

Wt. of can + Wt. of dry soil (gr) = 141,07

Wt. of can (gr) = 9,32

Water content, w (%) = 69,38

Proving Ring Info

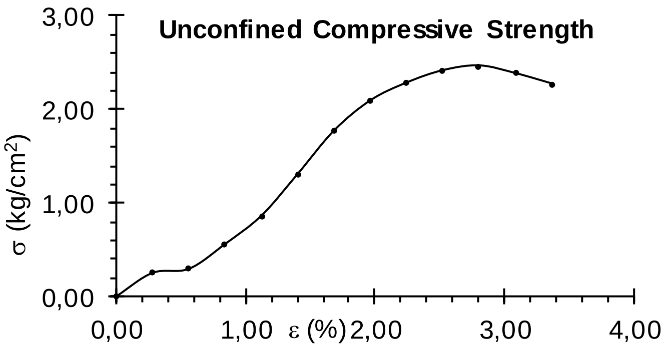
Ring No: 5737

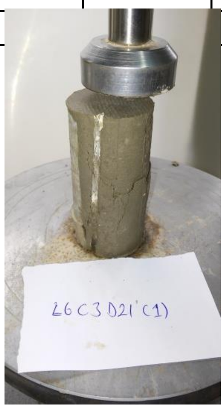
Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	141,0	0,082	4,01	15,95	0,251
20	0,508	0,561	150,0	0,100	4,71	15,99	0,294
30	0,762	0,841	205,0	0,210	8,99	16,04	0,560
40	1,016	1,121	268,0	0,336	13,89	16,08	0,864
50	1,270	1,402	361,0	0,522	21,13	16,13	1,310
60	1,524	1,682	458,0	0,716	28,68	16,18	1,773
70	1,778	1,962	526,0	0,852	33,97	16,22	2,094
80	2,032	2,243	567,0	0,934	37,17	16,27	2,284
90	2,286	2,523	596,0	0,992	39,42	16,32	2,416
100	2,540	2,804	608,0	1,016	40,36	16,36	2,466
110	2,794	3,084	592,0	0,984	39,11	16,41	2,383
120	3,048	3,364	570,0	0,940	37,40	16,46	2,272





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D21(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 234,72

Wt. of can + Wt. of dry soil (gr) = 142,01

Wt. of can (gr) = 9,32

Water content, w (%) = 69,87

Proving Ring Info

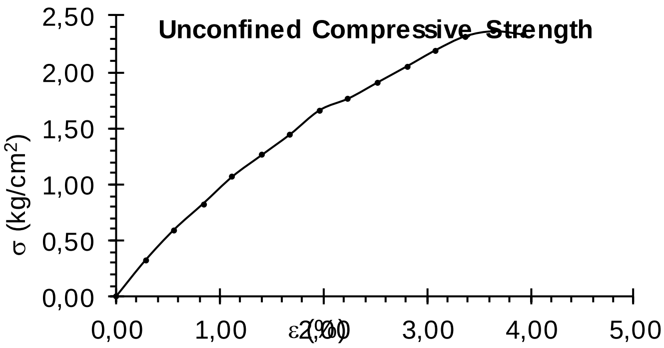
Ring No: 5737

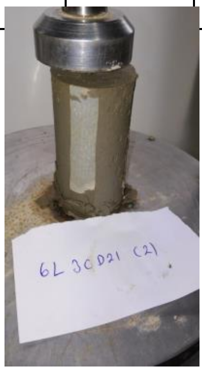
Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	155,0	0,110	5,10	15,95	0,319
20	0,508	0,561	212,0	0,224	9,53	15,99	0,596
30	0,762	0,841	260,0	0,320	13,27	16,04	0,827
40	1,016	1,121	310,0	0,420	17,16	16,08	1,067
50	1,270	1,402	350,0	0,500	20,27	16,13	1,257
60	1,524	1,682	390,0	0,580	23,39	16,18	1,446
70	1,778	1,962	435,0	0,670	26,89	16,22	1,658
80	2,032	2,243	458,0	0,716	28,68	16,27	1,763
90	2,286	2,523	489,0	0,778	31,09	16,32	1,906
100	2,540	2,804	520,0	0,840	33,51	16,36	2,048
110	2,794	3,084	552,0	0,904	36,00	16,41	2,194
120	3,048	3,364	579,0	0,958	38,10	16,46	2,315
130	3,302	3,645	590,0	0,980	38,96	16,51	2,360
140	3,556	3,925	585,0	0,970	38,57	16,55	2,330





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D21(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 234,78

Wt. of can + Wt. of dry soil (gr) = 141,07

Wt. of can (gr) = 9,32

Water content, w (%) = 71,13

Proving Ring Info

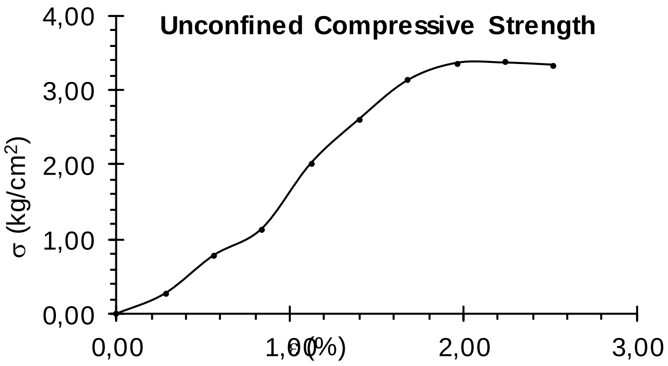
Ring No: 5737

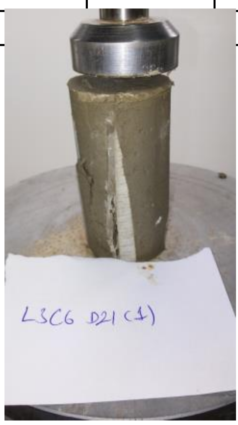
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	145,0	0,090	4,32	15,95	0,271
20	0,508	0,561	250,0	0,300	12,49	15,99	0,781
30	0,762	0,841	325,0	0,450	18,33	16,04	1,143
40	1,016	1,121	505,0	0,810	32,34	16,08	2,011
50	1,270	1,402	630,0	1,060	42,07	16,13	2,608
60	1,524	1,682	740,0	1,280	50,63	16,18	3,130
70	1,778	1,962	790,0	1,380	54,52	16,22	3,361
80	2,032	2,243	793,0	1,386	54,76	16,27	3,366
90	2,286	2,523	789,0	1,378	54,45	16,32	3,337





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D21(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 234,71

Wt. of can + Wt. of dry soil (gr) = 142,58

Wt. of can (gr) = 9,32

Water content, w (%) = 69,14

Proving Ring Info

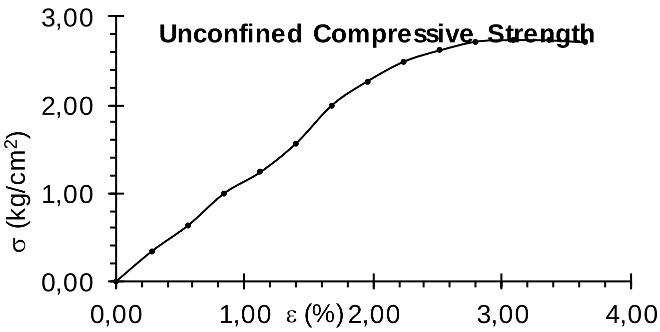
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	160,0	0,120	5,48	15,95	0,344
20	0,508	0,561	220,0	0,240	10,15	15,99	0,635
30	0,762	0,841	295,0	0,390	15,99	16,04	0,997
40	1,016	1,121	345,0	0,490	19,88	16,08	1,236
50	1,270	1,402	414,0	0,628	25,26	16,13	1,566
60	1,524	1,682	505,0	0,810	32,34	16,18	1,999
70	1,778	1,962	563,0	0,926	36,85	16,22	2,272
80	2,032	2,243	610,0	1,020	40,51	16,27	2,490
90	2,286	2,523	638,0	1,076	42,69	16,32	2,617
100	2,540	2,804	660,0	1,120	44,40	16,36	2,714
110	2,794	3,084	665,0	1,130	44,79	16,41	2,730
120	3,048	3,364	666,0	1,132	44,87	16,46	2,726
130	3,302	3,645	663,0	1,126	44,64	16,51	2,704



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D28(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 250,78

Wt. of can + Wt. of dry soil (gr) = 149,75

Wt. of can (gr) = 9,32

Water content, w (%) = 71,94

Proving Ring Info

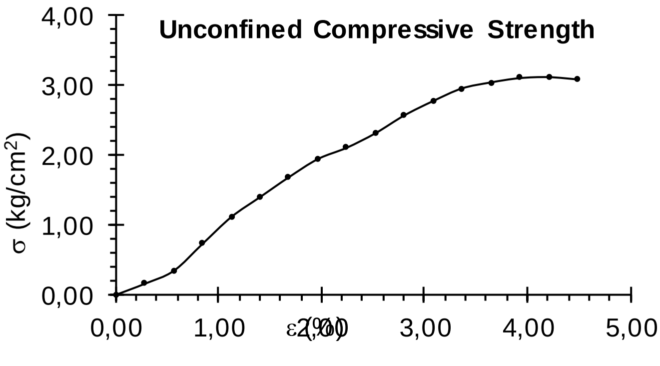
Ring No: 5737

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	122,0	0,044	2,53	15,95	0,158
20	0,508	0,561	160,0	0,120	5,48	15,99	0,343
30	0,762	0,841	240,0	0,280	11,71	16,04	0,730
40	1,016	1,121	320,0	0,440	17,94	16,08	1,115
50	1,270	1,402	380,0	0,560	22,61	16,13	1,402
60	1,524	1,682	440,0	0,680	27,28	16,18	1,686
70	1,778	1,962	495,0	0,790	31,56	16,22	1,945
80	2,032	2,243	530,0	0,860	34,29	16,27	2,107
90	2,286	2,523	575,0	0,950	37,79	16,32	2,316
100	2,540	2,804	630,0	1,060	42,07	16,36	2,571
110	2,794	3,084	675,0	1,150	45,57	16,41	2,777
120	3,048	3,364	715,0	1,230	48,69	16,46	2,958
130	3,302	3,645	735,0	1,270	50,24	16,51	3,044
140	3,556	3,925	750,0	1,300	51,41	16,55	3,106
150	3,810	4,205	755,0	1,310	51,80	16,60	3,120
160	4,064	4,486	750,0	1,300	51,41	16,65	3,087



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D28(2)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 247,85

Wt. of can + Wt. of dry soil (gr) = 149,78

Wt. of can (gr) = 9,32

Water content, w (%) = 69,82

Proving Ring Info

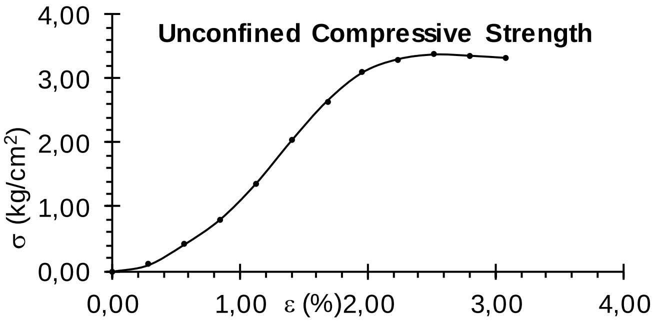
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	110,0	0,020	1,59	15,95	0,100
20	0,508	0,561	175,0	0,150	6,65	15,99	0,416
30	0,762	0,841	255,0	0,310	12,88	16,04	0,803
40	1,016	1,121	370,0	0,540	21,83	16,08	1,357
50	1,270	1,402	510,0	0,820	32,73	16,13	2,029
60	1,524	1,682	640,0	1,080	42,85	16,18	2,649
70	1,778	1,962	735,0	1,270	50,24	16,22	3,097
80	2,032	2,243	780,0	1,360	53,75	16,27	3,303
90	2,286	2,523	797,0	1,394	55,07	16,32	3,375
100	2,540	2,804	795,0	1,390	54,91	16,36	3,356
110	2,794	3,084	790,0	1,380	54,52	16,41	3,323



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
<u>UNCONFINED COMPRESSION TEST</u> DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D28(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 249,58

Wt. of can + Wt. of dry soil (gr) = 150,25

Wt. of can (gr) = 9,32

Water content, w (%) = 70,48

Proving Ring Info

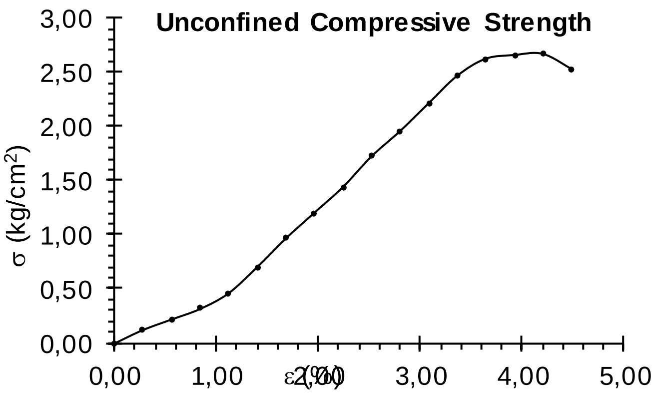
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	115,0	0,030	1,98	15,95	0,124
20	0,508	0,561	135,0	0,070	3,54	15,99	0,221
30	0,762	0,841	155,0	0,110	5,10	16,04	0,318
40	1,016	1,121	185,0	0,170	7,43	16,08	0,462
50	1,270	1,402	235,0	0,270	11,32	16,13	0,702
60	1,524	1,682	290,0	0,380	15,60	16,18	0,965
70	1,778	1,962	340,0	0,480	19,50	16,22	1,202
80	2,032	2,243	390,0	0,580	23,39	16,27	1,438
90	2,286	2,523	450,0	0,700	28,06	16,32	1,720
100	2,540	2,804	500,0	0,800	31,95	16,36	1,953
110	2,794	3,084	555,0	0,910	36,23	16,41	2,208
120	3,048	3,364	610,0	1,020	40,51	16,46	2,462
130	3,302	3,645	645,0	1,090	43,24	16,51	2,619
140	3,556	3,925	654,0	1,108	43,94	16,55	2,654
150	3,810	4,205	658,0	1,116	44,25	16,60	2,665
160	4,064	4,486	630,0	1,060	42,07	16,65	2,526



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D28(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 218,79

Wt. of can + Wt. of dry soil (gr) = 132,58

Wt. of can (gr) = 9,32

Water content, w (%) = 69,94

Proving Ring Info

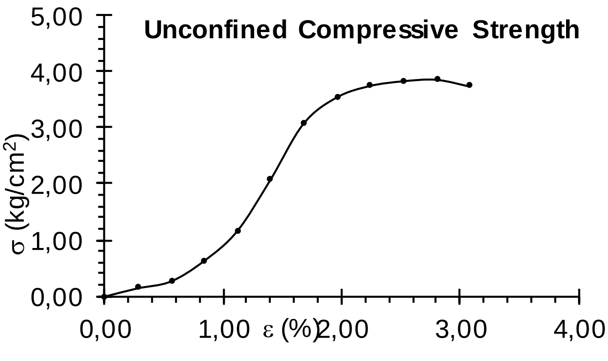
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	120,0	0,040	2,37	15,95	0,149
20	0,508	0,561	145,0	0,090	4,32	15,99	0,270
30	0,762	0,841	220,0	0,240	10,15	16,04	0,633
40	1,016	1,121	330,0	0,460	18,72	16,08	1,164
50	1,270	1,402	520,0	0,840	33,51	16,13	2,077
60	1,524	1,682	730,0	1,260	49,85	16,18	3,082
70	1,778	1,962	830,0	1,460	57,64	16,22	3,553
80	2,032	2,243	875,0	1,550	61,14	16,27	3,758
90	2,286	2,523	895,0	1,590	62,70	16,32	3,843
100	2,540	2,804	903,0	1,606	63,32	16,36	3,870
110	2,794	3,084	880,0	1,560	61,53	16,41	3,749



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4C2D14(1)

Admixtures

Lime+cem (%): 2 + 4   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 240,30

Wt. of can + Wt. of dry soil (gr) = 145,88

Wt. of can (gr) = 9,25

Water content, w (%) = 69,11

Proving Ring Info

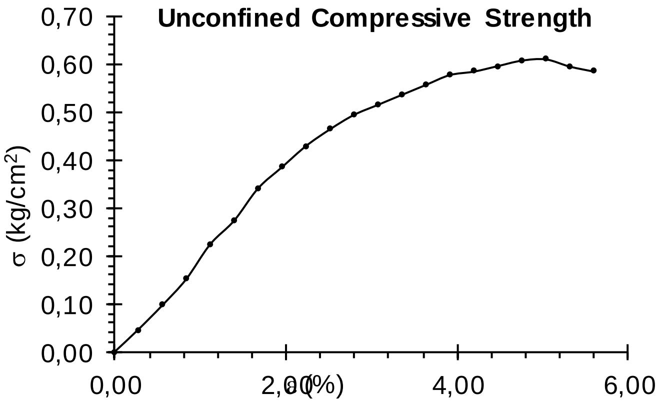
Ring No: 5789

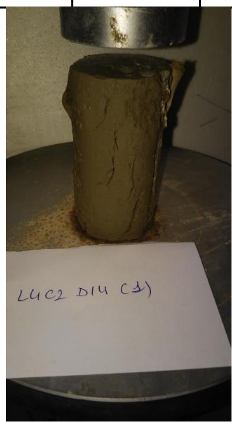
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	503,0	0,006	0,75	15,95	0,047
20	0,508	0,561	514,0	0,028	1,56	15,99	0,097
30	0,762	0,841	526,0	0,052	2,44	16,04	0,152
40	1,016	1,121	542,0	0,084	3,61	16,08	0,225
50	1,270	1,402	553,0	0,106	4,42	16,13	0,274
60	1,524	1,682	568,0	0,136	5,52	16,18	0,341
70	1,778	1,962	578,0	0,156	6,25	16,22	0,386
80	2,032	2,243	588,0	0,176	6,99	16,27	0,430
90	2,286	2,523	596,0	0,192	7,58	16,32	0,464
100	2,540	2,804	603,0	0,206	8,09	16,36	0,494
110	2,794	3,084	608,0	0,216	8,46	16,41	0,515
120	3,048	3,364	613,0	0,226	8,82	16,46	0,536
130	3,302	3,645	618,0	0,236	9,19	16,51	0,557
140	3,556	3,925	623,0	0,246	9,56	16,55	0,577
150	3,810	4,205	625,0	0,250	9,70	16,60	0,585
160	4,064	4,486	628,0	0,256	9,92	16,65	0,596
170	4,318	4,766	631,0	0,262	10,14	16,70	0,607
180	4,572	5,046	632,0	0,264	10,22	16,75	0,610
190	4,826	5,327	629,0	0,258	10,00	16,80	0,595
200	5,080	5,607	627,0	0,254	9,85	16,85	0,585





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L4C2D14(2)

Admixtures

Lime+cem (%): 2 + 4 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 241,64

Wt. of can + Wt. of dry soil (gr) = 148,21

Wt. of can (gr) = 9,25

Water content, w (%) = 67,24

Proving Ring Info

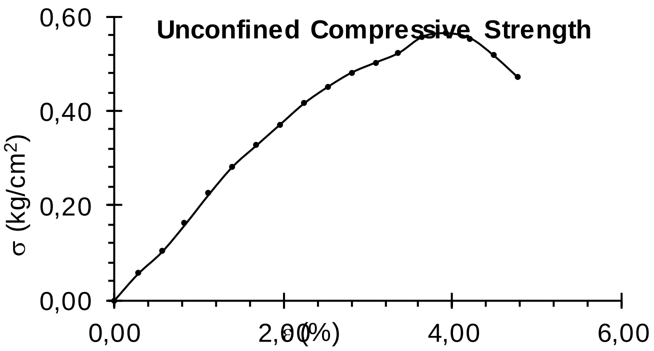
Ring No: 5789

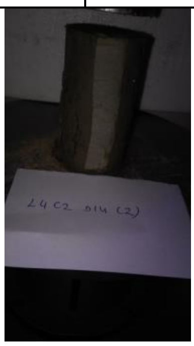
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	505,0	0,010	0,90	15,95	0,056
20	0,508	0,561	515,0	0,030	1,63	15,99	0,102
30	0,762	0,841	528,0	0,056	2,59	16,04	0,161
40	1,016	1,121	542,0	0,084	3,61	16,08	0,225
50	1,270	1,402	555,0	0,110	4,57	16,13	0,283
60	1,524	1,682	565,0	0,130	5,30	16,18	0,328
70	1,778	1,962	575,0	0,150	6,03	16,22	0,372
80	2,032	2,243	585,0	0,170	6,77	16,27	0,416
90	2,286	2,523	593,0	0,186	7,36	16,32	0,451
100	2,540	2,804	600,0	0,200	7,87	16,36	0,481
110	2,794	3,084	605,0	0,210	8,24	16,41	0,502
120	3,048	3,364	610,0	0,220	8,60	16,46	0,523
130	3,302	3,645	618,0	0,236	9,19	16,51	0,557
140	3,556	3,925	620,0	0,240	9,34	16,55	0,564
150	3,810	4,205	618,0	0,236	9,19	16,60	0,554
160	4,064	4,486	610,0	0,220	8,60	16,65	0,517
170	4,318	4,766	600,0	0,200	7,87	16,70	0,471





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L2C4D14(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,05

Wt. of can + Wt. of dry soil (gr) = 133,24

Wt. of can (gr) = 9,25

Water content, w (%) = 70,82

Proving Ring Info

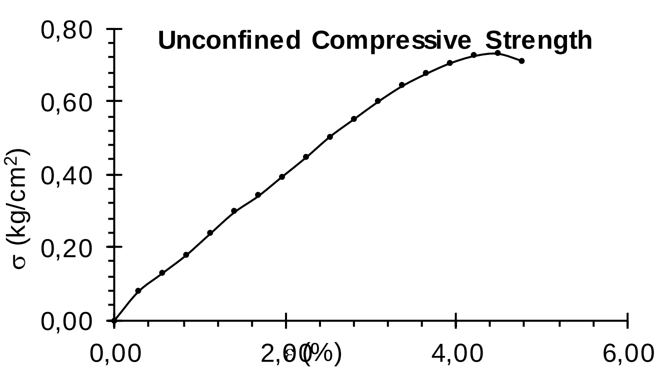
Ring No: 5789

$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	510,0	0,020	1,26	15,95	0,079
20	0,508	0,561	521,0	0,042	2,07	15,99	0,130
30	0,762	0,841	532,0	0,064	2,88	16,04	0,179
40	1,016	1,121	545,0	0,090	3,83	16,08	0,238
50	1,270	1,402	558,0	0,116	4,79	16,13	0,297
60	1,524	1,682	568,0	0,136	5,52	16,18	0,341
70	1,778	1,962	580,0	0,160	6,40	16,22	0,395
80	2,032	2,243	592,0	0,184	7,28	16,27	0,448
90	2,286	2,523	605,0	0,210	8,24	16,32	0,505
100	2,540	2,804	616,0	0,232	9,04	16,36	0,553
110	2,794	3,084	627,0	0,254	9,85	16,41	0,600
120	3,048	3,364	637,0	0,274	10,58	16,46	0,643
130	3,302	3,645	645,0	0,290	11,17	16,51	0,677
140	3,556	3,925	652,0	0,304	11,69	16,55	0,706
150	3,810	4,205	657,0	0,314	12,05	16,60	0,726
160	4,064	4,486	659,0	0,318	12,20	16,65	0,733
170	4,318	4,766	655,0	0,310	11,91	16,70	0,713



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L2C4D14(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,79

Wt. of can + Wt. of dry soil (gr) = 135,08

Wt. of can (gr) = 9,25

Water content, w (%) = 68,91

Proving Ring Info

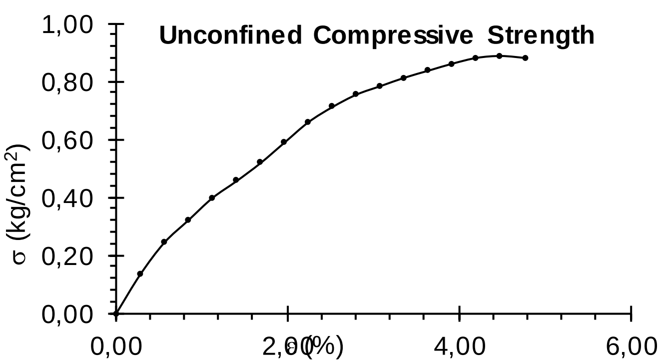
Ring No: 5789

Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	522,0	0,044	2,14	15,95	0,134
20	0,508	0,561	546,0	0,092	3,91	15,99	0,244
30	0,762	0,841	563,0	0,126	5,15	16,04	0,321
40	1,016	1,121	580,0	0,160	6,40	16,08	0,398
50	1,270	1,402	593,0	0,186	7,36	16,13	0,456
60	1,524	1,682	607,0	0,214	8,38	16,18	0,518
70	1,778	1,962	623,0	0,246	9,56	16,22	0,589
80	2,032	2,243	639,0	0,278	10,73	16,27	0,660
90	2,286	2,523	651,0	0,302	11,61	16,32	0,712
100	2,540	2,804	661,0	0,322	12,35	16,36	0,755
110	2,794	3,084	668,0	0,336	12,86	16,41	0,784
120	3,048	3,364	675,0	0,350	13,37	16,46	0,813
130	3,302	3,645	681,0	0,362	13,81	16,51	0,837
140	3,556	3,925	687,0	0,374	14,25	16,55	0,861
150	3,810	4,205	692,0	0,384	14,62	16,60	0,881
160	4,064	4,486	694,0	0,388	14,77	16,65	0,887
170	4,318	4,766	693,0	0,386	14,70	16,70	0,880



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D7(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,05

Wt. of can + Wt. of dry soil (gr) = 133,24

Wt. of can (gr) = 9,25

Water content, w (%) = 70,82

Proving Ring Info

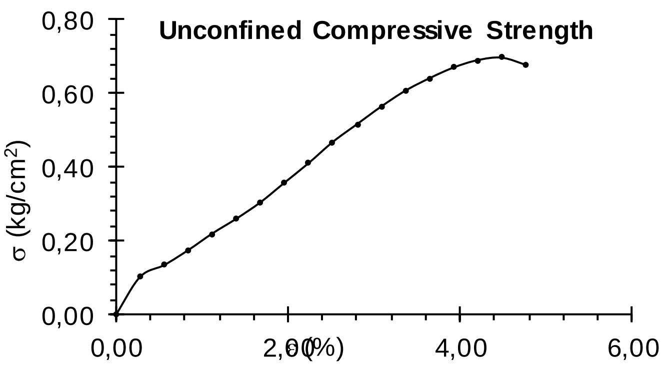
Ring No: 5789

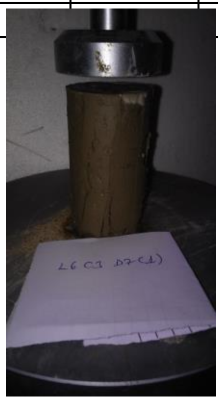
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	515,0	0,030	1,63	15,95	0,102
20	0,508	0,561	522,0	0,044	2,14	15,99	0,134
30	0,762	0,841	531,0	0,062	2,81	16,04	0,175
40	1,016	1,121	541,0	0,082	3,54	16,08	0,220
50	1,270	1,402	550,0	0,100	4,20	16,13	0,260
60	1,524	1,682	560,0	0,120	4,93	16,18	0,305
70	1,778	1,962	572,0	0,144	5,81	16,22	0,358
80	2,032	2,243	584,0	0,168	6,70	16,27	0,412
90	2,286	2,523	597,0	0,194	7,65	16,32	0,469
100	2,540	2,804	608,0	0,216	8,46	16,36	0,517
110	2,794	3,084	619,0	0,238	9,26	16,41	0,565
120	3,048	3,364	629,0	0,258	10,00	16,46	0,607
130	3,302	3,645	637,0	0,274	10,58	16,51	0,641
140	3,556	3,925	644,0	0,288	11,10	16,55	0,670
150	3,810	4,205	649,0	0,298	11,47	16,60	0,691
160	4,064	4,486	651,0	0,302	11,61	16,65	0,697
170	4,318	4,766	647,0	0,294	11,32	16,70	0,678





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D7(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 221,79

Wt. of can + Wt. of dry soil (gr) = 135,08

Wt. of can (gr) = 9,25

Water content, w (%) = 68,91

Proving Ring Info

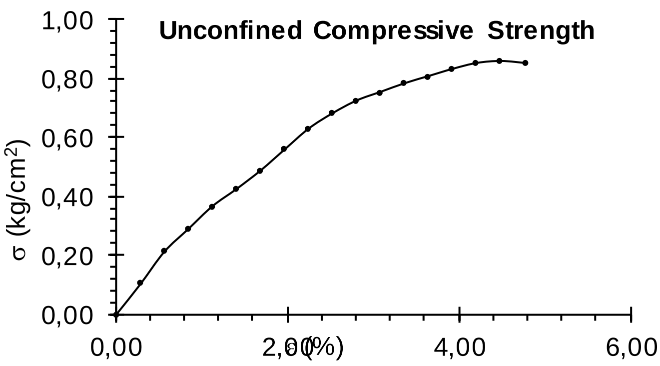
Ring No: 5789

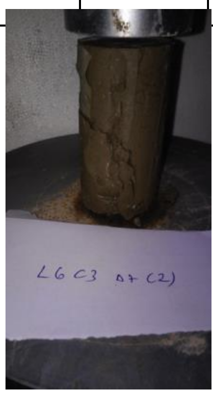
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	515,0	0,030	1,63	15,95	0,102
20	0,508	0,561	539,0	0,078	3,39	15,99	0,212
30	0,762	0,841	556,0	0,112	4,64	16,04	0,289
40	1,016	1,121	573,0	0,146	5,89	16,08	0,366
50	1,270	1,402	586,0	0,172	6,84	16,13	0,424
60	1,524	1,682	600,0	0,200	7,87	16,18	0,486
70	1,778	1,962	616,0	0,232	9,04	16,22	0,557
80	2,032	2,243	632,0	0,264	10,22	16,27	0,628
90	2,286	2,523	644,0	0,288	11,10	16,32	0,680
100	2,540	2,804	654,0	0,308	11,83	16,36	0,723
110	2,794	3,084	661,0	0,322	12,35	16,41	0,752
120	3,048	3,364	668,0	0,336	12,86	16,46	0,781
130	3,302	3,645	674,0	0,348	13,30	16,51	0,806
140	3,556	3,925	680,0	0,360	13,74	16,55	0,830
150	3,810	4,205	685,0	0,370	14,11	16,60	0,850
160	4,064	4,486	687,0	0,374	14,25	16,65	0,856
170	4,318	4,766	686,0	0,372	14,18	16,70	0,849





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D7(1)

Admixtures

Lime+cem (%): 2 + 4 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 247,89

Wt. of can + Wt. of dry soil (gr) = 148,29

Wt. of can (gr) = 9,25

Water content, w (%) = 71,63

Proving Ring Info

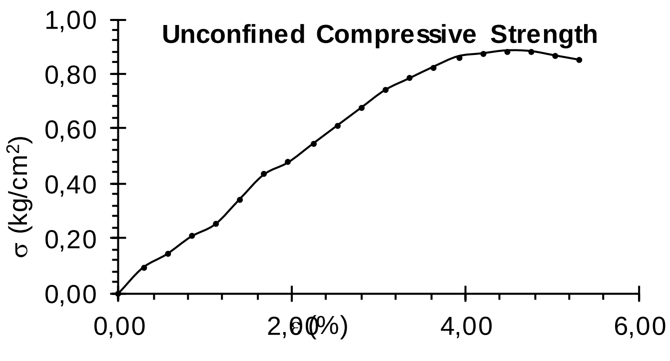
Ring No: 5789

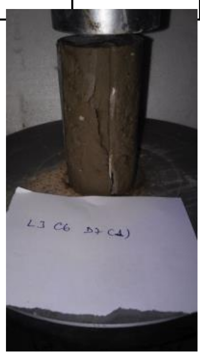
Y = ax + b (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	513,0	0,026	1,48	15,95	0,093
20	0,508	0,561	524,0	0,048	2,29	15,99	0,143
30	0,762	0,841	538,0	0,076	3,32	16,04	0,207
40	1,016	1,121	548,0	0,096	4,05	16,08	0,252
50	1,270	1,402	568,0	0,136	5,52	16,13	0,342
60	1,524	1,682	588,0	0,176	6,99	16,18	0,432
70	1,778	1,962	598,0	0,196	7,72	16,22	0,476
80	2,032	2,243	613,0	0,226	8,82	16,27	0,542
90	2,286	2,523	628,0	0,256	9,92	16,32	0,608
100	2,540	2,804	643,0	0,286	11,03	16,36	0,674
110	2,794	3,084	658,0	0,316	12,13	16,41	0,739
120	3,048	3,364	668,0	0,336	12,86	16,46	0,781
130	3,302	3,645	678,0	0,356	13,59	16,51	0,824
140	3,556	3,925	687,0	0,374	14,25	16,55	0,861
150	3,810	4,205	690,0	0,380	14,47	16,60	0,872
160	4,064	4,486	693,0	0,386	14,70	16,65	0,883
170	4,318	4,766	693,0	0,386	14,70	16,70	0,880
180	4,572	5,046	690,0	0,380	14,47	16,75	0,864
190	4,826	5,327	687,0	0,374	14,25	16,80	0,849





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D7(2)

Admixtures

Lime+cem (%): 2 + 4 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 241,89

Wt. of can + Wt. of dry soil (gr) = 147,40

Wt. of can (gr) = 9,25

Water content, w (%) = 68,40

Proving Ring Info

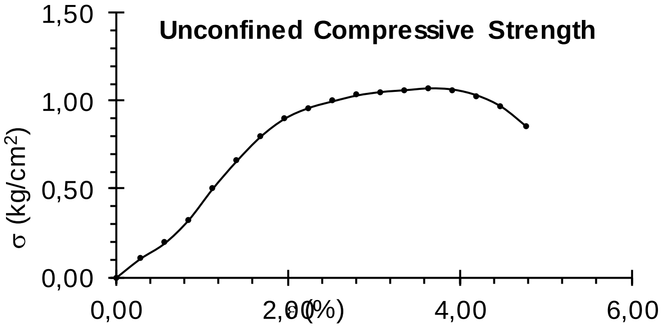
Ring No: 5789

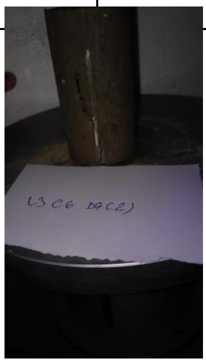
$Y = ax + b$ (Y: load in kg, x: def. in mm)

a = 36,6970

b = 0,5300

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	500,0	0,000	0,00	15,90	0,000
10	0,254	0,280	516,0	0,032	1,70	15,95	0,107
20	0,508	0,561	535,0	0,070	3,10	15,99	0,194
30	0,762	0,841	564,0	0,128	5,23	16,04	0,326
40	1,016	1,121	603,0	0,206	8,09	16,08	0,503
50	1,270	1,402	638,0	0,276	10,66	16,13	0,661
60	1,524	1,682	669,0	0,338	12,93	16,18	0,800
70	1,778	1,962	692,0	0,384	14,62	16,22	0,901
80	2,032	2,243	706,0	0,412	15,65	16,27	0,962
90	2,286	2,523	715,0	0,430	16,31	16,32	1,000
100	2,540	2,804	723,0	0,446	16,90	16,36	1,033
110	2,794	3,084	728,0	0,456	17,26	16,41	1,052
120	3,048	3,364	731,0	0,462	17,48	16,46	1,062
130	3,302	3,645	734,0	0,468	17,70	16,51	1,073
140	3,556	3,925	733,0	0,466	17,63	16,55	1,065
150	3,810	4,205	726,0	0,452	17,12	16,60	1,031
160	4,064	4,486	712,0	0,424	16,09	16,65	0,966
170	4,318	4,766	688,0	0,376	14,33	16,70	0,858





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D42(1)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 248,05

Wt. of can + Wt. of dry soil (gr) = 150,25

Wt. of can (gr) = 9,87

Water content, w (%) = 69,67

Proving Ring Info

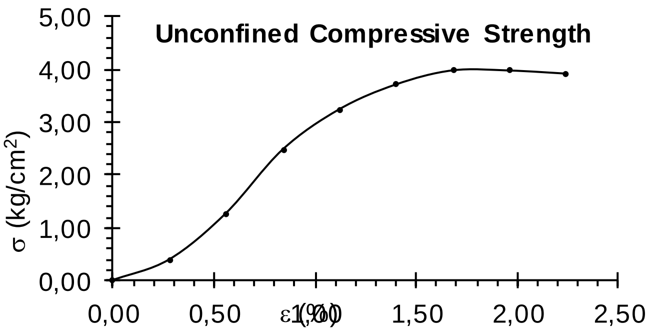
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	170,0	0,140	6,26	15,95	0,393
20	0,508	0,561	350,0	0,500	20,27	15,99	1,268
30	0,762	0,841	600,0	1,000	39,73	16,04	2,477
40	1,016	1,121	760,0	1,320	52,19	16,08	3,245
50	1,270	1,402	860,0	1,520	59,97	16,13	3,718
60	1,524	1,682	918,0	1,636	64,49	16,18	3,986
70	1,778	1,962	920,0	1,640	64,64	16,22	3,985
80	2,032	2,243	910,0	1,620	63,86	16,27	3,925



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L3C6D42(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 245,96

Wt. of can + Wt. of dry soil (gr) = 148,56

Wt. of can (gr) = 10,38

Water content, w (%) = 70,49

Proving Ring Info

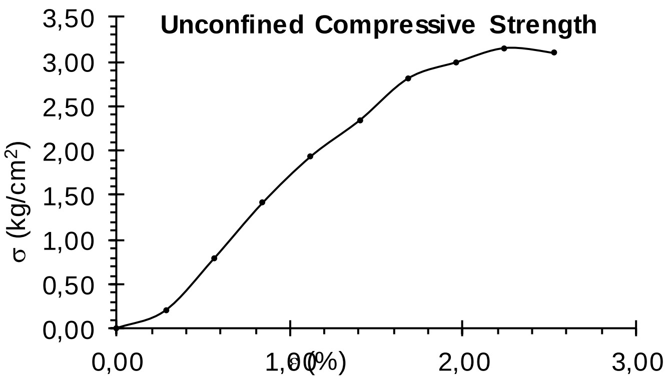
Ring No: 5737

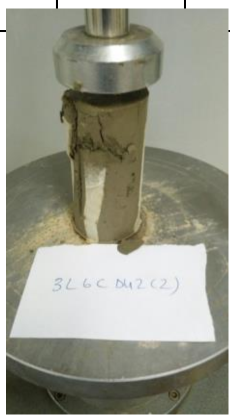
Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	130,0	0,060	3,15	15,95	0,197
20	0,508	0,561	250,0	0,300	12,49	15,99	0,781
30	0,762	0,841	380,0	0,560	22,61	16,04	1,410
40	1,016	1,121	490,0	0,780	31,17	16,08	1,938
50	1,270	1,402	575,0	0,950	37,79	16,13	2,343
60	1,524	1,682	675,0	1,150	45,57	16,18	2,817
70	1,778	1,962	715,0	1,230	48,69	16,22	3,001
80	2,032	2,243	750,0	1,300	51,41	16,27	3,160
90	2,286	2,523	740,0	1,280	50,63	16,32	3,103





DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY
UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D42(1)

Admixtures

Lime+cem (%): 4 + 2   Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60   L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 235,78

Wt. of can + Wt. of dry soil (gr) = 142,10

Wt. of can (gr) = 9,89

Water content, w (%) = 70,86

Proving Ring Info

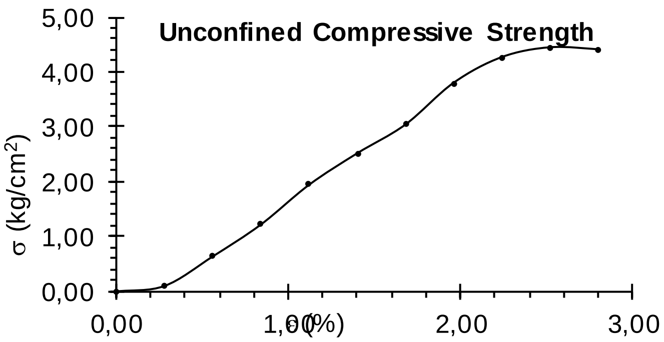
Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	110,0	0,020	1,59	15,95	0,100
20	0,508	0,561	220,0	0,240	10,15	15,99	0,635
30	0,762	0,841	340,0	0,480	19,50	16,04	1,215
40	1,016	1,121	490,0	0,780	31,17	16,08	1,938
50	1,270	1,402	610,0	1,020	40,51	16,13	2,512
60	1,524	1,682	720,0	1,240	49,07	16,18	3,034
70	1,778	1,962	880,0	1,560	61,53	16,22	3,793
80	2,032	2,243	980,0	1,760	69,31	16,27	4,260
90	2,286	2,523	1020,0	1,840	72,43	16,32	4,439
100	2,540	2,804	1015,0	1,830	72,04	16,36	4,402



DOKUZ EYLÜL UNIVERSITY, SOIL MECHANICS LABORATORY

UNCONFINED COMPRESSION TEST DATA SHEET

Date: 5.11.2014

Specimen ID: L6C3D42(2)

Admixtures

Lime+cem (%): 4 + 2 Curing period (days): 7 days

Specimen dimensions

Length (mm) = 90,60 L/D = 2,01

Diameter (mm) = 45,00 A_o (mm^2)= 1590,43

Post-test water content determination

Wt. of can + Wt. of wet soil (gr) = 235,25

Wt. of can + Wt. of dry soil (gr) = 142,78

Wt. of can (gr) = 9,89

Water content, w (%) = 69,58

Proving Ring Info

Ring No: 5737

Y = ax + b (Y: load in kg, x: def. in mm)

a = 38,9200

b = 0,8140

Deformation		Strain	Load			Corr. Area	Stress
Dial Read.	mm	ε (%)	Dial Read.	mm	Kg	A' (cm^2)	σ (kg/cm^2)
0	0,000	0,000	100,0	0,000	0,00	15,90	0,000
10	0,254	0,280	110,0	0,020	1,59	15,95	0,100
20	0,508	0,561	240,0	0,280	11,71	15,99	0,732
30	0,762	0,841	365,0	0,530	21,44	16,04	1,337
40	1,016	1,121	505,0	0,810	32,34	16,08	2,011
50	1,270	1,402	625,0	1,050	41,68	16,13	2,584
60	1,524	1,682	750,0	1,300	51,41	16,18	3,178
70	1,778	1,962	895,0	1,590	62,70	16,22	3,865
80	2,032	2,243	995,0	1,790	70,48	16,27	4,332
90	2,286	2,523	1035,0	1,870	73,59	16,32	4,511
100	2,540	2,804	1015,0	1,830	72,04	16,36	4,402