Effect of Lime on the Shear Strength of Soft Soils

by

Bennett George Lowe

Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Engineering (Hons)
(Civil Engineering)

DECEMBER 2006

Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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BACHELOR OF ENGINEERING (Hons)
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Approved by,

(Dr.Amer Awad)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

DECEMBER 2006

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

BENNETT GEORGE LOWE

ABSTRACT

Soft marine and/or swampy soils are, generally, abundant in Malaysia and problematic in nature due to their very low shear strength. Therefore, remedial actions are, always, required to tackle this problem. The objective of this project is to study the effects of the use of lime as a stabilizer for soft marine and/or swampy soils. A research approach and an experimental approach was used to overcome this problem. A soft soil sample from Ipoh was tested using soil classification tests, compaction and unconfined compression tests. Lime dosages of 0%, 2%, 4%, 6% and 8% were added to the soil sample with moisture contents of 25%,30%,and 35%. The trend of the graphs were observed.The graphs stopped at 8% lime. For the graphs which did not show the optimum value, further testing is required using more percentages of lime such as 10%, 12% and so on.

ACKNOWLEDGEMENT

First and foremost, I would like to express gratitude to the Lord Almighty for giving the strength, wisdom and patience to complete this project on time. It was a great time for me doing my Final Year Project even though there were challenges and problems that had to be faced. There are many people that stood behind me in making this project such as great and ambitious one.

Therefore, I would like to express my heartfelt gratitude to my Final Year Project supervisor, Dr. Amer Awad for always being such an understandable lecturer who always provided me with knowledge, advice, guidance and helped a great deal in completing the project.

Not to forget my deepest appreciation to Mr Ahmad, a contractor from Batu Gajah in helping me obtain the soil sample. I also would like to thank Mr Mohd Zaini, the technician from Civil Engineering Laboratory for his assistance and guidance during the laboratory testing for the project.

Last but not least, I am really indebted to all individuals who have contributed towards the completion of this project. Thank you for sharing your experience, knowledge and brilliant ideas with me to complete this project.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Lime is a calcium based substance with the capability of neutralizing soil acidity. Most soils contain appreciable amounts of acidic components (hydrogen H^+ and aluminum Al^{+++}) that can be toxic to plants. Indeed, lime is the "anti-acid" for soils. No soil amendment provides as many benefits as lime. Lime raises soil pH, providing a more favorable environment for microorganisms. Dolomitic lime provides the major portion of calcium and magnesium required for plant growth. Furthermore, plants utilize applied fertilizers more efficiently on soils that are properly limed (6).

Soil stabilization may be broadly defined as the alteration or preservation of one or more soil properties to improve the engineering characteristics and performance of a soil. Soil stabilization can be examined in terms of stabilization methods, the types and selection of various chemical stabilizers used in soil stabilization (7).

Shear strength of soil refers to its ability to resist shear stresses. Shear stresses exist in a sloping hillside or result from filled land, weight of footings, and so on. If a given soil does not have sufficient shear strength to resist such shear stresses, failures in the forms of landslides and footing failures will occur (1).

This study is proposed to determine the effect of lime on the shear strength of soft soils and the practical economical aspect of this stabilization to determine the optimum percentage needed.

1.2 PROBLEM STATEMENT

Soft marine and swampy soils are, generally, abundant in Malaysia and problematic in nature due to their very low shear strength. Remedial actions are always required to tackle this problem. In this project lime was added to the soft soil to observe its effects on the shear strength of the sample.

1.3 OBJECTIVES / SCOPE OF STUDY

The main objective of this project is to study the effects of the use of lime as a stabilizer for soft marine and/or swampy soils. The other objectives of this project are to:

1. Investigate the potential of lime as an additive to improve the shear strength of soft marine and/or soft soils.

2. Observe the practical and economical aspect of this stabilization to determine the optimum percentage needed.

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.1 SOIL TREATMENT, IMPROVEMENT, STABILIZATION

Soil improvement is frequently termed soil stabilization which in its broadest sense is the alteration of any property of a soil to improve its engineering performance. It is a physical means whereby a soil can have its physical properties improved to increase bearing capacity, increase soil shear strength, decrease settlement, reduce compressibility and reduce soil permeability (6).

Soil improvement may be a temporary measure to permit the construction of a facility or it may be a permanent measure to improve the performance of the completed facility. Soil stabilization can also be used to improve the properties of a natural soil by preloading the soil or by adding other special soils (mechanical stabilization), chemical additives(chemical stabilization), or some kind of fabric materials (geosynthetics) to the soil (6).

Soil improvement techniques can be classified in various ways, according to the nature of the process involved, the material added, the desired result, etc. For example, on the basis of process we have mechanical stabilization, chemical stabilization, thermal stabilization and electrical stabilization (6).

2.1.1 MECHANICAL STABILIZATION

This is the process of altering soil properties by changing the gradation through mixing with other soils, densifying the soils using compaction efforts, or undercutting the existing soils and replacing them with granular material. A common remedial procedure for wet and soft subgrade is to cover it with granular material or to partially remove and replace the wet subgrade with a granular material to a pre-determined depth below the grade lines. The compacted granular layer distributes the wheel loads over a wider area and serves as a working platform. To provide a firm-working platform with granular material, the following conditions shall be met.

1. The thickness of the granular material must be sufficient to develop acceptable pressure distribution over the wet soils.
2. The backfill material must be able to withstand the wheel load without rutting.
3. The compaction of the backfill material should be in accordance with the Standard Specifications.

Based on past experience, usually 6 to 12 in. (150 to 300 mm) of granular material should be adequate for subgrade stabilization. However, deeper undercut and replacement may be required in certain areas. The undercut and backfill option is widely used for construction traffic mobility and as a working platform. This option could be used either on the entire project or as a spot treatment. The equipment needed for construction is normally available on highway construction projects (7).

2.1.2 CHEMICAL STABILIZATION

The transformation of soil index properties by adding additives such as cement, fly ash, lime, or a combination of these, often alter the physical and chemical properties of the soil including the cementation of the soil particles. There are two primary mechanisms by which chemicals alter the soil into a stable subgrade:

1. General increase in particle size by cementation, reduction in plasticity index, hydraulic conductivity, and shrink/swell potential.
2. Absorption and chemical binding of moisture that will facilitate compaction (7).

The reaction of a soil-lime or a soil-cement mixture is important for stabilization and design methodology and shall be based on an increase in the unconfined compression strength test data. To determine the reactivity of the soils for lime-stabilization, a pair of specimens of 2 in. (50mm) diameter by 4 in. (100 mm) height (after mixing at least 5% lime by dry weight of the natural soil) is prepared at the optimum moisture content and maximum dry density (AASHTO T99). These specimens are cured for 48 hours at 120° F (50°C) in the laboratory and tested as per AASHTO T 208. The strength gain of lime-soil mixture must be at least 50 psi (350 kPa) greater than the natural soils. A strength gain of 100 psi (700 kPa) of a soil-cement mixture over the natural soil shall be considered adequate for cement stabilization with 3% cement by dry weight of soils and tested as described above. In case of soils modification, enhanced subgrade support is not accounted for in pavement design (7).

2.1.3 COMPACTION

The process of densifying, i.e, compacting soil is the oldest and most important method of soil stabilization. Compaction alone will often solve a particular soil problem and is usually the most economical of the techniques available. In addition to being used alone, compaction constitutes an essential part of a number of the other methods of stabilization.

In compacting any particular soil, the engineer can vary moisture content, amount of compaction energy, and type of compaction. Compaction characteristics of the soil can also be varied by means of chemical additives. A considerable amount is known about the effect of moisture content and amount of compaction on the properties of the compacted soil. The most desirable combination of the placement variables depends on the particular soil and the particular set of properties desired (13).

2.2 SOIL CLASSIFICATION

The principal objective of soil classification is the prediction of engineering properties and behavior of a soil based on a few simple laboratory or field tests. The results of these tests are then used to identify the soil and put it into a group of soils that have similar engineering characteristics. Soils seldom exist in nature separately as sand, gravel, or any other single component. Soils usually form mixtures with varying proportions of different size particles. Each component contributes to the characteristics of the mixture. Several methods of soil classification have been developed and used. The Unified Soil Classification System (USCS), is, probably, the widest used. The USCS is based on the textural or plasticity-compressibility characteristics that indicate how a soil will behave as a construction material. In the USCS, all soils are divided into three major divisions: (1) coarse grained, (2) fine grained, and (3) highly organic. Coarse-grained and fine-grained soils are distinguished by the amount of material that is either retained on or that passes a No.200 sieve. If 50 percent or more of the soil by weight is retained on a No.200 sieve, then the soil is coarse-grained. It is fine-grained if more than 50 percent passes the No. 200 sieve. Highly organic soils can generally be identified by visual examination. The major divisions are further subdivided into soil groups. The USCS uses 15 groups and each group is distinguished by a descriptive name and a letter symbol. The letter symbols are derived either from the Descriptive terms of the soil fractions, the relative value of the liquid limit (high or low), or the relative gradation of the soil (well graded or poorly graded)(13).

A soil that is composed entirely of gravel is designated gravel; if it contains some sand but is composed predominantly of gravel, it is designated sandy gravel. Thus the terms sand and gravel are used singly or in combination to designate granular soils.

A soil is considered fine grained if its individual particles cannot readily be distinguished with the unaided eye. The two soil types that comprise the fine grained group-silt and clay-may be similar in appearance but they exhibit markedly different physical properties. Fine grained soils whose engineering properties warrant the designation clay can be made to exhibit plastic properties by adjusting their water content and they will acquire considerable strength when air-dried. Conversely, those that warrant the designated silt cannot be made plastic and have little or no strength when air-dried. This circumstance not only provides the basis for defining the terms silt and clay but also affords a simple means for distinguishing between these two types of fine grained soils. Accordingly, a fine grained is designated clay, if it can be made plastic by adjusting its water content and if it exhibits considerable strength when air-dried. If it cannot be made plastic and if it exhibits little or no strength when air-dried it is silt (9).

In general, a fine grained soil will consist of some combination of clay-like and silt-like constituents. There is no simple, direct method (suitable for routine identification purposes) by means of which these constituents can be separated quantitatively. Hence the terms silt and clay are used in a qualitative rather than a quantitative sense (9).

The degree to which the soil is plastic is expressed by a combination of the terms silt and clay (9).

The term organic, as applied to soils, designates those soils containing an appreciable amount of decayed animal and/or vegetable matter in various states of decomposition. All organic soils, be they peat, organic silts, organic clays, or even organic sands, should be viewed with suspicion as foundation and construction materials. Certain types of organic matter may not be detrimental, but others may be objectionable for three reasons: they reduce the load sustaining qualities of the soil; they increase its compressibility; and they frequently contain toxic gases that are released during the excavation process. Although organic soils can generally be identified readily, the variable nature of the effects of organic materials on the physical properties of soils cannot always be adequately appraised solely on the basis of field inspection. When these soils are encountered in practice, laboratory tests are usually in order (9).

In addition to the terms gravel, sand, silt and clay, which form the basic elements of a soil name, it is necessary to depict significant detail so that the description of a given soil will convey as complete a picture as possible to one who has not had the benefit of examining it first hand. The physical characteristics of soils that are important from an engineering point of view and relevant to this project are discussed as follows:

Fine Grained Soils

a) Plasticity

Is an arbritrary term commonly used to express the inherent behavior characteristics of fine grained soils.The term has no meaning unless the method of measurement is defined, and it should not be assumed(as it often is) that is the arbitrary measure of soil characteristics necessarily has a direct relationship to the engineering properties of fine grained soil deposits (9).

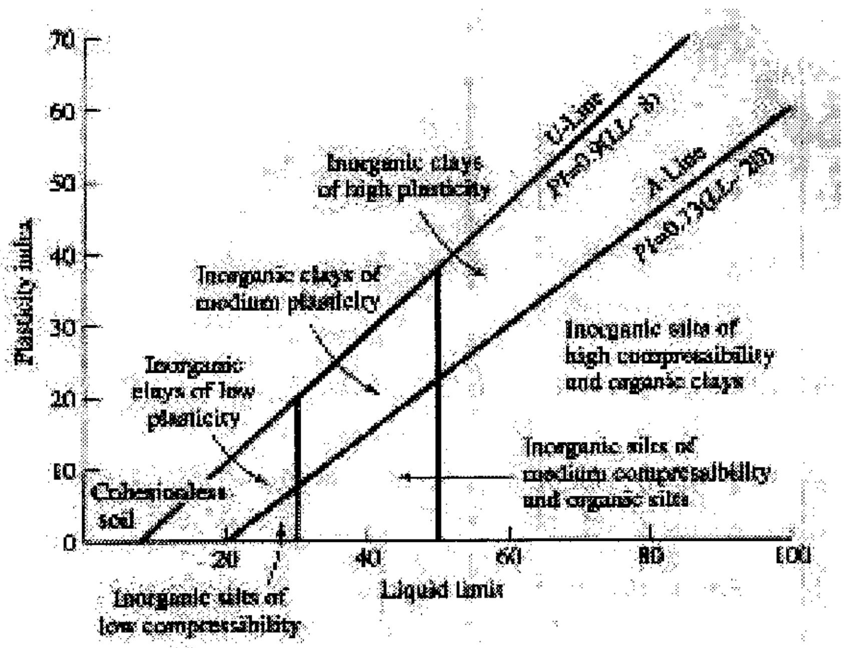

Figure 1: Plasticity Index Chart

The Plasticity index is important in classifying fine-grained soils. It is fundamental to the Casagrande plasticity chart (Figure 1).The chart shows the relationship between Plasticity Index(P.I) and Liquid Limit(LL) and provides information about the nature of cohesive soils.

$I_p = W_{LL} - W_{PL}$

Table 1: Description of Plasticity Index, I_p

Description	**I_p**
Non-plastic	0
Slightly Plastic	1-5
Low Plasticity	5-10
Medium Plasticity	10-20
High Plasticity	20-40
Very High Plasticity	>40

Table 2: Description of Liquid Limit, W_{LL}

Description	**W_{LL}**
Low Plasticity	< 35
Intermediate Plasticity	35 – 50
High Plasticity	50 – 70
Very High Plasticity	70 – 90
Extremely High Plasticity	> 90

b) Natural Water Content

In deposits of claylike soils, the natural water content generally varies considerably, the more plastic portions of the deposit having the higher water contents. For the identification and grouping of soils with similar inherent characteristics, the Casagrande system has been eminently successful. However, it is not well adapted for use as a system for rating the relative performance of fine grained soils, because the behaviour of very few structures is directly reflected by the remolded compressibility and permeability of the soils involved (9).

c) Maximum Dry Density and Optimum Moisture Content

- Maximum density: The maximum density of a material for a specific compactive effort is the highest density obtainable when the compaction is carried out on the material at varied moisture contents (5).

- Optimum moisture content: The optimum moisture content for a specific compactive effort is the moisture content at which the maximum density is obtained (5).

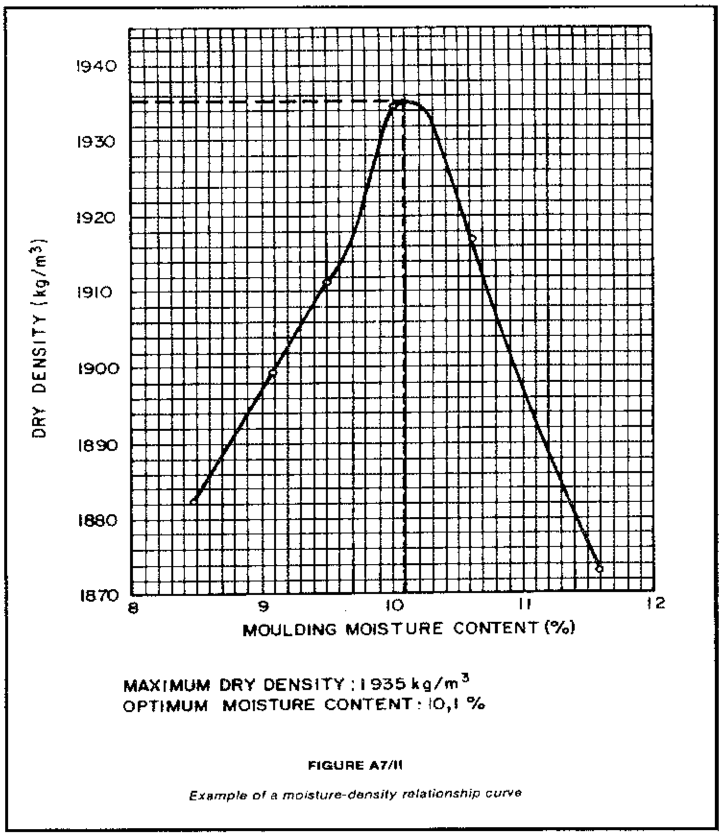

Figure 2: Example of moisture-density relationship curve

d) Strength Tests

- Vane shear test

Useful method of measuring the shear strength of clay. It is a cheaper and quicker method. The test can also be conducted in the laboratory. The laboratory vane shear test for the measurement of shear strength of cohesive soils, is useful for soils of low shear strength (less than 0.3 kg/cm^2) for which triaxial or unconfined tests can not be performed. The test gives the undrained strength of the soil. The undisturbed and remoulded strength obtained are useful for evaluating the sensitivity of soil (5).

- Unconfined Compression Test

Unconfined Compression is a special type of Unconsolidated Undrained test and is used if the soil under test has a very low permeability (8).

- Triaxial Test

The triaxial test is the most common and versatile test used to determine the stress-strain properties of soil (8).

- California Bearing Ratio(CBR)

The California Bearing Ratio (CBR) test is penetration test meant for the evaluation of subgrade strength of roads and pavements. The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers. This is the most widely used method for the design of flexible pavement (5).

- Direct Shear Test

The direct shear test is the oldest form of shear test upon soil, first used by Coulomb in 1776 and is widely used to study the strength of an over-consolidated clay at very large strains, i.e., ultimate strength and residual strength (8).

2.3 SOFT SOILS IN MALAYSIA

Within the Peninsular Malaysia, the Malaysian Highway Authority (MHA) encountered a deep soft marine clay in the southern stretch of the highway which was called Muar flat. The problem was that the soft clay failed when loaded with embankment for the highway. To seek the best method of soil treatment or improvement, the MHA organized a competition among the contractors. Each contractor was given a 50m stretch to treat the soil and build embankment on it with the criteria that the total settlement of the embankment should be less than 100mm, six months after its construction . The performance of the embankment and the underlying soil were monitored. Initially twelve contractors participated but finally only six were left standing. The major outcome of this trial embankment exercise was that voluminous of data for the behavior of soft marine clay were collected some of which already analyzed and were presented in two conferences (3).

As for the west coast of Malaysia, peat deposits, covering about 13% of the land area of Sarawak amounting to around 16,500 km2 , has been investigated by various agencies and from workers each from their own perspectives. In an effort to understand peat, workers from various disciplines have studied it from their own perspectives. The geotechnical standpoint, although concerning itself with aspects peculiar to it, has had to, now and then, resort to other research findings such as that of soil science to augment its understanding of this soil material (3).

Sarawak has the largest peat area in Malaysia of which about 90% is more than 1 m in depth . The essential thing to note is that peat here is identified from the soil sciences perspective prior to 1982 where soil with more than 35% of organic matter content were described as peat and this will be seen later differs from the geotechnical perspective. Another point to take heed of here is that the thicknesses of some of these peat deposits are too shallow to be of any impendence to construction. The Soil Map of Sarawak, on the scale of 1: 500,000, 1968, based on a classification of Sarawak soil, 1966 and subsequent amendments shows the extent of this peat. This is also the latest soil map available for the state (at this scale) that shows areas under peat. Of interest for geotechnical work will be the latter of two depth categories i.e. mainly shallow peat soils (< 1 m) and mainly deep peat soils (> 1 m) shown on this map as the problematic terrain would occur in this category of peat (3).

Peat in coastal lowlands lies between the lower stretches of the main river courses. Some small pockets of peat also occur in poorly drained interior valleys. The former are referred to as basin peats while the later are called valley peats. In fact, at one time the peats or organic soils (as they were equivalent terms then) were divided on the basis of their place of occurrence into basin and valley peats (3).

Peat commonly occur as extremely soft, wet, unconsolidated superficial deposits normally as an integral part of wetland systems. They may also occur as strata beneath other superficial deposits. The term peat is described as a naturally occurring highly organic substance derived primarily from plant materials. It is formed when organic (usually plant) matter accumulates more quickly than it humidifies (decays). This usually occurs when the organic matter is preserved below a high water table like in wetlands. Peats are therefore superficial deposit or soils with high organic matter content. However, the cut-off value of the percentage of organic matter necessary to classify a superficial deposits or soil as peat varies throughout the world, usually depending on the purpose of classification. This cut-off value also serves to differentiate peat from superficial deposits or soils with lesser amounts of organic matter content.

On the other hand, organic soil is an analogous term for superficial deposits or soil that contains organic matter. Soils with organic matter in it have undergone a change in perception accompanied by a change in terminology particularly in the discipline of soil sciences itself. Peats and organic soils, both terms used for describing soils with an organic content, were used in soil sciences at separate times and today these terms have also come into engineering literature. These different perspectives are related below:

Organic soils: the soil science perspective Prior to 1982

(i) the term peat was used for organic soils prior to this date and an exclusive definition of peat was used in Sarawak (requirement of more than 35% organic matter content vis-à-vis an organic matter content of 65% as was normally used.

(ii) All organic soils in Sarawak were classified as peat and peat was not a category of organic soils.

(iii) That soil requires to have organic matter content of above 35% to be considered as organic soils in the first place and they were right away called peats (3).

Organic soils: the geotechnical perspective

Most soil classifications for engineering purpose are woefully inadequate in their dealing with organic soils and peats. As is the objective, engineering soil classification strive to group materials with similar properties together. It is pertinent to note that the engineering perspective of organic soils and peat, however, retains the organic matter as a deterministic criteria for recognizing and defining organic soils and peats (3).

Clay soil is a variable and complex material, but because of its availability and low cost it frequently is used for construction purposes. At a particular location, however, a clay soil may not be wholly suitable for the desired purpose. This soil usually possesses medium or high or even very high plasticity and therefore presents soil which would be likely to be more suspect as far as construction is concerned.

In relation to the above problematic soils (swelling or soft) contain clay minerals that exhibit medium to high volume change upon wetting. The large volume change upon wetting causes extensive damage to structures, in particular, light buildings and pavements. This volume change depends upon the portion and type of expanding clay mineral in a clayey soil (3).

2.4 LIME STABILIZATION

Lime is an excellent choice for short-term *modification* of soil properties. Lime can modify almost all fine-grained soils, but the most dramatic improvement occurs in clay soils of moderate to high plasticity. Modification occurs because calcium cations supplied by the hydrated lime replace the cations normally present on the surface of the clay mineral, promoted by the high pH environment of the lime-water system. Thus, the clay surface mineralogy is altered, producing the following benefits (12):

- Plasticity reduction
- Reduction in moisture-holding capacity (drying)
- Swell reduction
- Improved stability
- The ability to construct a solid working platform

Lime is produced from natural limestone, and the particular type of lime formed depends upon the parent material and production process. There are five basic types of lime:

- High calcium quicklime-CaO
- Dolomitic quicklime-CaO + MgO
- Hydrated high calcium lime- Ca(OH)2
- Normal hydrated dolomitic lime-Ca(OH)2+MgO
- Pressure-hydrated dolomitic lime-Ca(OH)2+Mg(OH)2

The most commonly used forms in soil stabilization are the hydrated limes, also called slaked limes. In addition to being used alone as a soil stabilizer, lime is also used in the following admixtures:

- Lime-fly ash (hydrated lime,4 to 8 percent of the soil weight, plus fly ash,8 to 20 percent of the soil weight)
- Lime-portland cement
- Lime bitumen

Lime stabilization of soils can be used in the following situations:

- If materials are unacceptably wet or plastic
- When improved workability and compaction properties are needed.
- When greater soil strength and stability is required.
- Where off site disposal need to be avoided.
- When materials up to sub-base quality are required from in-situ soils.
- Where temporary works and haul roads are needed.
- Where there is a need to encapsulate difficult materials.
- On sites easily affected by adverse weather conditions.

2.4.1 LIME SOIL WATER REACTIONS

There are two types of chemical reactions that occur when lime is added to wet soil. The first, occurring almost immediately, is a colloidal-type reaction involving any of the three following :ion exchange of calcium for the ion naturally carried by the soil; a depression of the double layer on the soil colloids because of the increase in cation concentration in the pore water; and an expansion of the double layer of the soil colloids from the high pH of the lime.

The second reaction, requiring considerable time, is a cementing action. The cementing action, also called pozzolanic action, is not completely understood, but is thought to be a reaction between the calcium from the lime with the available reactive alumina or silica from the soil. This reaction can often be improved by adding a material high in reactive alumina or silica such as fly ash (9).

2.4.2 EFFECTS OF LIME ON SOIL PROPERTIES

Lime has the following effects on soil properties (9):

<u>Plasticity</u>

Lime generally increases the plasticity index of low-plasticity soils and decreases the plasticity index of highly plastic soils. By reducing the plasticity of plastic soils, lime tends to make the soil friable and more easily handled in the field.

Density

Lime generally causes a reduction in the maximum compacted density and an increase in the optimum molding water content.

Strength

In general, lime increases the strength of almost all types of soil.

2.5 LIME MANUFACTURING

Lime is the high-temperature product of the calcination of limestone. Although limestone deposits are found in every state, only a small portion is pure enough for industrial lime manufacturing. To be classified as limestone, the rock must contain at least 50 percent calcium carbonate. When the rock contains 30 to 45 percent magnesium carbonate, it is referred to as dolomite, or dolomitic limestone. Lime can also be produced from aragonite, chalk, coral, marble, and sea shells (8).

Lime is manufactured in various kinds of kilns by one of the following reactions:

CaCO + heat $\rightarrow$ CO + CaO (high calcium lime)
CaCO3.MgCO3 + heat $\rightarrow$ 2CO + CaO.MgO (dolomitic lime)

In some lime plants, the resulting lime is reacted (slaked) with water to form hydrated lime. The basic processes in the production of lime are: (1) quarrying raw limestone; (2) preparing limestone for the kilns by crushing and sizing; (3) calcining limestone; (4) processing the lime further by hydrating; and (5) miscellaneous transfer, storage, and handling operations.

The heart of a lime plant is the kiln. The prevalent type of kiln is the rotary kiln, accounting for about 90 percent of all lime production in the United States. This kiln is a long, cylindrical, slightly inclined, refractory-lined furnace, through which the limestone and hot combustion gases pass co-currently. Coal, oil, and natural gas may all be fired in rotary kilns. Product coolers and kiln feed pre-heaters of various types are commonly used to recover heat from the hot lime product and hot exhaust gases, respectively. The next most common type of kiln in the United States is the vertical, or shaft, kiln. This kiln can be described as an upright heavy steel cylinder lined with refractory material. The limestone is charged at the top and is calcined as it descends slowly to discharge at the bottom of the kiln. A primary advantage of vertical kilns over rotary kilns is higher average fuel efficiency. The primary disadvantages of vertical kilns are their relatively low production rates and the fact that coal cannot be used without degrading the quality of the lime produced. There have been few recent vertical kiln installations in the United States because of high product quality requirements. Other, much less common, kiln types include rotary hearth and fluidized bed kilns. Both kiln types can achieve high production rates, but neither can operate with coal. The "calcimatic" kiln, or rotary hearth kiln, is a circular kiln with a slowly revolving doughnut-shaped hearth. In fluidized bed kilns, finely divided limestone is brought into contact with hot combustion air in a turbulent zone, usually above a perforated grate. Because of the amount of lime carryover into the exhaust gases, dust collection equipment must be installed on fluidized bed kilns for process economy (8).

In Malaysia several plants produce different products as quicklime having reactivity values in the range 30 sec/1.5 min, to meet the needs of iron, chemical and building industry. The lime burning processes with the regenerative system, which take place in twin shaft kilns, have for some time demonstrated their superiority compared with the processes which take place in single-shaft furnaces: superior quality of the produced lime, and lower heat consumption per ton of product (8).

2.6 LIME COLUMN METHOD

Lime and lime/cement columns are mainly used in Sweden and Finland to increase the stability of shallow trenches. Lime columns are a new foundation method where columns manufactured in situ by mixing soft clay with unslaked lime are used as foundation for light structures to reduce settlements and to increase the bearing capacity and also function as drains in soft clay which increase the consolidation rate of the soil. The main advantage with lime/cement columns is the high shear strength which can be obtained also for organic soils, where unslaked lime alone has not been effective. Lime columns have the advantage that the permeability of the stabilized soil is high compared with soils stabilized with lime/cement or cement (2).

Undrained Shear Strength

The short term shear strength of soft soils with lime (CaO) depends mainly on the reduction of water content during the slaking and on the increase of the plastic limit and the reduction of the plasticity index. The long term increase of the shear strength is mainly governed by the pozzolanic reactions of the lime with the clay. The behaviour is similar to that of an over-consolidated clay (2).

Increase of Shear Strength with Time

The increase of the shear strength is usually faster in the field than in the laboratory due to the high ground temperature and high confining pressure. Especially the pozzolanic reactions are affected. The increase is initially faster with lime/cement than with lime (2).

The shear strength of the soil next to the columns will also increase with time partly due to consolidation of the soft soil and partly due to the diffusion of Ca-ions into the unstabilized soil around the column (2).

The bearing capacity of high strength lime/cement could be reduced by progressive failure due to the low failure strain when the shear strength is high. An approximate method is proposed to estimate the lateral displacement of the unstabilised soil along a slip surface at failure and at working loads. The reduction of the bearing capacity caused by progressive failure can be reduced or prevented by preloading the columns just after the installation of the columns when the shear strength of the columns is still low and the ductility is high. It is important that the bearing capacity of the columns is not exceeded during the preloading (2).

High Strength Columns can likely be designed as piles when the shear strength and the bearing capacity of the columns are high. The shear strength of the unstabilised soil between the columns should in that case be neglected (2).

The settlements with lime and lime/cement columns have generally been much larger than calculated. The permeability of lime columns is usually sufficient for the columns to function as vertical drains (2).

CHAPTER 3

METHODOLOGY

Based on the research conducted, as part of the methodology in solving the problem and to ensure the accomplishment of the objective of the project, two approaches had been taken.

3.1 RESEARCH BASED APPROACH

Firstly, a strong fundamental knowledge on several aspects of lime and soil stabilization was acquired. Journals, publications, and books regarding the relevant fields were studied and reviewed from time to time to enhance the knowledge and understanding of the topics.

3.2 EXPERIMENTAL/ANALYSIS APPROACH

Once the suitable soil had been obtained from the double track project in Ipoh, experiments for soil classification, soil strength and identification of lime was carried out in the lab using the unconfined compression testing machine and soil classification testing equipment. Results obtained through the various experiments using different testing machines and equipment were used as data in analyzing the shear strength of soil.

CHAPTER 4

RESULT AND DISCUSSION

At the very start of the project the price of 50kg lime and cement was compared. It was found that 50kg Ordinary Portland Cement (OPC) is RM9.17 and 50kg Calcium Oxide(lime) is RM50. The soft soil from Ipoh was eventually obtained in April 2006 and soil classification tests were immediately carried out. First of all,the initial soil classification tests which were carried out were the moisture content test (Table 4), followed by Atterberg tests for Plastic and Liquid Limits (Table 5), Specific Gravity (Table 6) and Sieve Analysis (Table 7). The final results for the tests carried out for the soft soil sample are as follows:

Table 3: Basic parameters for the natural soil used

Specific Gravity	2.86
Natural Moisture Content	63.50%
Liquid Limit	45.70%
Plastic Limit	29.80%
Plasticity Index	15.87

Utilizing Casagrande's Chart, the soft soil being used is classified as *Inorganic clays of medium plasticity.*

The remainder of the tests for the soft soil conducted were as follows :

a) Hydrometer test to determine the grain size distribution.
b) Compaction test to determine the maximum dry density and optimum moisture content.
c) Unconfined Compression test (Immediate and after 24 hours) to measure the approximate shear strength. After compaction, 3 samples were extruded from the mould to be tested for unconfined compression immediately. Another 3 samples were wrapped in a plastic foil and kept in a air tight container for a 24 hour period for hibernation then tested for unconfined compression.

The percentage of lime (0%,2%,4%,6%,8%) that was applied depended on the outcome of the following results.

a) Atterberg Limits
b) Compaction Test.

Figure 3 shows the results of the initial compaction test carried out on the soft soil using 0% lime. The optimum moisture content obtained was 30%.From these results, we used the dry optimum value of 25% and wet optimum value of 35% for further testing.Initially it was planned that the optimum dry density for 2%,4%,6%, and 8% lime be obtained as well. However due to time constraints, we had instead obtained graphs for compressive strength in which the optimum values will be compared with Figure 3.

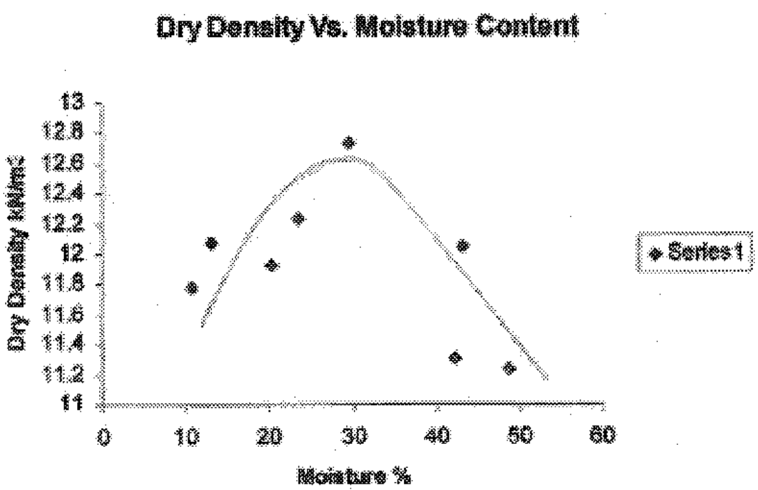

Figure 3 : Dry Density vs. Moisture Content Graph for Soft Soil

From Figure 4 the optimum values of compressive strength are shown for the tests carried out using 0%, 2% and 8% lime. These 3 graphs show a gradual increase in compressive strength and decrease once the optimum moisture content value of around 30% is reached. However for the tests with 4% and 6% lime added, the optimum value is still undetermined and would require further testing.

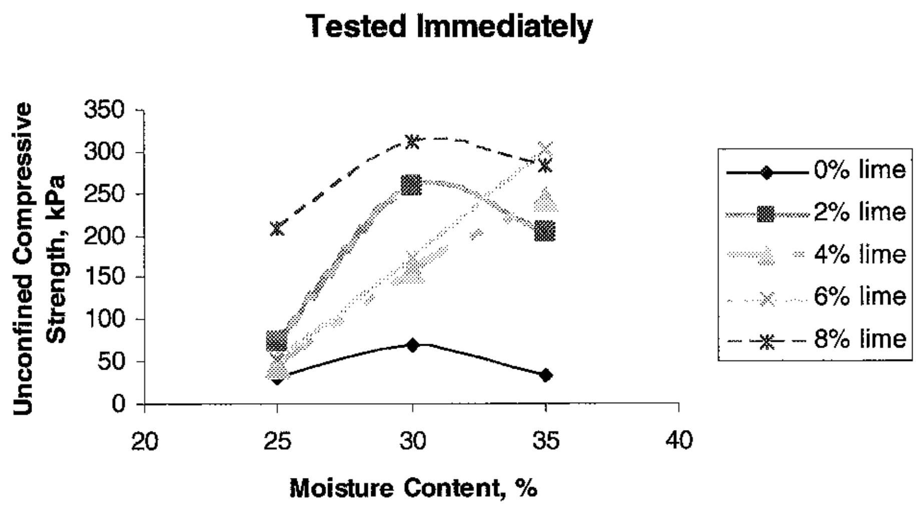

Figure 4 : Unconfined Compressive Strength vs. Moisture Content Graph for Soft Soil with 0%,2%,4%,6%,8% lime added (immediate testing)

Figure 5 shows the results obtained after the samples with lime are left to cure for a 24 hour period. For 0% and 2% lime, the optimum values are clearly shown once a moisture content of 30% was reached. However for 4% and 8% lime the graphs are still increasing, hence the optimum value cannot be determined as yet without further testing. The 6% lime graph on the other hand starts off by decreasing and gradually increases again once it reaches 30% moisture content.

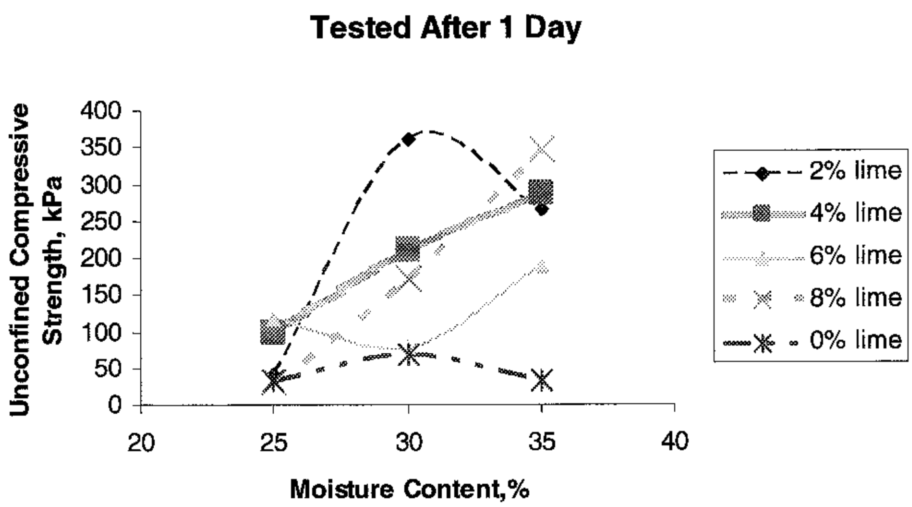

Figure 5 : Unconfined Compressive Strength vs. Moisture Content Graph for Soft Soil with 0%,2%,4%,6%,8% lime added(tested after 1 day)

Figure 6 shows the optimum compressive strength values for lime percentages with different moisture contents. For 25% moisture content, the unconfined compressive strength increases until it reaches 2% lime content, then it starts to decrease again until the reaches about 6% lime content. From there it increases again until 8% lime content. Futher testing is required to obtain the optimum value. For 30% moisture content, the graph increases as well until about 2% lime content then decreases at 4 % lime content.It then remains constant until about 6% where it increases again until 8%. For 35% moisture content, the graph increases and reaches at optimum compressive strength value of 302kpa at 6% lime content. Then it decreases again until 8% lime content.

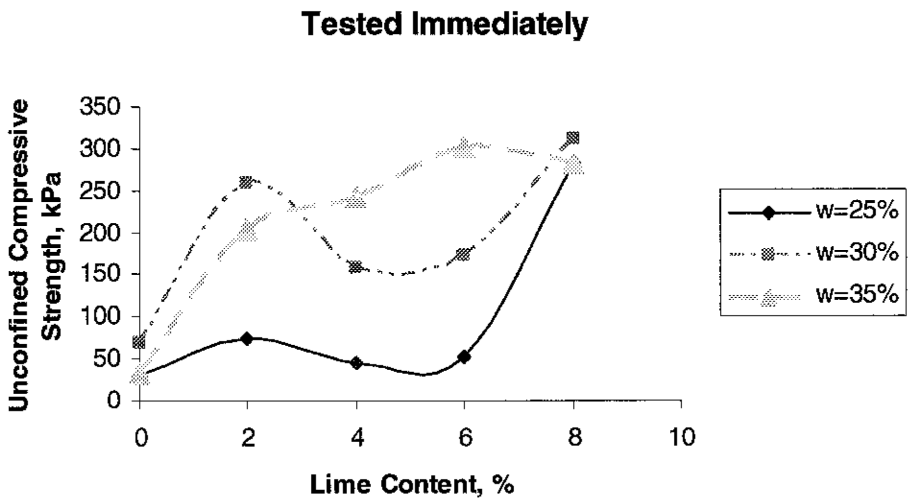

Figure 6 : Unconfined Compressive Strength vs. Lime Content Graph for Soft Soil with 25%,30%,35%,moisture content (immediate testing)

Figure 7 shows compressive strength values for the soft soil sample using the different percentages of lime and moisture contents which are left to cure for a 24 hour period. The 25% moisture content graph gradually increases and achieves an optimum compressive strength value when it reaches 6% lime content. However for the 30% moisture graph there is a significant decrease in compressive strength before it increases again and the extent of this increase is still unknown without further testing on more percentages of lime such as 10% and 12%. For the 35 % moisture content graph, the compressive strength increases and reaches an optimum value at 4% lime content before it decreases again until 6% lime content. From there it increases again until 8% lime where further testing is required to see the extent of the increase.

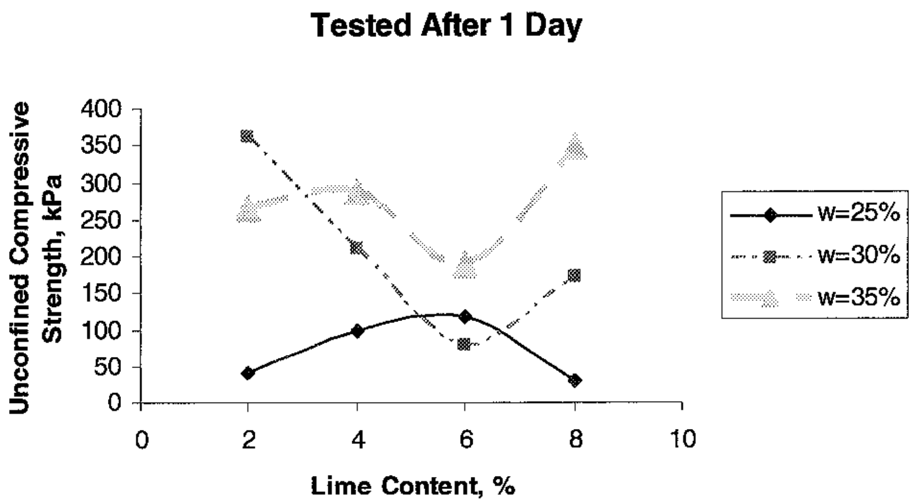

Figure 7 : Unconfined Compressive Strength vs. Lime Content Graph for Soft Soil with 25%,30%,35%,moisture content (tested after 1 day)

CHAPTER 5

CONCLUSION

Based on the results obtained it can be concluded that:-

Immediate tests

- With 4% and 6% lime added, the optimum value is still undetermined and would require further testing.
- For 25% moisture content, the unconfined compressive strength increases until it reaches 2% lime content, then it starts to decrease again until the reaches about 6% lime content. From there it increases again until 8% lime content. Futher testing is required to obtain the optimum value.
- For 30% moisture content, the graph increases as well until about 2% lime content then decreases at 4 % lime content. It then remains constant until about 6% where it increases again until 8%.
- For 35% moisture content, the graph increases and reaches a optimum compressive strength value of 302kpa at 6% lime content. Then it decreases until 8% lime content.

After 24 hour curing tests

- After curing for a 24 period, the 4% and 8% lime the graphs are still increasing, hence the optimum value cannot be determined as yet without further testing. The 6% lime graph on the other hand starts off by decreasing and gradually increases again once it reaches 30% moisture content.
- The 25% moisture content graph gradually increases and achieves an optimum compressive strength value when it reaches 6% lime content.
- However for the 30% moisture graph there is a significant decrease in compressive strength before it increases again and the extent of this increase is still unknown without further testing.
- For the 35 % moisture content graph, the compressive strength increases and reaches an optimum value at 4% lime content before it decreases again until 6%.

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APPENDICES

APPENDIX 1-1 : Lab Results for Soil Classification Tests and Unconfined Compression

Table 4 : Natural Moisture Content

Container No:		1	2	3	Avg
Mass of wet soil + container (m_2)	(g)	85.8	77.9	68.9	77.5
Mass of dry soil + container (m_3)	(g)	63.7	58.9	53.5	58.7
Mass of container (m_1)	(g)	29.2	29.0	29.1	29.1
Mass of moisture ($m_2 - m_3$)	(g)	22.1	19.0	15.4	18.8
Mass of dry soil ($m_3 - m_1$)	(g)	34.5	29.9	24.4	29.6
Moisture content $\omega = \frac{(m_2 - m_3)}{(m_3 - m_1)} \times 100\%$	(%)	64	63.5	63.1	63.5

Table 5 : Liquid Limit

Test	1			2			3		
Dial gauge reading	25.0	20.5	22.0	25.0	23.5	30.2	37.5	35.0	30.0
Average Gauge Reading	22.5			26.2			34.2		
Mass of Wet Soil + Container	48.5			53.3			57.4		
Mass of Dry Soil + Container	40.6			43.0			44.7		
Mass of Container	20.60			20.39			20.25		
Mass of Moisture	7.9			10.3			12.7		
Mass of Dry Soil	20.0			22.61			24.4		
Moisture Content	39.5			45.5			52.0		

Table 6 : Specific Gravity

Mass of pyknometer + cap + soil + water (m_3)	(g)	1794.98
Mass of pyknometer + cap + soil (m_2)	(g)	932.0
Mass of pyknometer + cap + water (m_4)	(g)	1539.45
Mass of pyknometer + cap assembly (m_1)	(g)	539.06
Mass of soil ($m_2 - m_1$)	(g)	393.0
Mass of water in full jar ($m_4 - m_1$)	(g)	1000.39
Mass of water used ($m_3 - m_2$)	(g)	862.98
Volume of soil particles ($m_4 - m_1$) - ($m_3 - m_2$)	ML	137.41
Particle density ($m_2 - m_1$)	Mg/m^3	2.860

$(m_4 - m_1)$ - $(m_3 - m_2)$		

Table 7 : Particle Size Distribution Test on Soft Soil Sample

SIEVE OPENING	WEIGHT (PAN)	WEIGHT (PAN+SOIL)	WEIGHT (SOIL)	PERCENT (%)	CUMM. (%)
2.00 mm	454.22 g	866.90g	412.68 g	41.93%	58.07%
1.18 mm	434.02g	533.62 g	99.60 g	10.12%	47.95%
600 µm	403.94 g	507.57 g	103.63 g	10.53%	37.42%
425 µm	367.50 g	409.60 g	42.10 g	4.28%	33.14%
300 µm	370.44g	411.75 g	41.31 g	4.20%	28.94%
212 µm	346.14 g	381.65 g	35.51 g	3.61%	25.33%
150 µm	310.14 g	339.45 g	29.31 g	2.98%	22.35%
63 µm	321.14 g	381.62 g	60.48 g	6.15%	16.20%
PAN	246.34 g	405.85 g	159.54 g	16.20%	0.00%

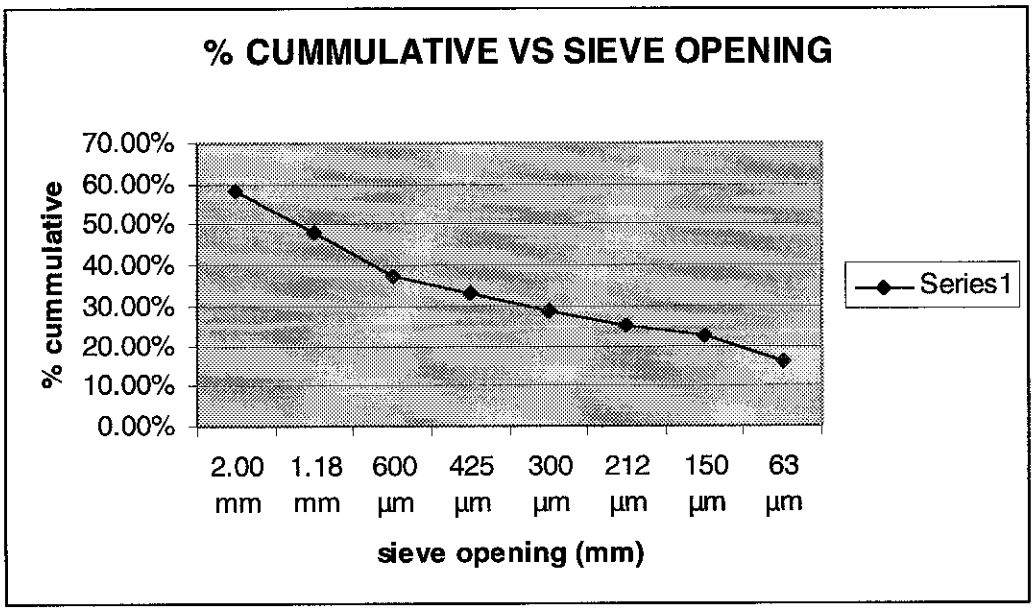


Figure 8: Particle Size Distribution Graph

Table 8 : Compaction Results for Initial Dry Density

ıumber	1	2	3	4	5	6	7	8
+ base + compacted ı2)	6430	6490	6560	6640	6780	6740	6820	676
+ base, g (m_1)	5100	5100	5100	5100	5100	5100	5100	5100
cted specimen, g (m_2 -	1330	1390	1460	1540	1680	1640	1720	166
n³) m_1) ------	1.33	1.39	1.46	1.54	1.68	1.64	1.72	1.66

tent, ω (%):

ber	1	2	3	4	5	6	7	8
er added, %	10	15	20	25	30	35	40	45
ner, g (m_1)	29.61	29.2	29.1	29.5	29.47	29.27	38.39	30.1
il + container, g (m_2)	46	41.95	42.74	51.14	56.01	66.52	79.51	75.4
il + container, g (m_3)	44.42	40.49	40.46	47.03	49.97	55.45	67.11	60.5
ıre, g ($m_2 - m_3$)	1.58	1.46	2.28	4.11	6.04	11.07	12.4	14.8
il, g ($m_3 - m_1$)	14.81	11.29	11.36	17.53	20.5	26.18	28.72	30.4
ıt, % $\frac{m_3)}{m_1)} \times 100\%$	10.6685	12.9318	20.0704	23.4455	29.4634	42.2842	43.1755	48.7

d (Mg/m³):

/m³)	1.33	1.39	1.46	1.54	1.68	1.64	1.72	1.66
nt, ω(%)	10.6685	12.9318	20.0704	23.4455	29.4634	42.2842	43.1755	48.7
/m³	11.7859	12.0708	11.9249	12.2344	12.7262	11.3038	12.0486	11.

Table 9 : Unconfined Compressive Strength(qu) From Graphs(Immediate)

Lime Content (%)	Moisture Content (%)	qu (kpa)
0	25	31.9745
	30	69.5275
	35	32.9181
2	25	74.7836
	30	259.7298
	35	202.8751
4	25	44.3657
	30	158.1949
	35	242.8368
6	25	53.2826
	30	172.0894
	35	302.3899
8	25	207.929
	30	311.9693
	35	282.8686

Table 10: Unconfined Compressive Strength (qu) From Graphs (After 1 Day)

Lime Content (%)	Moisture Content (%)	qu (kpa)
2	25	41.7124
	30	361.6716
	35	266.91
4	25	98.78
	30	210.9569
	35	287.7746
6	25	117.1825
	30	80.0959
	35	189.9446
8	25	30.6014

	30	172.7734
	35	347.3324

p,C	cm	READING (Rh')	Rc	R	L	part size(D)/ mm	L/t	L/t^0.5	% finer	K
5	5	30	**26.3**	31	11.2	**0.0577**	22.4	4.732863826	50.496	0.0122
5	5	30	**26.3**	31	11.2	**0.0408**	11.2	3.346640106	50.496	0.0122
5	5	30	**26.3**	31	11.2	**0.0289**	5.6	2.366431913	50.496	0.0122
5	5	30	**26.3**	31	11.2	**0.0204**	2.8	1.673320053	50.496	0.0122
5	5	30	**26.3**	31	11.2	**0.0144**	1.4	1.183215957	50.496	0.0122
5	5	30	**26.3**	31	11.2	**0.0075**	0.373333333	0.611010093	50.496	0.0122
5	5	29	**25.3**	30	11.4	**0.0038**	0.095	0.3082207	48.576	0.0122
5	5	28	**24.3**	29	11.5	**0.0019**	0.023958333	0.154784797	46.656	0.0122
5	5	26	**22.3**	27	11.9	**0.0016**	0.016527778	0.128560405	42.816	0.0122
5	5	25	**21.3**	26	12	**0.0011**	0.008333333	0.091287093	40.896	0.0122

Table 11 : Hydrometer Results

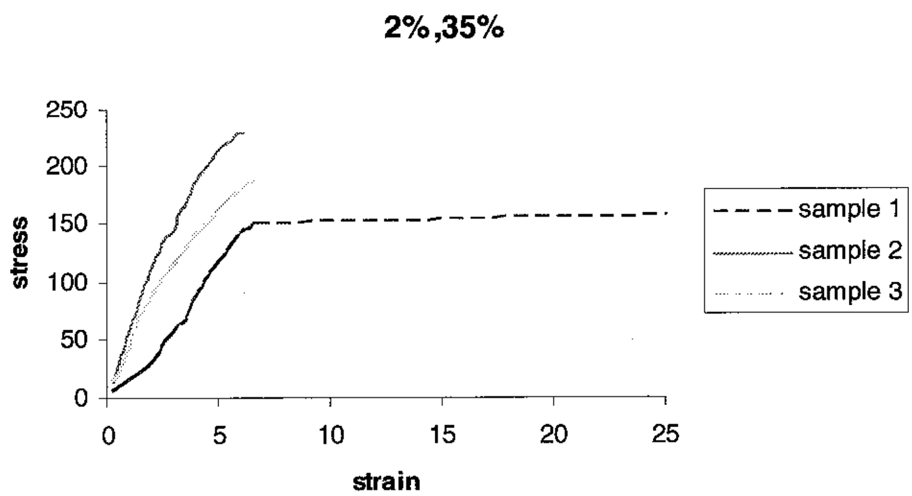


Figure 9 : stress vs strain graph for soft soil with 2 % lime added and 35% moisture content

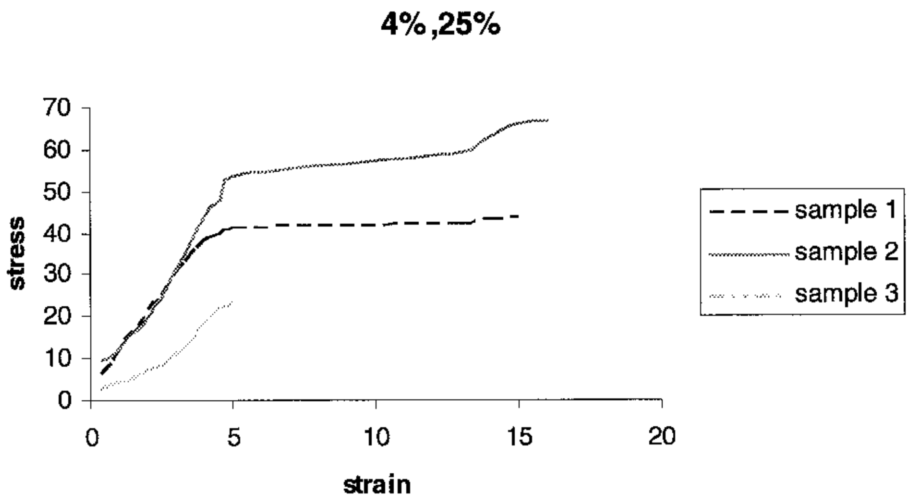


Figure 10 : stress vs strain graph for soft soil with 2 % lime added and 35% moisture content

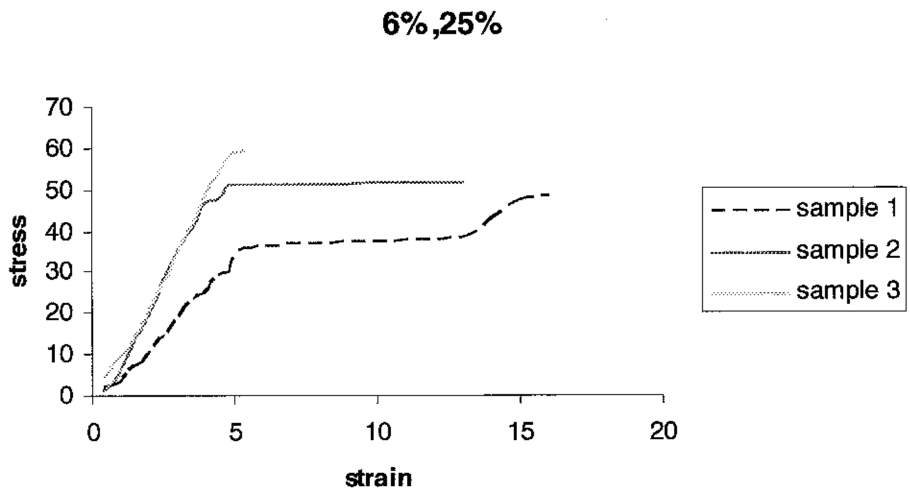


Figure 11 : stress vs strain graph for soft soil with 6 % lime added and 25% moisture content

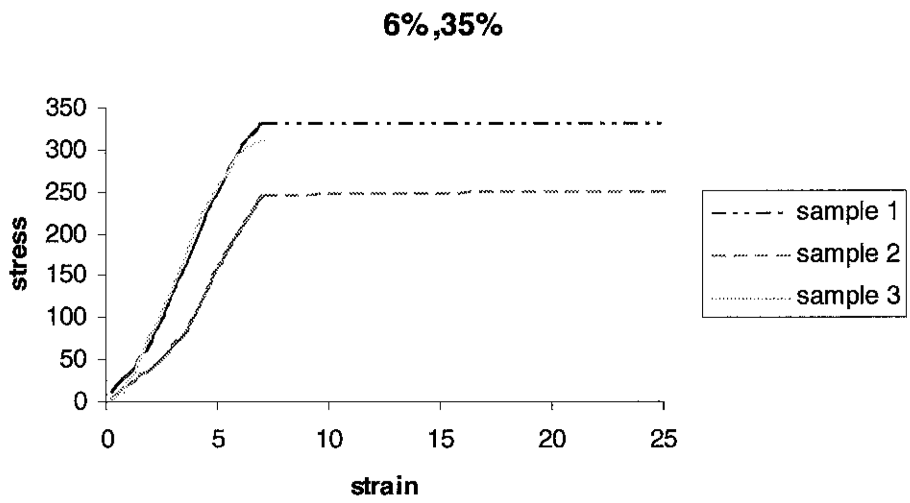


Figure 12 : stress vs strain graph for soft soil with 6 % lime added and 35% moisture content

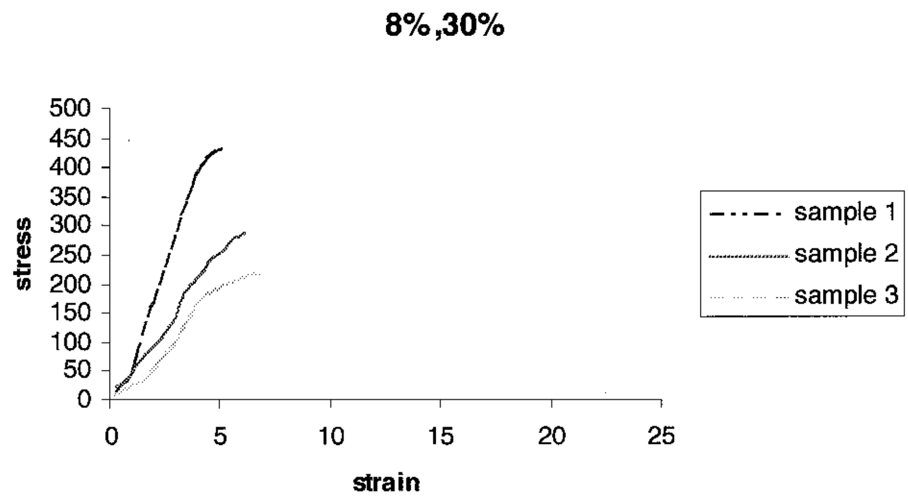


Figure 13 : stress vs strain graph for soft soil with 8 % lime added and 30% moisture content

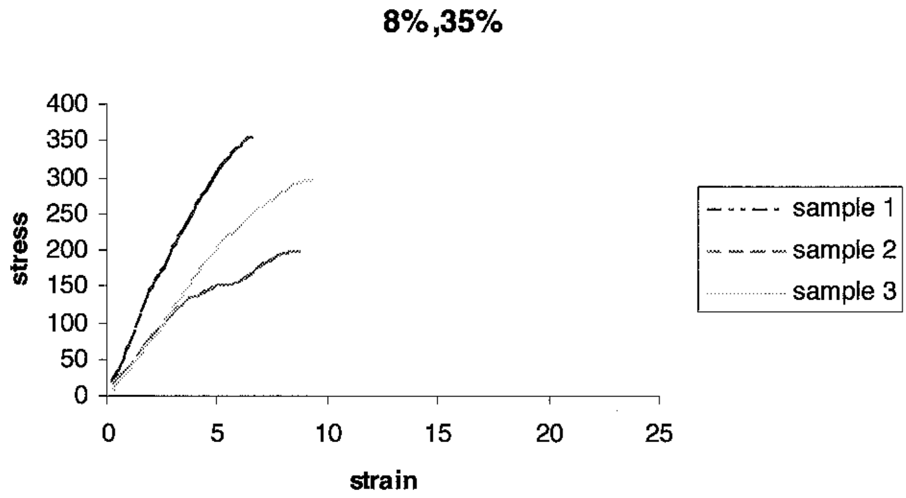


Figure 14 : stress vs strain graph for soft soil with 8 % lime added and 30% moisture content

Table 12 : Results of Unconfined Compression Tests for Lime Contents 0 %,2 %,4 %,6 %,8 % and Moisture Contents 25 % 30% and 35%

0% lime,25% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.4357	0.9956	3	4.0500	1120.5717	3.6142
40	0.4000	0.8715	0.9913	8	10.8000	1125.4973	9.5958
60	0.6000	1.3072	0.9869	9	12.1500	1130.4664	10.7478
80	0.8000	1.7429	0.9826	10	13.5000	1135.4795	11.8892
100	1.0000	2.1786	0.9782	10.9	14.7150	1140.5374	12.9018

0% lime,25% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.4193	0.9958	11	14.8500	1120.3867	13.2544
40	0.4000	0.8386	0.9916	15	20.2500	1125.1241	17.9980
60	0.6000	1.2579	0.9874	18	24.3000	1129.9017	21.5063
80	0.8000	1.6771	0.9832	19	25.6500	1134.7200	22.6047
100	1.0000	2.0964	0.9790	21	28.3500	1139.5796	24.8776
120	1.2000	2.5157	0.9748	23	31.0500	1144.4810	27.1302
140	1.4000	2.9350	0.9706	23.5	31.7250	1149.4248	27.6008
160	1.6000	3.3543	0.9665	24	32.4000	1154.4114	28.0662

0% lime,25% moisture content
sample 3

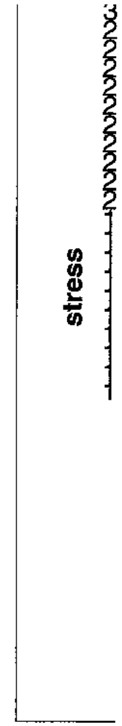
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.4301	0.9957	2	2.7000	1120.5084	2.4096
40	0.4000	0.8602	0.9914	5	6.7500	1125.3697	5.9980
60	0.6000	1.2903	0.9871	7	9.4500	1130.2732	8.3608
80	0.8000	1.7204	0.9828	9	12.1500	1135.2197	10.7028
100	1.0000	2.1505	0.9785	11	14.8500	1140.2097	13.0239
120	1.2000	2.5806	0.9742	12	16.2000	1145.2437	14.1455
140	1.4000	3.0108	0.9699	17	22.9500	1150.3224	19.9509
160	1.6000	3.4409	0.9656	18	24.3000	1155.4463	21.0308

180	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
200	2.0000	4.3011	0.9570	27	36.4500	1165.8324	31.2652
220	2.2000	4.7312	0.9527	31	41.8500	1171.0957	35.7358
240	2.4000	5.1613	0.9484	35	47.2500	1176.4068	40.1647
260	2.6000	5.5914	0.9441	36	48.6000	1181.7663	41.1249
280	2.8000	6.0215	0.9398	38	51.3000	1187.1749	43.2118
300	3.0000	6.4516	0.9355	40	54.0000	1192.6331	45.2780
320	3.2000	6.8817	0.9312	46	62.1000	1198.1418	51.8303
340	3.4000	7.3118	0.9269	49	66.1500	1203.7016	54.9555

0% lime,30% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.3058	0.9969	17	22.9500	1119.1114	20.5073
40	0.4000	0.6116	0.9939	16	21.6000	1122.5548	19.2418
60	0.6000	0.9174	0.9908	23	31.0500	1126.0195	27.5750
80	0.8000	1.2232	0.9878	25	33.7500	1129.5056	29.8803
100	1.0000	1.5291	0.9847	29	39.1500	1133.0134	34.5539
120	1.2000	1.8349	0.9817	30	40.5000	1136.5431	35.6344
140	1.4000	2.1407	0.9786	34	45.9000	1140.0948	40.2598
160	1.6000	2.4465	0.9755	37	49.9500	1143.6687	43.6752
180	1.8000	2.7523	0.9725	38	51.3000	1147.2652	44.7150
200	2.0000	3.0581	0.9694	39	52.6500	1150.8843	45.7474
220	2.2000	3.3639	0.9664	44	59.4000	1154.5263	51.4497
240	2.4000	3.6697	0.9633	45	60.7500	1158.1915	52.4525
260	2.6000	3.9755	0.9602	49	66.1500	1161.8800	56.9336
280	2.8000	4.2813	0.9572	53	71.5500	1165.5921	61.3851
300	3.0000	4.5872	0.9541	59	79.6500	1169.3279	68.1160
320	3.2000	4.8930	0.9511	60	81.0000	1173.0878	69.0485
340	3.4000	5.1988	0.9480	62	83.7000	1176.8720	71.1207
360	3.6000	5.5046	0.9450	65	87.7500	1180.6806	74.3215
380	3.8000	5.8104	0.9419	69	93.1500	1184.5140	78.6398

420	4.2000	6.4220	0.9358	78	105.3000	1192.2559	88.3200
440	4.4000	6.7278	0.9327	79	106.6500	1196.1650	89.1599
460	4.6000	7.0336	0.9297	82	110.7000	1200.0997	92.2423
480	4.8000	7.3394	0.9266	85	114.7500	1204.0605	95.3025
500	5.0000	7.6453	0.9235	91	122.8500	1208.0474	101.6930
520	5.2000	7.9511	0.9205	92	124.2000	1212.0609	102.4701
540	5.4000	8.2569	0.9174	94	126.9000	1216.1011	104.3499
560	5.6000	8.5627	0.9144	98	132.3000	1220.1683	108.4277
580	5.8000	8.8685	0.9113	101	136.3500	1224.2628	111.3731
600	6.0000	9.1743	0.9083	106	143.1000	1228.3849	116.4944
620	6.2000	9.4801	0.9052	108	145.8000	1232.5349	118.2928
640	6.4000	9.7859	0.9021	110	148.5000	1236.7130	120.0764
660	6.6000	10.0917	0.8991	112	151.2000	1240.9195	121.8451
680	6.8000	10.3976	0.8960	117	157.9500	1245.1547	126.8517
700	7.0000	10.7034	0.8930	122	164.7000	1249.4189	131.8213
720	7.2000	11.0092	0.8899	123	166.0500	1253.7124	132.4466
740	7.4000	11.3150	0.8869	124	167.4000	1258.0356	133.0646
760	7.6000	11.6208	0.8838	127	171.4500	1262.3887	135.8140
780	7.8000	11.9266	0.8807	130	175.5000	1266.7719	138.5411
800	8.0000	12.2324	0.8777	132	178.2000	1271.1858	140.1841
820	8.2000	12.5382	0.8746	134	180.9000	1275.6305	141.8122
840	8.4000	12.8440	0.8716	136	183.6000	1280.1064	143.4256
860	8.6000	13.1498	0.8685	139	187.6500	1284.6138	146.0750
880	8.8000	13.4557	0.8654	141	190.3500	1289.1531	147.6551
900	9.0000	13.7615	0.8624	142	191.7000	1293.7245	148.1768
920	9.2000	14.0673	0.8593	143	193.0500	1298.3285	148.6912
940	9.4000	14.3731	0.8563	145	195.7500	1302.9654	150.2342
960	9.6000	14.6789	0.8532	146	197.1000	1307.6356	150.7301



0% lime,30% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3058	0.9969	11	14.8500	1119.1114	13.2695

60	0.6000	0.9174	0.9908	24	32.4000	1126.0195	28.7739
80	0.8000	1.2232	0.9878	30	40.5000	1129.5056	35.8564
100	1.0000	1.5291	0.9847	34	45.9000	1133.0134	40.5114
120	1.2000	1.8349	0.9817	41	55.3500	1136.5431	48.7003
140	1.4000	2.1407	0.9786	45	60.7500	1140.0948	53.2850
160	1.6000	2.4465	0.9755	48	64.8000	1143.6687	56.6598
180	1.8000	2.7523	0.9725	51	68.8500	1147.2652	60.0123
200	2.0000	3.0581	0.9694	57	76.9500	1150.8843	66.8616
220	2.2000	3.3639	0.9664	62	83.7000	1154.5263	72.4973
240	2.4000	3.6697	0.9633	66	89.1000	1158.1915	76.9303
260	2.6000	3.9755	0.9602	70	94.5000	1161.8800	81.3337
280	2.8000	4.2813	0.9572	74	99.9000	1165.5921	85.7075
300	3.0000	4.5872	0.9541	79	106.6500	1169.3279	91.2062
320	3.2000	4.8930	0.9511	83	112.0500	1173.0878	95.5171
340	3.4000	5.1988	0.9480	89	120.1500	1176.8720	102.0927
360	3.6000	5.5046	0.9450	93	125.5500	1180.6806	106.3370
380	3.8000	5.8104	0.9419	97	130.9500	1184.5140	110.5517
400	4.0000	6.1162	0.9388	102	137.7000	1188.3724	115.8728
420	4.2000	6.4220	0.9358	108	145.8000	1192.2559	122.2892
440	4.4000	6.7278	0.9327	115	155.2500	1196.1650	129.7898
460	4.6000	7.0336	0.9297	117	157.9500	1200.0997	131.6141
480	4.8000	7.3394	0.9266	121	163.3500	1204.0605	135.6659
500	5.0000	7.6453	0.9235	126	170.1000	1208.0474	140.8057
520	5.2000	7.9511	0.9205	131	176.8500	1212.0609	145.9085
540	5.4000	8.2569	0.9174	136	183.6000	1216.1011	150.9743
560	5.6000	8.5627	0.9144	139	187.6500	1220.1683	153.7903
580	5.8000	8.8685	0.9113	144	194.4000	1224.2628	158.7894
600	6.0000	9.1743	0.9083	148	199.8000	1228.3849	162.6526
620	6.2000	9.4801	0.9052	152	205.2000	1232.5349	166.4862
640	6.4000	9.7859	0.9021	157	211.9500	1236.7130	171.3817
660	6.6000	10.0917	0.8991	160	216.0000	1240.9195	174.0645
680	6.8000	10.3976	0.8960	164	221.4000	1245.1547	177.8092
700	7.0000	10.7034	0.8930	167	225.4500	1249.4189	180.4439
720	7.2000	11.0092	0.8899	172	232.2000	1253.7124	185.2099

0% lime,30% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.3058	0.9969	19	25.6500	1119.1114	22.9200
40	0.4000	0.6116	0.9939	21	28.3500	1122.5548	25.2549
60	0.6000	0.9174	0.9908	32	43.2000	1126.0195	38.3652
80	0.8000	1.2232	0.9878	39	52.6500	1129.5056	46.6133
100	1.0000	1.5291	0.9847	46	62.1000	1133.0134	54.8096
120	1.2000	1.8349	0.9817	55	74.2500	1136.5431	65.3297
140	1.4000	2.1407	0.9786	64	86.4000	1140.0948	75.7832
160	1.6000	2.4465	0.9755	75	101.2500	1143.6687	88.5309
180	1.8000	2.7523	0.9725	84	113.4000	1147.2652	98.8438
200	2.0000	3.0581	0.9694	95	128.2500	1150.8843	111.4361
220	2.2000	3.3639	0.9664	104	140.4000	1154.5263	121.6083
240	2.4000	3.6697	0.9633	113	152.5500	1158.1915	131.7140
260	2.6000	3.9755	0.9602	120	162.0000	1161.8800	139.4292
280	2.8000	4.2813	0.9572	129	174.1500	1165.5921	149.4090
300	3.0000	4.5872	0.9541	137	184.9500	1169.3279	158.1678
320	3.2000	4.8930	0.9511	146	197.1000	1173.0878	168.0181
340	3.4000	5.1988	0.9480	154	207.9000	1176.8720	176.6547
360	3.6000	5.5046	0.9450	162	218.7000	1180.6806	185.2321
380	3.8000	5.8104	0.9419	169	228.1500	1184.5140	192.6106
400	4.0000	6.1162	0.9388	176	237.6000	1188.3724	199.9373
420	4.2000	6.4220	0.9358	183	247.0500	1192.2559	207.2122
440	4.4000	6.7278	0.9327	191	257.8500	1196.1650	215.5639
460	4.6000	7.0336	0.9297	199	268.6500	1200.0997	223.8564
480	4.8000	7.3394	0.9266	208	280.8000	1204.0605	233.2109
500	5.0000	7.6453	0.9235	212	286.2000	1208.0474	236.9112
520	5.2000	7.9511	0.9205	219	295.6500	1212.0609	243.9234
540	5.4000	8.2569	0.9174	225	303.7500	1216.1011	249.7736
560	5.6000	8.5627	0.9144	232	313.2000	1220.1683	256.6859
580	5.8000	8.8685	0.9113	238	321.3000	1224.2628	262.4436
600	6.0000	9.1743	0.9083	241	325.3500	1228.3849	264.8600
620	6.2000	9.4801	0.9052	248	334.8000	1232.5349	271.6353
640	6.4000	9.7859	0.9021	252	340.2000	1236.7130	275.0840

680	6.8000	10.3976	0.8960	260	351.0000	1245.1547	281.8927
700	7.0000	10.7034	0.8930	263	355.0500	1249.4189	284.1721
720	7.2000	11.0092	0.8899	267	360.4500	1253.7124	287.5061
740	7.4000	11.3150	0.8869	269	363.1500	1258.0356	288.6643
760	7.6000	11.6208	0.8838	271	365.8500	1262.3887	289.8077

0% lime,35% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2721	0.9973	4	5.4000	1118.7332	4.8269
40	0.4000	0.5442	0.9946	5	6.7500	1121.7941	6.0171
60	0.6000	0.8163	0.9918	6	8.1000	1124.8717	7.2008
80	0.8000	1.0884	0.9891	7	9.4500	1127.9662	8.3779
100	1.0000	1.3605	0.9864	8	10.8000	1131.0779	9.5484
120	1.2000	1.6327	0.9837	8.5	11.4750	1134.2067	10.1172
140	1.4000	1.9048	0.9810	9	12.1500	1137.3529	10.6827
160	1.6000	2.1769	0.9782	10	13.5000	1140.5166	11.8367
180	1.8000	2.4490	0.9755	11	14.8500	1143.6980	12.9842
200	2.0000	2.7211	0.9728	11.5	15.5250	1146.8971	13.5365
220	2.2000	2.9932	0.9701	12	16.2000	1150.1142	14.0856
240	2.4000	3.2653	0.9673	13	17.5500	1153.3494	15.2166
260	2.6000	3.5374	0.9646	14	18.9000	1156.6029	16.3410
280	2.8000	3.8095	0.9619	14.5	19.5750	1159.8748	16.8768
300	3.0000	4.0816	0.9592	15	20.2500	1163.1652	17.4094
320	3.2000	4.3537	0.9565	15.5	20.9250	1166.4743	17.9387
340	3.4000	4.6259	0.9537	16	21.6000	1169.8024	18.4647
360	3.6000	4.8980	0.9510	17	22.9500	1173.1494	19.5627
380	3.8000	5.1701	0.9483	17.5	23.6250	1176.5157	20.0805
400	4.0000	5.4422	0.9456	18	24.3000	1179.9014	20.5949
420	4.2000	5.7143	0.9429	18.5	24.9750	1183.3066	21.1061
440	4.4000	5.9864	0.9401	19	25.6500	1186.7315	21.6140

480	4.8000	6.5306	0.9347	20	27.0000	1193.6411	22.6199
500	5.0000	6.8027	0.9320	20.5	27.6750	1197.1262	23.1179
520	5.2000	7.0748	0.9293	21	28.3500	1200.6317	23.6126
540	5.4000	7.3469	0.9265	21.5	29.0250	1204.1578	24.1040
560	5.6000	7.6190	0.9238	22	29.7000	1207.7046	24.5921
580	5.8000	7.8912	0.9211	22.5	30.3750	1211.2725	25.0769
600	6.0000	8.1633	0.9184	23	31.0500	1214.8614	25.5585
620	6.2000	8.4354	0.9156	24	32.4000	1218.4717	26.5907
640	6.4000	8.7075	0.9129	24.5	33.0750	1222.1035	27.0640
660	6.6000	8.9796	0.9102	25	33.7500	1225.7570	27.5340
680	6.8000	9.2517	0.9075	26	35.1000	1229.4325	28.5498
700	7.0000	9.5238	0.9048	27	36.4500	1233.1300	29.5589
720	7.2000	9.7959	0.9020	27.5	37.1250	1236.8499	30.0158
740	7.4000	10.0680	0.8993	28	37.8000	1240.5922	30.4693
760	7.6000	10.3401	0.8966	28.5	38.4750	1244.3573	30.9196
780	7.8000	10.6122	0.8939	29	39.1500	1248.1453	31.3665
800	8.0000	10.8844	0.8912	29.5	39.8250	1251.9564	31.8102
820	8.2000	11.1565	0.8884	30	40.5000	1255.7909	32.2506
840	8.4000	11.4286	0.8857	30.5	41.1750	1259.6489	32.6877
860	8.6000	11.7007	0.8830	31	41.8500	1263.5307	33.1215
880	8.8000	11.9728	0.8803	31.5	42.5250	1267.4366	33.5520
900	9.0000	12.2449	0.8776	32	43.2000	1271.3666	33.9792
920	9.2000	12.5170	0.8748	33	44.5500	1275.3211	34.9324
940	9.4000	12.7891	0.8721	34	45.9000	1279.3002	35.8790
960	9.6000	13.0612	0.8694	34.5	46.5750	1283.3043	36.2930
980	9.8000	13.3333	0.8667	35	47.2500	1287.3335	36.7038
1000	10.0000	13.6054	0.8639	35.5	47.9250	1291.3881	37.1112
1020	10.2000	13.8776	0.8612	36	48.6000	1295.4683	37.5154
1040	10.4000	14.1497	0.8585	36.5	49.2750	1299.5744	37.9163
1060	10.6000	14.4218	0.8558	37	49.9500	1303.7066	38.3138
1080	10.8000	14.6939	0.8531	37.5	50.6250	1307.8652	38.7081
1100	11.0000	14.9660	0.8503	38	51.3000	1312.0503	39.0991

0% lime,35% moisture content

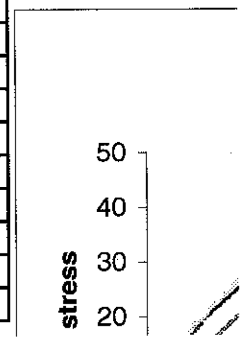
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2762	0.9972	2	2.7000	1118.7796	2.4133
40	0.4000	0.5525	0.9945	3	4.0500	1121.8873	3.6100
60	0.6000	0.8287	0.9917	4	5.4000	1125.0124	4.7999
80	0.8000	1.1050	0.9890	4.5	6.0750	1128.1549	5.3849
100	1.0000	1.3812	0.9862	5	6.7500	1131.3150	5.9665
120	1.2000	1.6575	0.9834	6	8.1000	1134.4928	7.1398
140	1.4000	1.9337	0.9807	6.5	8.7750	1137.6886	7.7130
160	1.6000	2.2099	0.9779	7	9.4500	1140.9024	8.2829
180	1.8000	2.4862	0.9751	7.5	10.1250	1144.1344	8.8495
200	2.0000	2.7624	0.9724	8	10.8000	1147.3848	9.4127
220	2.2000	3.0387	0.9696	8.5	11.4750	1150.6537	9.9726
240	2.4000	3.3149	0.9669	9	12.1500	1153.9412	10.5291
260	2.6000	3.5912	0.9641	9.5	12.8250	1157.2477	11.0823
280	2.8000	3.8674	0.9613	10	13.5000	1160.5731	11.6322
300	3.0000	4.1436	0.9586	10.5	14.1750	1163.9177	12.1787
320	3.2000	4.4199	0.9558	11	14.8500	1167.2816	12.7219
340	3.4000	4.6961	0.9530	12	16.2000	1170.6650	13.8383
360	3.6000	4.9724	0.9503	12.5	16.8750	1174.0681	14.3731
380	3.8000	5.2486	0.9475	13	17.5500	1177.4911	14.9046
400	4.0000	5.5249	0.9448	13.5	18.2250	1180.9340	15.4327
420	4.2000	5.8011	0.9420	14	18.9000	1184.3972	15.9575
440	4.4000	6.0773	0.9392	14.5	19.5750	1187.8807	16.4789
460	4.6000	6.3536	0.9365	15	20.2500	1191.3848	16.9970
480	4.8000	6.6298	0.9337	15.5	20.9250	1194.9096	17.5118
500	5.0000	6.9061	0.9309	16	21.6000	1198.4553	18.0232
520	5.2000	7.1823	0.9282	16.5	22.2750	1202.0221	18.5313
540	5.4000	7.4586	0.9254	17	22.9500	1205.6103	19.0360
560	5.6000	7.7348	0.9227	17.5	23.6250	1209.2199	19.5374
580	5.8000	8.0110	0.9199	18	24.3000	1212.8512	20.0354
600	6.0000	8.2873	0.9171	18.5	24.9750	1216.5043	20.5301
620	6.2000	8.5635	0.9144	19	25.6500	1220.1796	21.0215
640	6.4000	8.8398	0.9116	19.5	26.3250	1223.8771	21.5095
660	6.6000	9.1160	0.9088	20	27.0000	1227.5971	21.9942
680	6.8000	9.3923	0.9061	20.5	27.6750	1231.3397	22.4755

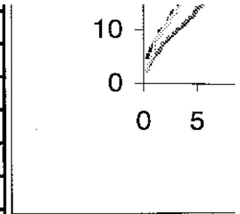
700	7.0000	[illegible]	[illegible]	21	[illegible]	[illegible]	[illegible]
720	7.2000	9.9448	0.9006	21.5	29.0250	1238.8940	23.4282
740	7.4000	10.2210	0.8978	22	29.7000	1242.7060	23.8995

0% lime,35% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2928	0.9971	2	2.7000	1118.9657	2.4129
40	0.4000	0.5857	0.9941	3.5	4.7250	1122.2616	4.2102
60	0.6000	0.8785	0.9912	4.5	6.0750	1125.5770	5.3972
80	0.8000	1.1713	0.9883	7	9.4500	1128.9120	8.3709
100	1.0000	1.4641	0.9854	7.5	10.1250	1132.2669	8.9422
120	1.2000	1.7570	0.9824	8	10.8000	1135.6418	9.5100
140	1.4000	2.0498	0.9795	9	12.1500	1139.0368	10.6669
160	1.6000	2.3426	0.9766	9.5	12.8250	1142.4522	11.2259
180	1.8000	2.6354	0.9736	10.5	14.1750	1145.8882	12.3703
200	2.0000	2.9283	0.9707	11	14.8500	1149.3448	12.9204
220	2.2000	3.2211	0.9678	12	16.2000	1152.8224	14.0525
240	2.4000	3.5139	0.9649	12.5	16.8750	1156.3211	14.5937
260	2.6000	3.8067	0.9619	14.5	19.5750	1159.8411	16.8773
280	2.8000	4.0996	0.9590	15	20.2500	1163.3826	17.4061
300	3.0000	4.3924	0.9561	16	21.6000	1166.9458	18.5099
320	3.2000	4.6852	0.9531	16.5	22.2750	1170.5309	19.0298
340	3.4000	4.9780	0.9502	17	22.9500	1174.1381	19.5463
360	3.6000	5.2709	0.9473	17.5	23.6250	1177.7676	20.0591
380	3.8000	5.5637	0.9444	18	24.3000	1181.4196	20.5685
400	4.0000	5.8565	0.9414	19	25.6500	1185.0943	21.6438
420	4.2000	6.1493	0.9385	19.5	26.3250	1188.7919	22.1443
440	4.4000	6.4422	0.9356	20	27.0000	1192.5127	22.6413
460	4.6000	6.7350	0.9327	20.5	27.6750	1196.2569	23.1347
480	4.8000	7.0278	0.9297	21	28.3500	1200.0246	23.6245
500	5.0000	7.3206	0.9268	21.5	29.0250	1203.8162	24.1108
520	5.2000	7.6135	0.9239	22	29.7000	1207.6317	24.5936
540	5.4000	7.9063	0.9209	22.5	30.3750	1211.4716	25.0728
560	5.6000	8.1991	0.9180	23.5	31.7250	1215.3359	26.1039

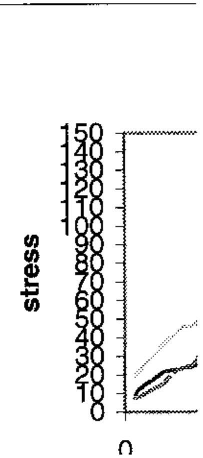


580	5.8000	8.4919	0.9151	[illegible]	[illegible]	[illegible]	[illegible]
600	6.0000	8.7848	0.9122	24.5	33.0750	1223.1390	27.0411
620	6.2000	9.0776	0.9092	25	33.7500	1227.0783	27.5044
640	6.4000	9.3704	0.9063	25.5	34.4250	1231.0430	27.9641
660	6.6000	9.6633	0.9034	26	35.1000	1235.0334	28.4203
680	6.8000	9.9561	0.9004	26.5	35.7750	1239.0498	28.8729
700	7.0000	10.2489	0.8975	27	36.4500	1243.0924	29.3220
720	7.2000	10.5417	0.8946	27.5	37.1250	1247.1614	29.7676
740	7.4000	10.8346	0.8917	28	37.8000	1251.2572	30.2096
760	7.6000	11.1274	0.8887	29	39.1500	1255.3799	31.1858
780	7.8000	11.4202	0.8858	29.5	39.8250	1259.5300	31.6189
800	8.0000	11.7130	0.8829	30	40.5000	1263.7075	32.0486
820	8.2000	12.0059	0.8799	30.5	41.1750	1267.9129	32.4746
840	8.4000	12.2987	0.8770	31	41.8500	1272.1463	32.8972
860	8.6000	12.5915	0.8741	31.5	42.5250	1276.4081	33.3161
880	8.8000	12.8843	0.8712	32	43.2000	1280.6985	33.7316
900	9.0000	13.1772	0.8682	32.5	43.8750	1285.0179	34.1435
920	9.2000	13.4700	0.8653	33	44.5500	1289.3665	34.5519
940	9.4000	13.7628	0.8624	33.5	45.2250	1293.7447	34.9567
960	9.6000	14.0556	0.8594	34	45.9000	1298.1527	35.3579
980	9.8000	14.3485	0.8565	34.5	46.5750	1302.5908	35.7557



2% lime,25% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4120	0.9959	8	10.8000	1120.3051	9.6402
40	0.4000	0.8241	0.9918	12	16.2000	1124.9594	14.4005
60	0.6000	1.2361	0.9876	15	20.2500	1129.6526	17.9259
80	0.8000	1.6481	0.9835	18	24.3000	1134.3851	21.4213
100	1.0000	2.0602	0.9794	19	25.6500	1139.1575	22.5166
120	1.2000	2.4722	0.9753	20	27.0000	1143.9701	23.6020
140	1.4000	2.8842	0.9712	21	28.3500	1148.8236	24.6774
160	1.6000	3.2963	0.9670	23	31.0500	1153.7185	26.9130
180	1.8000	3.7083	0.9629	24	32.4000	1158.6553	27.9635
200	2.0000	4.1203	0.9588	24.5	33.0750	1163.6344	28.4239



220	2.2000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
240	2.4000	4.9444	0.9506	25.5	34.4250	1173.7223	29.3298
260	2.6000	5.3564	0.9464	26	35.1000	1178.8321	29.7752
280	2.8000	5.7684	0.9423	26.5	35.7750	1183.9866	30.2157

2% lime,25% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3476	0.9965	6	8.1000	1119.5805	7.2349
40	0.4000	0.6952	0.9930	8	10.8000	1123.4993	9.6128
60	0.6000	1.0428	0.9896	10.5	14.1750	1127.4455	12.5727
80	0.8000	1.3903	0.9861	13	17.5500	1131.4196	15.5115
100	1.0000	1.7379	0.9826	18	24.3000	1135.4218	21.4017
120	1.2000	2.0855	0.9791	20	27.0000	1139.4524	23.6956
140	1.4000	2.4331	0.9757	22	29.7000	1143.5117	25.9726
160	1.6000	2.7807	0.9722	28	37.8000	1147.6001	32.9383
180	1.8000	3.1283	0.9687	35	47.2500	1151.7178	41.0257
200	2.0000	3.4758	0.9652	43	58.0500	1155.8651	50.2221
220	2.2000	3.8234	0.9618	50	67.5000	1160.0424	58.1875
240	2.4000	4.1710	0.9583	56	75.6000	1164.2501	64.9345
260	2.6000	4.5186	0.9548	61	82.3500	1168.4883	70.4757
280	2.8000	4.8662	0.9513	67	90.4500	1172.7575	77.1259
300	3.0000	5.2138	0.9479	72	97.2000	1177.0581	82.5788
320	3.2000	5.5613	0.9444	77	103.9500	1181.3903	87.9896
340	3.4000	5.9089	0.9409	82	110.7000	1185.7545	93.3583
360	3.6000	6.2565	0.9374	90	121.5000	1190.1511	102.0879
380	3.8000	6.6041	0.9340	97	130.9500	1194.5804	109.6201
400	4.0000	6.9517	0.9305	104	140.4000	1199.0427	117.0934
420	4.2000	7.2993	0.9270	111	149.8500	1203.5386	124.5078
440	4.4000	7.6469	0.9235	118	159.3000	1208.0683	131.8634
460	4.6000	7.9944	0.9201	124	167.4000	1212.6322	138.0468
480	4.8000	8.3420	0.9166	128	172.8000	1217.2307	141.9616

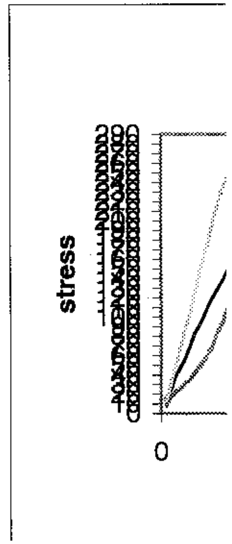
2% lime,25% moisture content

sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4647	0.9954	16	21.6000	1120.8977	19.2703
40	0.4000	0.9294	0.9907	21	28.3500	1126.1552	25.1742
60	0.6000	1.3941	0.9861	26	35.1000	1131.4622	31.0218
80	0.8000	1.8587	0.9814	31	41.8500	1136.8195	36.8132
100	1.0000	2.3234	0.9768	35	47.2500	1142.2278	41.3665
120	1.2000	2.7881	0.9721	39	52.6500	1147.6878	45.8748
140	1.4000	3.2528	0.9675	40	54.0000	1153.2002	46.8262
160	1.6000	3.7175	0.9628	44	59.4000	1158.7659	51.2614
180	1.8000	4.1822	0.9582	45	60.7500	1164.3855	52.1734

2% lime,30% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2918	0.9971	13	17.5500	1118.9542	15.6843
40	0.4000	0.5836	0.9942	20	27.0000	1122.2384	24.0591
60	0.6000	0.8754	0.9912	31	41.8500	1125.5421	37.1821
80	0.8000	1.1672	0.9883	39	52.6500	1128.8652	46.6398
100	1.0000	1.4590	0.9854	46	62.1000	1132.2080	54.8486
120	1.2000	1.7508	0.9825	57	76.9500	1135.5707	67.7633
140	1.4000	2.0426	0.9796	68	91.8000	1138.9533	80.6003
160	1.6000	2.3344	0.9767	76	102.6000	1142.3563	89.8144
180	1.8000	2.6262	0.9737	85	114.7500	1145.7796	100.1502
200	2.0000	2.9180	0.9708	95	128.2500	1149.2234	111.5971
220	2.2000	3.2098	0.9679	103	139.0500	1152.6881	120.6311
240	2.4000	3.5016	0.9650	110	148.5000	1156.1737	128.4409
260	2.6000	3.7934	0.9621	118	159.3000	1159.6804	137.3654
280	2.8000	4.0852	0.9591	126	170.1000	1163.2085	146.2335
300	3.0000	4.3770	0.9562	134	180.9000	1166.7581	155.0450
320	3.2000	4.6688	0.9533	141	190.3500	1170.3295	162.6465
340	3.4000	4.9606	0.9504	146	197.1000	1173.9227	167.8986
360	3.6000	5.2524	0.9475	156	210.6000	1177.5382	178.8477
380	3.8000	5.5442	0.9446	163	220.0500	1181.1759	186.2974
400	4.0000	5.8360	0.9416	170	229.5000	1184.8362	193.6977



420	4.2000	6.1278	0.9387	176	[illegible]	[illegible]	[illegible]
440	4.4000	6.4196	0.9358	182	245.7000	1192.2253	206.0852
460	4.6000	6.7114	0.9329	188	253.8000	1195.9545	212.2154
480	4.8000	7.0032	0.9300	195	263.2500	1199.7071	219.4286
500	5.0000	7.2950	0.9270	200	270.0000	1203.4833	224.3488
520	5.2000	7.5868	0.9241	205	276.7500	1207.2834	229.2337
540	5.4000	7.8786	0.9212	211	284.8500	1211.1075	235.1979
560	5.6000	8.1704	0.9183	216	291.6000	1214.9560	240.0087
580	5.8000	8.4622	0.9154	221	298.3500	1218.8289	244.7841

2% lime,30% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2658	0.9973	7	9.4500	1118.6626	8.4476
40	0.4000	0.5316	0.9947	14	18.9000	1121.6521	16.8501
60	0.6000	0.7974	0.9920	18	24.3000	1124.6576	21.6066
80	0.8000	1.0633	0.9894	21	28.3500	1127.6793	25.1401
100	1.0000	1.3291	0.9867	25	33.7500	1130.7172	29.8483
120	1.2000	1.5949	0.9841	29	39.1500	1133.7715	34.5308
140	1.4000	1.8607	0.9814	34	45.9000	1136.8424	40.3750
160	1.6000	2.1265	0.9787	40	54.0000	1139.9300	47.3713
180	1.8000	2.3923	0.9761	45	60.7500	1143.0344	53.1480
200	2.0000	2.6582	0.9734	53	71.5500	1146.1557	62.4261
220	2.2000	2.9240	0.9708	60	81.0000	1149.2941	70.4780
240	2.4000	3.1898	0.9681	71	95.8500	1152.4498	83.1707
260	2.6000	3.4556	0.9654	80	108.0000	1155.6229	93.4561
280	2.8000	3.7214	0.9628	91	122.8500	1158.8134	106.0136
300	3.0000	3.9872	0.9601	100	135.0000	1162.0217	116.1768
320	3.2000	4.2531	0.9575	108	145.8000	1165.2477	125.1236
340	3.4000	4.5189	0.9548	118	159.3000	1168.4917	136.3296
360	3.6000	4.7847	0.9522	125	168.7500	1171.7538	144.0149
380	3.8000	5.0505	0.9495	132	178.2000	1175.0342	151.6552
400	4.0000	5.3163	0.9468	140	189.0000	1178.3330	160.3961
420	4.2000	5.5821	0.9442	145	195.7500	1181.6504	165.6581
440	4.4000	5.8480	0.9415	155	209.2500	1184.9865	176.5843
460	4.6000	6.1138	0.9389	162	218.7000	1188.3415	184.0380

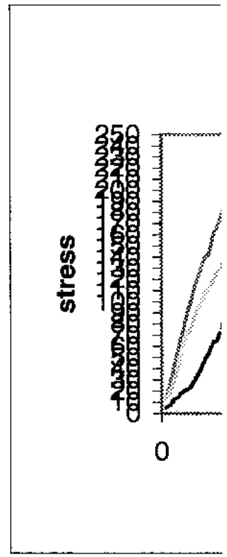
500	5.0000	6.6454	0.9335	175	236.2500	1195.1088	197.6807
520	5.2000	6.9112	0.9309	180	243.0000	1198.5215	202.7498
540	5.4000	7.1770	0.9282	189	255.1500	1201.9537	212.2794
560	5.6000	7.4428	0.9256	195	263.2500	1205.4056	218.3912
580	5.8000	7.7087	0.9229	202	272.7000	1208.8774	225.5812
600	6.0000	7.9745	0.9203	209	282.1500	1212.3692	232.7261
620	6.2000	8.2403	0.9176	215	290.2500	1215.8813	238.7157
640	6.4000	8.5061	0.9149	220	297.0000	1219.4138	243.5597
660	6.6000	8.7719	0.9123	226	305.1000	1222.9668	249.4753
680	6.8000	9.0377	0.9096	230	310.5000	1226.5407	253.1510
700	7.0000	9.3036	0.9070	234	315.9000	1230.1355	256.8010
720	7.2000	9.5694	0.9043	237	319.9500	1233.7514	259.3310
740	7.4000	9.8352	0.9016	239	322.6500	1237.3886	260.7507

2% lime,30% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2985	0.9970	10	13.5000	1119.0294	12.0640
40	0.4000	0.5970	0.9940	25	33.7500	1122.3899	30.0698
60	0.6000	0.8955	0.9910	41	55.3500	1125.7706	49.1663
80	0.8000	1.1940	0.9881	56	75.6000	1129.1717	66.9517
100	1.0000	1.4925	0.9851	71	95.8500	1132.5934	84.6288
120	1.2000	1.7910	0.9821	85	114.7500	1136.0360	101.0091
140	1.4000	2.0896	0.9791	102	137.7000	1139.4995	120.8425
160	1.6000	2.3881	0.9761	120	162.0000	1142.9842	141.7342
180	1.8000	2.6866	0.9731	138	186.3000	1146.4903	162.4959
200	2.0000	2.9851	0.9701	153	206.5500	1150.0179	179.6059
220	2.2000	3.2836	0.9672	170	229.5000	1153.5674	198.9481
240	2.4000	3.5821	0.9642	185	249.7500	1157.1388	215.8341
260	2.6000	3.8806	0.9612	200	270.0000	1160.7324	232.6118
280	2.8000	4.1791	0.9582	212	286.2000	1164.3484	245.8027
300	3.0000	4.4776	0.9552	224	302.4000	1167.9870	258.9070
320	3.2000	4.7761	0.9522	232	313.2000	1171.6484	267.3157
340	3.4000	5.0746	0.9493	236	318.6000	1175.3328	271.0722

2% lime,35% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2653	0.9973	4	5.4000	1118.6563	4.8272
40	0.4000	0.5305	0.9947	7	9.4500	1121.6394	8.4252
60	0.6000	0.7958	0.9920	10	13.5000	1124.6384	12.0039
80	0.8000	1.0610	0.9894	13	17.5500	1127.6535	15.5633
100	1.0000	1.3263	0.9867	16	21.6000	1130.6849	19.1035
120	1.2000	1.5915	0.9841	18	24.3000	1133.7325	21.4336
140	1.4000	1.8568	0.9814	21	28.3500	1136.7967	24.9385
160	1.6000	2.1220	0.9788	26	35.1000	1139.8774	30.7928
180	1.8000	2.3873	0.9761	32	43.2000	1142.9749	37.7961
200	2.0000	2.6525	0.9735	40	54.0000	1146.0893	47.1167
220	2.2000	2.9178	0.9708	46	62.1000	1149.2207	54.0366
240	2.4000	3.1830	0.9682	54	72.9000	1152.3692	63.2610
260	2.6000	3.4483	0.9655	56	75.6000	1155.5351	65.4242
280	2.8000	3.7135	0.9629	66	89.1000	1158.7184	76.8953
300	3.0000	3.9788	0.9602	75	101.2500	1161.9193	87.1403
320	3.2000	4.2440	0.9576	82	110.7000	1165.1379	95.0102
340	3.4000	4.5093	0.9549	91	122.8500	1168.3744	105.1461
360	3.6000	4.7745	0.9523	97	130.9500	1171.6289	111.7675
380	3.8000	5.0398	0.9496	103	139.0500	1174.9016	118.3503
400	4.0000	5.3050	0.9469	108	145.8000	1178.1926	123.7489
420	4.2000	5.5703	0.9443	115	155.2500	1181.5022	131.4005
440	4.4000	5.8355	0.9416	121	163.3500	1184.8303	137.8678
460	4.6000	6.1008	0.9390	126	170.1000	1188.1773	143.1604
480	4.8000	6.3660	0.9363	129	174.1500	1191.5433	146.1550
500	5.0000	6.6313	0.9337	134	180.9000	1194.9283	151.3898
520	5.2000	6.8966	0.9310	140	189.0000	1198.3327	157.7191
540	5.4000	7.1618	0.9284	145	195.7500	1201.7565	162.8866
560	5.6000	7.4271	0.9257	150	202.5000	1205.1999	168.0219
580	5.8000	7.6923	0.9231	155	209.2500	1208.6631	173.1252
600	6.0000	7.9576	0.9204	160	216.0000	1212.1463	178.1963
620	6.2000	8.2228	0.9178	165	222.7500	1215.6496	183.2354



660	6.6000	8.7533	0.9125	171	230.8500	1222.7174	188.8008
680	6.8000	9.0186	0.9098	174	234.9000	1226.2821	191.5546
700	7.0000	9.2838	0.9072	175	236.2500	1229.8678	192.0938
720	7.2000	9.5491	0.9045	175.5	236.9250	1233.4744	192.0794

2% lime,35% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2725	0.9973	12	16.2000	1118.7374	14.4806
40	0.4000	0.5450	0.9946	24	32.4000	1121.8024	28.8821
60	0.6000	0.8174	0.9918	36	48.6000	1124.8843	43.2044
80	0.8000	1.0899	0.9891	50	67.5000	1127.9831	59.8413
100	1.0000	1.3624	0.9864	62	83.7000	1131.0991	73.9988
120	1.2000	1.6349	0.9837	76	102.6000	1134.2324	90.4577
140	1.4000	1.9074	0.9809	87	117.4500	1137.3830	103.2634
160	1.6000	2.1798	0.9782	98	132.3000	1140.5512	115.9965
180	1.8000	2.4523	0.9755	108	145.8000	1143.7371	127.4768
200	2.0000	2.7248	0.9728	118	159.3000	1146.9408	138.8912
220	2.2000	2.9973	0.9700	122	164.7000	1150.1626	143.1971
240	2.4000	3.2698	0.9673	136	183.6000	1153.4025	159.1812
260	2.6000	3.5422	0.9646	143	193.0500	1156.6607	166.9029
280	2.8000	3.8147	0.9619	152	205.2000	1159.9373	176.9061
300	3.0000	4.0872	0.9591	162	218.7000	1163.2326	188.0105
320	3.2000	4.3597	0.9564	168	226.8000	1166.5467	194.4200
340	3.4000	4.6322	0.9537	175	236.2500	1169.8797	201.9438
360	3.6000	4.9046	0.9510	181	244.3500	1173.2318	208.2709
380	3.8000	5.1771	0.9482	188	253.8000	1176.6031	215.7057
400	4.0000	5.4496	0.9455	192	259.2000	1179.9939	219.6622
420	4.2000	5.7221	0.9428	195	263.2500	1183.4043	222.4515
440	4.4000	5.9946	0.9401	201	271.3500	1186.8344	228.6334
460	4.6000	6.2670	0.9373	203	274.0500	1190.2845	230.2391

2% lime,35% moisture content

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2674	0.9973	11	14.8500	1118.6802	13.2746
40	0.4000	0.5348	0.9947	16	21.6000	1121.6874	19.2567
60	0.6000	0.8021	0.9920	25	33.7500	1124.7108	30.0077
80	0.8000	1.0695	0.9893	36	48.6000	1127.7506	43.0946
100	1.0000	1.3369	0.9866	50	67.5000	1130.8068	59.6919
120	1.2000	1.6043	0.9840	60	81.0000	1133.8796	71.4362
140	1.4000	1.8717	0.9813	66	89.1000	1136.9692	78.3662
160	1.6000	2.1390	0.9786	75	101.2500	1140.0757	88.8099
180	1.8000	2.4064	0.9759	83	112.0500	1143.1992	98.0144
200	2.0000	2.6738	0.9733	90	121.5000	1146.3399	105.9895
220	2.2000	2.9412	0.9706	96	129.6000	1149.4978	112.7449
240	2.4000	3.2086	0.9679	102	137.7000	1152.6732	119.4614
260	2.6000	3.4759	0.9652	108	145.8000	1155.8662	126.1392
280	2.8000	3.7433	0.9626	114	153.9000	1159.0770	132.7781
300	3.0000	4.0107	0.9599	121	163.3500	1162.3056	140.5396
320	3.2000	4.2781	0.9572	124	167.4000	1165.5523	143.6229
340	3.4000	4.5455	0.9545	130	175.5000	1168.8171	150.1518
360	3.6000	4.8128	0.9519	135	182.2500	1172.1003	155.4901
380	3.8000	5.0802	0.9492	141	190.3500	1175.4020	161.9446
400	4.0000	5.3476	0.9465	146	197.1000	1178.7223	167.2150
420	4.2000	5.6150	0.9439	151	203.8500	1182.0615	172.4530
440	4.4000	5.8824	0.9412	155	209.2500	1185.4196	176.5198
460	4.6000	6.1497	0.9385	160	216.0000	1188.7969	181.6963
480	4.8000	6.4171	0.9358	163	220.0500	1192.1934	184.5758
500	5.0000	6.6845	0.9332	165	222.7500	1195.6095	186.3067

4% lime,25% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2651	0.9973	5	6.7500	1118.6547	6.0340
40	0.4000	0.5302	0.9947	8	10.8000	1121.6362	9.6288
60	0.6000	0.7953	0.9920	12	16.2000	1124.6336	14.4047
80	0.8000	1.0604	0.9894	14	18.9000	1127.6471	16.7606

120	1.2000	1.5907	0.9841	21	28.3500	1133.7228	25.0061
140	1.4000	1.8558	0.9814	25	33.7500	1136.7853	29.6890
160	1.6000	2.1209	0.9788	28	37.8000	1139.8643	33.1618
180	1.8000	2.3860	0.9761	31	41.8500	1142.9601	36.6155
200	2.0000	2.6511	0.9735	33	44.5500	1146.0727	38.8719
220	2.2000	2.9162	0.9708	34	45.9000	1149.2024	39.9407
240	2.4000	3.1813	0.9682	35	47.2500	1152.3492	41.0032
260	2.6000	3.4464	0.9655	36	48.6000	1155.5132	42.0592
280	2.8000	3.7116	0.9629	37	49.9500	1158.6947	43.1089
300	3.0000	3.9767	0.9602	37.5	50.6250	1161.8937	43.5711

4% lime,25% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2731	0.9973	8	10.8000	1118.7441	9.6537
40	0.4000	0.5461	0.9945	9	12.1500	1121.8158	10.8307
60	0.6000	0.8192	0.9918	12	16.2000	1124.9045	14.4012
80	0.8000	1.0923	0.9891	14	18.9000	1128.0103	16.7552
100	1.0000	1.3654	0.9863	17	22.9500	1131.1333	20.2894
120	1.2000	1.6384	0.9836	21	28.3500	1134.2735	24.9940
140	1.4000	1.9115	0.9809	26	35.1000	1137.4313	30.8590
160	1.6000	2.1846	0.9782	30	40.5000	1140.6067	35.5074
180	1.8000	2.4577	0.9754	35	47.2500	1143.7999	41.3097
200	2.0000	2.7307	0.9727	39	52.6500	1147.0110	45.9019
220	2.2000	3.0038	0.9700	41	55.3500	1150.2402	48.1204
240	2.4000	3.2769	0.9672	46	62.1000	1153.4877	53.8367
260	2.6000	3.5500	0.9645	51	68.8500	1156.7535	59.5200
280	2.8000	3.8230	0.9618	54	72.9000	1160.0379	62.8428
300	3.0000	4.0961	0.9590	57	76.9500	1163.3409	66.1457
320	3.2000	4.3692	0.9563	57.5	77.6250	1166.6629	66.5359

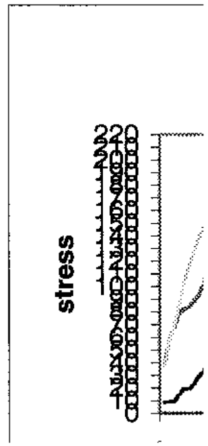
4% lime,25% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4167	0.9958	2	2.7000	1120.3572	2.4099

60	0.6000	1.2500	0.9875	3.5	4.7250	1129.8117	4.1821
80	0.8000	1.6667	0.9833	5	6.7500	1134.5990	5.9492
100	1.0000	2.0833	0.9792	6	8.1000	1139.4271	7.1088
120	1.2000	2.5000	0.9750	7	9.4500	1144.2965	8.2583
140	1.4000	2.9167	0.9708	9	12.1500	1149.2076	10.5725
160	1.6000	3.3333	0.9667	11	14.8500	1154.1611	12.8665
180	1.8000	3.7500	0.9625	14	18.9000	1159.1575	16.3049
200	2.0000	4.1667	0.9583	17	22.9500	1164.1973	19.7132
220	2.2000	4.5833	0.9542	19	25.6500	1169.2811	21.9366
240	2.4000	5.0000	0.9500	20	27.0000	1174.4095	22.9903

4% lime,30% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2667	0.9973	7	9.4500	1118.6722	8.4475
40	0.4000	0.5333	0.9947	7.5	10.1250	1121.6713	9.0267
60	0.6000	0.8000	0.9920	8	10.8000	1124.6865	9.6027
80	0.8000	1.0667	0.9893	13	17.5500	1127.7180	15.5624
100	1.0000	1.3333	0.9867	16	21.6000	1130.7659	19.1021
120	1.2000	1.6000	0.9840	16.5	22.2750	1133.8303	19.6458
140	1.4000	1.8667	0.9813	20	27.0000	1136.9114	23.7486
160	1.6000	2.1333	0.9787	25	33.7500	1140.0093	29.6050
180	1.8000	2.4000	0.9760	28	37.8000	1143.1240	33.0673
200	2.0000	2.6667	0.9733	33	44.5500	1146.2559	38.8657
220	2.2000	2.9333	0.9707	37	49.9500	1149.4049	43.4573
240	2.4000	3.2000	0.9680	39	52.6500	1152.5713	45.6805
260	2.6000	3.4667	0.9653	39.5	53.3250	1155.7552	46.1387
280	2.8000	3.7333	0.9627	40	54.0000	1158.9568	46.5936
300	3.0000	4.0000	0.9600	43	58.0500	1162.1761	49.9494
320	3.2000	4.2667	0.9573	49	66.1500	1165.4134	56.7610
340	3.4000	4.5333	0.9547	55	74.2500	1168.6687	63.5338
360	3.6000	4.8000	0.9520	63	85.0500	1171.9423	72.5718
380	3.8000	5.0667	0.9493	72	97.2000	1175.2343	82.7069
400	4.0000	5.3333	0.9467	82	110.7000	1178.5448	93.9294



440	4.4000	5.8667	0.9413	101	136.3500	1185.2221	115.0417
460	4.6000	6.1333	0.9387	107	144.4500	1188.5892	121.5306
480	4.8000	6.4000	0.9360	115	155.2500	1191.9755	130.2460
500	5.0000	6.6667	0.9333	121	163.3500	1195.3811	136.6510
520	5.2000	6.9333	0.9307	127	171.4500	1198.8063	143.0173
540	5.4000	7.2000	0.9280	131	176.8500	1202.2511	147.0991
560	5.6000	7.4667	0.9253	132	178.2000	1205.7158	147.7960
580	5.8000	7.7333	0.9227	134	180.9000	1209.2006	149.6030
600	6.0000	8.0000	0.9200	142	191.7000	1212.7055	158.0763
620	6.2000	8.2667	0.9173	147	198.4500	1216.2308	163.1680
640	6.4000	8.5333	0.9147	155	209.2500	1219.7767	171.5478
660	6.6000	8.8000	0.9120	163	220.0500	1223.3433	179.8759
680	6.8000	9.0667	0.9093	170	229.5000	1226.9308	187.0521
700	7.0000	9.3333	0.9067	174	234.9000	1230.5394	190.8919
720	7.2000	9.6000	0.9040	177	238.9500	1234.1693	193.6120
740	7.4000	9.8667	0.9013	181	244.3500	1237.8207	197.4034
760	7.6000	10.1333	0.8987	185	249.7500	1241.4938	201.1690
780	7.8000	10.4000	0.8960	186	251.1000	1245.1887	201.6562

4% lime,30% moisture content
sample 2

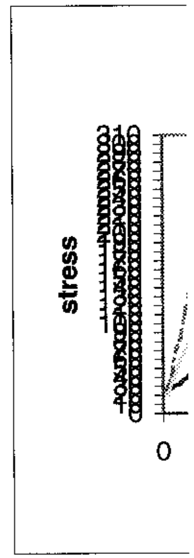
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3058	0.9969	33	44.5500	1119.1114	39.8084
40	0.4000	0.6116	0.9939	48	64.8000	1122.5548	57.7255
60	0.6000	0.9174	0.9908	57	76.9500	1126.0195	68.3381
80	0.8000	1.2232	0.9878	66	89.1000	1129.5056	78.8841
100	1.0000	1.5291	0.9847	69	93.1500	1133.0134	82.2144
120	1.2000	1.8349	0.9817	71	95.8500	1136.5431	84.3347
140	1.4000	2.1407	0.9786	75	101.2500	1140.0948	88.8084
160	1.6000	2.4465	0.9755	80	108.0000	1143.6687	94.4329
180	1.8000	2.7523	0.9725	88	118.8000	1147.2652	103.5506
200	2.0000	3.0581	0.9694	95	128.2500	1150.8843	111.4361
220	2.2000	3.3639	0.9664	104	140.4000	1154.5263	121.6083
240	2.4000	3.6697	0.9633	106	143.1000	1158.1915	123.5547

4% lime,30% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.3556	0.9964	31	41.8500	1119.6708	37.3771
40	0.4000	0.7112	0.9929	47	63.4500	1123.6811	56.4662
60	0.6000	1.0669	0.9893	59	79.6500	1127.7202	70.6292
80	0.8000	1.4225	0.9858	74	99.9000	1131.7885	88.2674
100	1.0000	1.7781	0.9822	88	118.8000	1135.8862	104.5879
120	1.2000	2.1337	0.9787	99	133.6500	1140.0137	117.2354
140	1.4000	2.4893	0.9751	109	147.1500	1144.1713	128.6084
160	1.6000	2.8450	0.9716	118	159.3000	1148.3593	138.7196
180	1.8000	3.2006	0.9680	125	168.7500	1152.5781	146.4109
200	2.0000	3.5562	0.9644	128	172.8000	1156.8280	149.3740

4% lime,35% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2671	0.9973	21	28.3500	1118.6774	25.3424
40	0.4000	0.5343	0.9947	23	31.0500	1121.6817	27.6816
60	0.6000	0.8014	0.9920	26	35.1000	1124.7023	31.2083
80	0.8000	1.0685	0.9893	27	36.4500	1127.7392	32.3213
100	1.0000	1.3356	0.9866	31	41.8500	1130.7925	37.0094
120	1.2000	1.6028	0.9840	34	45.9000	1133.8624	40.4811
140	1.4000	1.8699	0.9813	39	52.6500	1136.9490	46.3081
160	1.6000	2.1370	0.9786	43	58.0500	1140.0524	50.9187
180	1.8000	2.4042	0.9760	45	60.7500	1143.1728	53.1416
200	2.0000	2.6713	0.9733	48	64.8000	1146.3104	56.5292
220	2.2000	2.9384	0.9706	51	68.8500	1149.4652	59.8974
240	2.4000	3.2056	0.9679	55	74.2500	1152.6375	64.4175
260	2.6000	3.4727	0.9653	60	81.0000	1155.8273	70.0797
280	2.8000	3.7398	0.9626	62	83.7000	1159.0348	72.2153
300	3.0000	4.0069	0.9599	63	85.0500	1162.2602	73.1764
320	3.2000	4.2741	0.9573	70	94.5000	1165.5035	81.0808
340	3.4000	4.5412	0.9546	78	105.3000	1168.7651	90.0951
360	3.6000	4.8083	0.9519	88	118.8000	1172.0449	101.3613



400	4.0000	5.3426	0.9466	110	148.5000	1178.6601	125.9905
420	4.2000	5.6097	0.9439	121	163.3500	1181.9957	138.1985
440	4.4000	5.8769	0.9412	133	179.5500	1185.3504	151.4742
460	4.6000	6.1440	0.9386	144	194.4000	1188.7241	163.5367
480	4.8000	6.4111	0.9359	156	210.6000	1192.1170	176.6605
500	5.0000	6.6782	0.9332	164	221.4000	1195.5294	185.1899
520	5.2000	6.9454	0.9305	169	228.1500	1198.9614	190.2897
540	5.4000	7.2125	0.9279	172	232.2000	1202.4131	193.1117
560	5.6000	7.4796	0.9252	179	241.6500	1205.8848	200.3923
580	5.8000	7.7468	0.9225	185	249.7500	1209.3766	206.5114
600	6.0000	8.0139	0.9199	191	257.8500	1212.8886	212.5917
620	6.2000	8.2810	0.9172	198	267.3000	1216.4211	219.7430
640	6.4000	8.5482	0.9145	205	276.7500	1219.9743	226.8490
660	6.6000	8.8153	0.9118	212	286.2000	1223.5483	233.9099
680	6.8000	9.0824	0.9092	225	303.7500	1227.1432	247.5261
700	7.0000	9.3495	0.9065	236	318.6000	1230.7594	258.8646
720	7.2000	9.6167	0.9038	244	329.4000	1234.3969	266.8510
740	7.4000	9.8838	0.9012	251	338.8500	1238.0560	273.6952
760	7.6000	10.1509	0.8985	259	349.6500	1241.7369	281.5814
780	7.8000	10.4181	0.8958	264	356.4000	1245.4397	286.1640
800	8.0000	10.6852	0.8931	268	361.8000	1249.1646	289.6336
820	8.2000	10.9523	0.8905	269	363.1500	1252.9119	289.8448

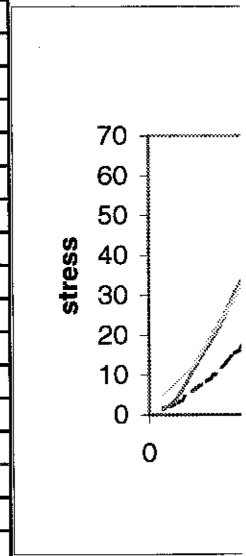
4% lime,35% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2875	0.9971	21	28.3500	1118.9057	25.3373
40	0.4000	0.5750	0.9943	34	45.9000	1122.1409	40.9040
60	0.6000	0.8624	0.9914	57	76.9500	1125.3949	68.3760
80	0.8000	1.1499	0.9885	68	91.8000	1128.6678	81.3348
100	1.0000	1.4374	0.9856	88	118.8000	1131.9599	104.9507
120	1.2000	1.7249	0.9828	108	145.8000	1135.2711	128.4275
140	1.4000	2.0124	0.9799	128	172.8000	1138.6018	151.7651
160	1.6000	2.2998	0.9770	145	195.7500	1141.9521	171.4170
180	1.8000	2.5873	0.9741	163	220.0500	1145.3222	192.1293

220	2.2000	3.1623	0.9684	196	264.6000	1152.1224	229.6631
240	2.4000	3.4498	0.9655	209	282.1500	1155.5529	244.1688
260	2.6000	3.7372	0.9626	222	299.7000	1159.0038	258.5841
280	2.8000	4.0247	0.9598	230	310.5000	1162.4755	267.1024
300	3.0000	4.3122	0.9569	234	315.9000	1165.9680	270.9337

4% lime,35% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2918	0.9971	16	21.6000	1118.9542	19.3037
40	0.4000	0.5836	0.9942	27	36.4500	1122.2384	32.4797
60	0.6000	0.8754	0.9912	37	49.9500	1125.5421	44.3786
80	0.8000	1.1672	0.9883	49	66.1500	1128.8652	58.5987
100	1.0000	1.4590	0.9854	57	76.9500	1132.2080	67.9645
120	1.2000	1.7508	0.9825	64	86.4000	1135.5707	76.0851
140	1.4000	2.0426	0.9796	71	95.8500	1138.9533	84.1562
160	1.6000	2.3344	0.9767	71.5	96.5250	1142.3563	84.4964
180	1.8000	2.6262	0.9737	72	97.2000	1145.7796	84.8331
200	2.0000	2.9180	0.9708	75	101.2500	1149.2234	88.1030
220	2.2000	3.2098	0.9679	82	110.7000	1152.6881	96.0364
240	2.4000	3.5016	0.9650	86	116.1000	1156.1737	100.4174
260	2.6000	3.7934	0.9621	89	120.1500	1159.6804	103.6061
280	2.8000	4.0852	0.9591	93	125.5500	1163.2085	107.9342
300	3.0000	4.3770	0.9562	101	136.3500	1166.7581	116.8623
320	3.2000	4.6688	0.9533	109	147.1500	1170.3295	125.7338
340	3.4000	4.9606	0.9504	110	148.5000	1173.9227	126.4990
360	3.6000	5.2524	0.9475	112	151.2000	1177.5382	128.4035
380	3.8000	5.5442	0.9446	119	160.6500	1181.1759	136.0085
400	4.0000	5.8360	0.9416	121	163.3500	1184.8362	137.8672
420	4.2000	6.1278	0.9387	122	164.7000	1188.5192	138.5758
440	4.4000	6.4196	0.9358	126	170.1000	1192.2253	142.6744
460	4.6000	6.7114	0.9329	134	180.9000	1195.9545	151.2599
480	4.8000	7.0032	0.9300	140	189.0000	1199.7071	157.5385
500	5.0000	7.2950	0.9270	146	197.1000	1203.4833	163.7746
520	5.2000	7.5868	0.9241	150	202.5000	1207.2834	167.7320



6% lime,25% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.3044	0.9970	1.5	2.0250	1119.0957	1.8095
40	0.4000	0.6088	0.9939	2.5	3.3750	1122.5233	3.0066
60	0.6000	0.9132	0.9909	5	6.7500	1125.9719	5.9948
80	0.8000	1.2177	0.9878	7	9.4500	1129.4418	8.3670
100	1.0000	1.5221	0.9848	10	13.5000	1132.9331	11.9160
120	1.2000	1.8265	0.9817	13	17.5500	1136.4461	15.4429
140	1.4000	2.1309	0.9787	16	21.6000	1139.9809	18.9477
160	1.6000	2.4353	0.9756	20	27.0000	1143.5378	23.6109
180	1.8000	2.7397	0.9726	21	28.3500	1147.1169	24.7141
200	2.0000	3.0441	0.9696	25	33.7500	1150.7185	29.3295
220	2.2000	3.3486	0.9665	26	35.1000	1154.3428	30.4069
240	2.4000	3.6530	0.9635	31	41.8500	1157.9901	36.1402
260	2.6000	3.9574	0.9604	33	44.5500	1161.6604	38.3503
280	2.8000	4.2618	0.9574	37	49.9500	1165.3541	42.8625
300	3.0000	4.5662	0.9543	41	55.3500	1169.0713	47.3453
320	3.2000	4.8706	0.9513	42	56.7000	1172.8123	48.3453

6% lime,25% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.3571	0.9964	1	1.3500	1119.6879	1.2057
40	0.4000	0.7143	0.9929	4	5.4000	1123.7156	4.8055
60	0.6000	1.0714	0.9893	9	12.1500	1127.7723	10.7735
80	0.8000	1.4286	0.9857	14	18.9000	1131.8585	16.6982
100	1.0000	1.7857	0.9821	19	25.6500	1135.9743	22.5797
120	1.2000	2.1429	0.9786	26	35.1000	1140.1202	30.7862
140	1.4000	2.5000	0.9750	31	41.8500	1144.2965	36.5727
160	1.6000	2.8571	0.9714	35	47.2500	1148.5034	41.1405
180	1.8000	3.2143	0.9679	40	54.0000	1152.7415	46.8448
200	2.0000	3.5714	0.9643	41	55.3500	1157.0109	47.8388

240	2.4000	4.2857	0.9571	44.5	60.0750	1165.6453	51.5380
260	2.6000	4.6429	0.9536	45	60.7500	1170.0110	51.9226

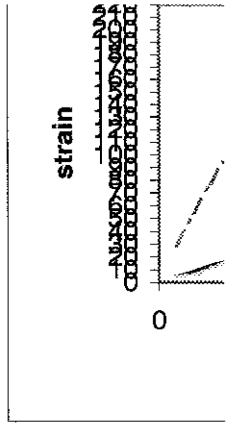
6% lime,25% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4425	0.9956	4	5.4000	1120.6477	4.8186
40	0.4000	0.8850	0.9912	7	9.4500	1125.6506	8.3951
60	0.6000	1.3274	0.9867	10	13.5000	1130.6983	11.9395
80	0.8000	1.7699	0.9823	15	20.2500	1135.7916	17.8290
100	1.0000	2.2124	0.9779	20	27.0000	1140.9309	23.6649
120	1.2000	2.6549	0.9735	25	33.7500	1146.1169	29.4473
140	1.4000	3.0973	0.9690	31	41.8500	1151.3503	36.3486
160	1.6000	3.5398	0.9646	36	48.6000	1156.6318	42.0186
180	1.8000	3.9823	0.9602	42	56.7000	1161.9619	48.7968
200	2.0000	4.4248	0.9558	47	63.4500	1167.3413	54.3543
220	2.2000	4.8673	0.9513	51	68.8500	1172.7708	58.7071
240	2.4000	5.3097	0.9469	52	70.2000	1178.2511	59.5798

6% lime,30% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2918	0.9971	4	5.4000	1118.9542	4.8259
40	0.4000	0.5836	0.9942	7	9.4500	1122.2384	8.4207
60	0.6000	0.8754	0.9912	11	14.8500	1125.5421	13.1936
80	0.8000	1.1672	0.9883	14	18.9000	1128.8652	16.7425
100	1.0000	1.4590	0.9854	20	27.0000	1132.2080	23.8472
120	1.2000	1.7508	0.9825	28	37.8000	1135.5707	33.2872
140	1.4000	2.0426	0.9796	32	43.2000	1138.9533	37.9296
160	1.6000	2.3344	0.9767	41	55.3500	1142.3563	48.4525
180	1.8000	2.6262	0.9737	50	67.5000	1145.7796	58.9119
200	2.0000	2.9180	0.9708	61	82.3500	1149.2234	71.6571
220	2.2000	3.2098	0.9679	74	99.9000	1152.6881	86.6670
240	2.4000	3.5016	0.9650	84	113.4000	1156.1737	98.0821

280	2.8000	4.0852	0.9591	112	151.2000	1163.2085	129.9853
300	3.0000	4.3770	0.9562	122	164.7000	1166.7581	141.1604
320	3.2000	4.6688	0.9533	135	182.2500	1170.3295	155.7254
340	3.4000	4.9606	0.9504	144	194.4000	1173.9227	165.5986
360	3.6000	5.2524	0.9475	152	205.2000	1177.5382	174.2619
380	3.8000	5.5442	0.9446	158	213.3000	1181.1759	180.5828
400	4.0000	5.8360	0.9416	160	216.0000	1184.8362	182.3037



6% lime,30% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.4207	0.9958	24	32.4000	1120.4026	28.9182
40	0.4000	0.8414	0.9916	45	60.7500	1125.1561	53.9925
60	0.6000	1.2621	0.9874	65	87.7500	1129.9501	77.6583
80	0.8000	1.6828	0.9832	84	113.4000	1134.7851	99.9308
100	1.0000	2.1035	0.9790	100	135.0000	1139.6617	118.4562
120	1.2000	2.5242	0.9748	109	147.1500	1144.5804	128.5624
140	1.4000	2.9449	0.9706	112	151.2000	1149.5418	131.5307
160	1.6000	3.3656	0.9663	114	153.9000	1154.5463	133.2991
180	1.8000	3.7863	0.9621	109	147.1500	1159.5946	126.8978

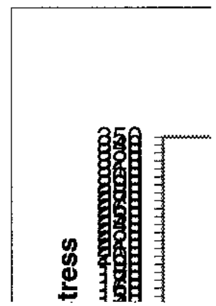
6% lime,30% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2653	0.9973	4	5.4000	1118.6563	4.8272
40	0.4000	0.5305	0.9947	5	6.7500	1121.6394	6.0180
60	0.6000	0.7958	0.9920	9	12.1500	1124.6384	10.8035
80	0.8000	1.0610	0.9894	14	18.9000	1127.6535	16.7605
100	1.0000	1.3263	0.9867	19	25.6500	1130.6849	22.6854
120	1.2000	1.5915	0.9841	25	33.7500	1133.7325	29.7689
140	1.4000	1.8568	0.9814	30	40.5000	1136.7967	35.6264
160	1.6000	2.1220	0.9788	38	51.3000	1139.8774	45.0048
180	1.8000	2.3873	0.9761	45	60.7500	1142.9749	53.1508
200	2.0000	2.6525	0.9735	50	67.5000	1146.0893	58.8959

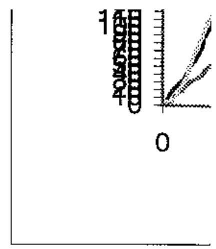
240	2.4000	3.1830	0.9682	68	91.8000	1152.3692	79.6620
260	2.6000	3.4483	0.9655	78	105.3000	1155.5351	91.1266
280	2.8000	3.7135	0.9629	84	113.4000	1158.7184	97.8667
300	3.0000	3.9788	0.9602	96	129.6000	1161.9193	111.5396
320	3.2000	4.2440	0.9576	101	136.3500	1165.1379	117.0248
340	3.4000	4.5093	0.9549	109	147.1500	1168.3744	125.9442
360	3.6000	4.7745	0.9523	117	157.9500	1171.6289	134.8123
380	3.8000	5.0398	0.9496	122	164.7000	1174.9016	140.1820
400	4.0000	5.3050	0.9469	126	170.1000	1178.1926	144.3737
420	4.2000	5.5703	0.9443	130	175.5000	1181.5022	148.5397
440	4.4000	5.8355	0.9416	134	180.9000	1184.8303	152.6801
460	4.6000	6.1008	0.9390	139	187.6500	1188.1773	157.9310
480	4.8000	6.3660	0.9363	146	197.1000	1191.5433	165.4157
500	5.0000	6.6313	0.9337	152	205.2000	1194.9283	171.7258
520	5.2000	6.8966	0.9310	160	216.0000	1198.3327	180.2504
540	5.4000	7.1618	0.9284	167	225.4500	1201.7565	187.6004
560	5.6000	7.4271	0.9257	173	233.5500	1205.1999	193.7853
580	5.8000	7.6923	0.9231	180	243.0000	1208.6631	201.0486
600	6.0000	7.9576	0.9204	185	249.7500	1212.1463	206.0395
620	6.2000	8.2228	0.9178	186	251.1000	1215.6496	206.5562
640	6.4000	8.4881	0.9151	187	252.4500	1219.1733	207.0666

6% lime,35% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2634	0.9974	8	10.8000	1118.6352	9.6546
40	0.4000	0.5267	0.9947	15	20.2500	1121.5969	18.0546
60	0.6000	0.7901	0.9921	21	28.3500	1124.5743	25.2095
80	0.8000	1.0535	0.9895	26	35.1000	1127.5676	31.1290
100	1.0000	1.3168	0.9868	32	43.2000	1130.5768	38.2106
120	1.2000	1.5802	0.9842	44	59.4000	1133.6022	52.3993
140	1.4000	1.8436	0.9816	50	67.5000	1136.6438	59.3854
160	1.6000	2.1069	0.9789	60	81.0000	1139.7017	71.0712
180	1.8000	2.3703	0.9763	75	101.2500	1142.7762	88.6000



220	2.2000	2.8970	0.9710	101	136.3500	1148.9751	118.6710
240	2.4000	3.1604	0.9684	115	155.2500	1152.0999	134.7539
260	2.6000	3.4238	0.9658	130	175.5000	1155.2417	151.9163
280	2.8000	3.6871	0.9631	141	190.3500	1158.4007	164.3214
300	3.0000	3.9505	0.9605	157	211.9500	1161.5770	182.4675
320	3.2000	4.2139	0.9579	172	232.2000	1164.7708	199.3525
340	3.4000	4.4772	0.9552	186	251.1000	1167.9822	214.9862
360	3.6000	4.7406	0.9526	201	271.3500	1171.2113	231.6832
380	3.8000	5.0040	0.9500	212	286.2000	1174.4584	243.6868
400	4.0000	5.2673	0.9473	226	305.1000	1177.7235	259.0591
420	4.2000	5.5307	0.9447	240	324.0000	1181.0068	274.3422
440	4.4000	5.7940	0.9421	251	338.8500	1184.3085	286.1163
460	4.6000	6.0574	0.9394	262	353.7000	1187.6286	297.8204
480	4.8000	6.3208	0.9368	272	367.2000	1190.9675	308.3208
500	5.0000	6.5841	0.9342	281	379.3500	1194.3252	317.6271
520	5.2000	6.8475	0.9315	288	388.8000	1197.7018	324.6217
540	5.4000	7.1109	0.9289	294	396.9000	1201.0976	330.4477
560	5.6000	7.3742	0.9263	296	399.6000	1204.5127	331.7524



6% lime,35% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2669	0.9973	1	1.3500	1118.6746	1.2068
40	0.4000	0.5338	0.9947	5	6.7500	1121.6761	6.0178
60	0.6000	0.8006	0.9920	11	14.8500	1124.6938	13.2036
80	0.8000	1.0675	0.9893	16	21.6000	1127.7278	19.1536
100	1.0000	1.3344	0.9867	21	28.3500	1130.7782	25.0712
120	1.2000	1.6013	0.9840	26	35.1000	1133.8451	30.9566
140	1.4000	1.8682	0.9813	29	39.1500	1136.9287	34.4349
160	1.6000	2.1350	0.9786	32	43.2000	1140.0291	37.8938
180	1.8000	2.4019	0.9760	39	52.6500	1143.1465	46.0571
200	2.0000	2.6688	0.9733	44	59.4000	1146.2810	51.8198
220	2.2000	2.9357	0.9706	52	70.2000	1149.4327	61.0736
240	2.4000	3.2026	0.9680	59	79.6500	1152.6018	69.1045
260	2.6000	3.4694	0.9653	63	85.0500	1155.7885	73.5861

300	3.0000	4.0032	0.9600	85	114.7500	1162.2149	98.7339
320	3.2000	4.2701	0.9573	98	132.3000	1165.4549	113.5179
340	3.4000	4.5370	0.9546	111	149.8500	1168.7131	128.2179
360	3.6000	4.8038	0.9520	121	163.3500	1171.9896	139.3784
380	3.8000	5.0707	0.9493	135	182.2500	1175.2845	155.0688
400	4.0000	5.3376	0.9466	145	195.7500	1178.5979	166.0872
420	4.2000	5.6045	0.9440	157	211.9500	1181.9301	179.3253
440	4.4000	5.8714	0.9413	168	226.8000	1185.2812	191.3470
460	4.6000	6.1382	0.9386	177	238.9500	1188.6514	201.0261
480	4.8000	6.4051	0.9359	189	255.1500	1192.0407	214.0447
500	5.0000	6.6720	0.9333	197	265.9500	1195.4495	222.4686
520	5.2000	6.9389	0.9306	209	282.1500	1198.8778	235.3451
540	5.4000	7.2058	0.9279	218	294.3000	1202.3258	244.7756
560	5.6000	7.4726	0.9253	225	303.7500	1205.7937	251.9088
580	5.8000	7.7395	0.9226	231	311.8500	1209.2817	257.8804
600	6.0000	8.0064	0.9199	236	318.6000	1212.7899	262.7001
620	6.2000	8.2733	0.9173	237	319.9500	1216.3186	263.0479

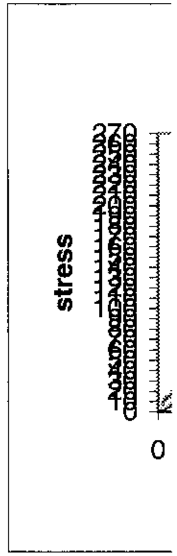
6% lime,35% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2644	0.9974	4	5.4000	1118.6469	4.8273
40	0.4000	0.5288	0.9947	6	8.1000	1121.6204	7.2217
60	0.6000	0.7932	0.9921	10	13.5000	1124.6098	12.0042
80	0.8000	1.0576	0.9894	22	29.7000	1127.6152	26.3388
100	1.0000	1.3221	0.9868	30	40.5000	1130.6367	35.8205
120	1.2000	1.5865	0.9841	47	63.4500	1133.6744	55.9685
140	1.4000	1.8509	0.9815	60	81.0000	1136.7284	71.2571
160	1.6000	2.1153	0.9788	71	95.8500	1139.7990	84.0938
180	1.8000	2.3797	0.9762	84	113.4000	1142.8862	99.2225
200	2.0000	2.6441	0.9736	97	130.9500	1145.9902	114.2680
220	2.2000	2.9085	0.9709	111	149.8500	1149.1111	130.4051
240	2.4000	3.1729	0.9683	124	167.4000	1152.2490	145.2811
260	2.6000	3.4373	0.9656	140	189.0000	1155.4042	163.5791
280	2.8000	3.7017	0.9630	156	210.6000	1158.5766	181.7748

320	3.2000	4.2306	0.9577	186	251.1000	1164.9740	215.5413
340	3.4000	4.4950	0.9551	198	267.3000	1168.1993	228.8137
360	3.6000	4.7594	0.9524	211	284.8500	1171.4425	243.1617
380	3.8000	5.0238	0.9498	221	298.3500	1174.7038	253.9789
400	4.0000	5.2882	0.9471	232	313.2000	1177.9832	265.8781
420	4.2000	5.5526	0.9445	240	324.0000	1181.2811	274.2785
440	4.4000	5.8170	0.9418	252	340.2000	1184.5974	287.1862
460	4.6000	6.0814	0.9392	260	351.0000	1187.9324	295.4714
480	4.8000	6.3458	0.9365	266	359.1000	1191.2863	301.4389
500	5.0000	6.6103	0.9339	271	365.8500	1194.6591	306.2380
520	5.2000	6.8747	0.9313	275	371.2500	1198.0511	309.8783
540	5.4000	7.1391	0.9286	278	375.3000	1201.4624	312.3693

8% lime,25% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2658	0.9973	1	1.3500	1118.6626	1.2068
40	0.4000	0.5316	0.9947	4	5.4000	1121.6521	4.8143
60	0.6000	0.7974	0.9920	5	6.7500	1124.6576	6.0018
80	0.8000	1.0633	0.9894	7	9.4500	1127.6793	8.3800
100	1.0000	1.3291	0.9867	9	12.1500	1130.7172	10.7454
120	1.2000	1.5949	0.9841	12	16.2000	1133.7715	14.2886
140	1.4000	1.8607	0.9814	14	18.9000	1136.8424	16.6250
160	1.6000	2.1265	0.9787	17	22.9500	1139.9300	20.1328
180	1.8000	2.3923	0.9761	21	28.3500	1143.0344	24.8024
200	2.0000	2.6582	0.9734	26	35.1000	1146.1557	30.6241
220	2.2000	2.9240	0.9708	29	39.1500	1149.2941	34.0644
240	2.4000	3.1898	0.9681	31	41.8500	1152.4498	36.3139
260	2.6000	3.4556	0.9654	34	45.9000	1155.6229	39.7188
280	2.8000	3.7214	0.9628	37	49.9500	1158.8134	43.1044
300	3.0000	3.9872	0.9601	41	55.3500	1162.0217	47.6325
320	3.2000	4.2531	0.9575	47	63.4500	1165.2477	54.4519
340	3.4000	4.5189	0.9548	50	67.5000	1168.4917	57.7668
360	3.6000	4.7847	0.9522	55	74.2500	1171.7538	63.3666



400	4.0000	5.3163	0.9468	71	95.8500	1178.3330	81.3437
420	4.2000	5.5821	0.9442	78	105.3000	1181.6504	89.1127
440	4.4000	5.8480	0.9415	83	112.0500	1184.9865	94.5580
460	4.6000	6.1138	0.9389	91	122.8500	1188.3415	103.3794
480	4.8000	6.3796	0.9362	98	132.3000	1191.7156	111.0164
500	5.0000	6.6454	0.9335	105	141.7500	1195.1088	118.6084
520	5.2000	6.9112	0.9309	113	152.5500	1198.5215	127.2818
540	5.4000	7.1770	0.9282	120	162.0000	1201.9537	134.7806
560	5.6000	7.4428	0.9256	128	172.8000	1205.4056	143.3542
580	5.8000	7.7087	0.9229	135	182.2500	1208.8774	150.7597
600	6.0000	7.9745	0.9203	145	195.7500	1212.3692	161.4607
620	6.2000	8.2403	0.9176	156	210.6000	1215.8813	173.2077
640	6.4000	8.5061	0.9149	167	225.4500	1219.4138	184.8839
660	6.6000	8.7719	0.9123	178	240.3000	1222.9668	196.4894
680	6.8000	9.0377	0.9096	188	253.8000	1226.5407	206.9234
700	7.0000	9.3036	0.9070	198	267.3000	1230.1355	217.2931
720	7.2000	9.5694	0.9043	205	276.7500	1233.7514	224.3159
740	7.4000	9.8352	0.9016	212	286.2000	1237.3886	231.2935
760	7.6000	10.1010	0.8990	224	302.4000	1241.0474	243.6652
780	7.8000	10.3668	0.8963	228	307.8000	1244.7278	247.2830
800	8.0000	10.6326	0.8937	232	313.2000	1248.4302	250.8751
820	8.2000	10.8985	0.8910	235	317.2500	1252.1546	253.3633

8% lime,25% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2645	0.9974	6	8.1000	1118.6480	7.2409
40	0.4000	0.5290	0.9947	11	14.8500	1121.6228	13.2397
60	0.6000	0.7935	0.9921	13	17.5500	1124.6134	15.6054
80	0.8000	1.0581	0.9894	18	24.3000	1127.6200	21.5498
100	1.0000	1.3226	0.9868	20	27.0000	1130.6427	23.8802
120	1.2000	1.5871	0.9841	23	31.0500	1133.6816	27.3886
140	1.4000	1.8516	0.9815	28	37.8000	1136.7370	33.2531
160	1.6000	2.1161	0.9788	32	43.2000	1139.8088	37.9011
180	1.8000	2.3806	0.9762	34	45.9000	1142.8973	40.1611

220	2.2000	2.9097	0.9709	47	63.4500	1149.1248	55.2159
240	2.4000	3.1742	0.9683	55	74.2500	1152.2640	64.4384
260	2.6000	3.4387	0.9656	60	81.0000	1155.4205	70.1043
280	2.8000	3.7032	0.9630	73	98.5500	1158.5943	85.0600
300	3.0000	3.9677	0.9603	82	110.7000	1161.7856	95.2844
320	3.2000	4.2322	0.9577	94	126.9000	1164.9945	108.9276
340	3.4000	4.4968	0.9550	102	137.7000	1168.2212	117.8715
360	3.6000	4.7613	0.9524	110	148.5000	1171.4658	126.7643
380	3.8000	5.0258	0.9497	121	163.3500	1174.7284	139.0534
400	4.0000	5.2903	0.9471	130	175.5000	1178.0093	148.9801
420	4.2000	5.5548	0.9445	141	190.3500	1181.3086	161.1349
440	4.4000	5.8193	0.9418	150	202.5000	1184.6264	170.9400
460	4.6000	6.0839	0.9392	163	220.0500	1187.9630	185.2330
480	4.8000	6.3484	0.9365	177	238.9500	1191.3183	200.5761
500	5.0000	6.6129	0.9339	188	253.8000	1194.6927	212.4396
520	5.2000	6.8774	0.9312	200	270.0000	1198.0862	225.3594
540	5.4000	7.1419	0.9286	211	284.8500	1201.4991	237.0788
560	5.6000	7.4064	0.9259	221	298.3500	1204.9314	247.6075
580	5.8000	7.6709	0.9233	227	306.4500	1208.3835	253.6033
600	6.0000	7.9355	0.9206	229	309.1500	1211.8553	255.1047

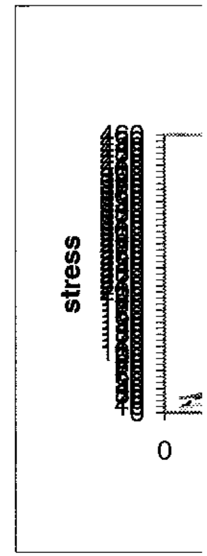
8% lime,25% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2935	0.9971	3	4.0500	1118.9734	3.6194
40	0.4000	0.5870	0.9941	5	6.7500	1122.2771	6.0146
60	0.6000	0.8805	0.9912	8	10.8000	1125.6004	9.5949
80	0.8000	1.1741	0.9883	11	14.8500	1128.9435	13.1539
100	1.0000	1.4676	0.9853	14	18.9000	1132.3064	16.6916
120	1.2000	1.7611	0.9824	18	24.3000	1135.6895	21.3967
140	1.4000	2.0546	0.9795	23	31.0500	1139.0928	27.2585
160	1.6000	2.3481	0.9765	30	40.5000	1142.5166	35.4481
180	1.8000	2.6416	0.9736	40	54.0000	1145.9610	47.1220
200	2.0000	2.9351	0.9706	49	66.1500	1149.4262	57.5505
220	2.2000	3.2286	0.9677	55	74.2500	1152.9125	64.4021

260	2.6000	3.8157	0.9618	79	106.6500	1159.9489	91.9437
280	2.8000	4.1092	0.9589	87	117.4500	1163.4994	100.9455
300	3.0000	4.4027	0.9560	95	128.2500	1167.0717	109.8904
320	3.2000	4.6962	0.9530	100	135.0000	1170.6660	115.3190

8% lime,30% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2546	0.9975	5	6.7500	1118.5374	6.0347
40	0.4000	0.5093	0.9949	20	27.0000	1121.4003	24.0770
60	0.6000	0.7639	0.9924	26	35.1000	1124.2779	31.2200
80	0.8000	1.0186	0.9898	42	56.7000	1127.1703	50.3030
100	1.0000	1.2732	0.9873	64	86.4000	1130.0776	76.4549
120	1.2000	1.5279	0.9847	96	129.6000	1133.0000	114.3866
140	1.4000	1.7825	0.9822	120	162.0000	1135.9375	142.6135
160	1.6000	2.0372	0.9796	142	191.7000	1138.8903	168.3217
180	1.8000	2.2918	0.9771	168	226.8000	1141.8585	198.6236
200	2.0000	2.5465	0.9745	195	263.2500	1144.8422	229.9444
220	2.2000	2.8011	0.9720	220	297.0000	1147.8415	258.7465
240	2.4000	3.0558	0.9694	247	333.4500	1150.8566	289.7407
260	2.6000	3.3104	0.9669	272	367.2000	1153.8875	318.2286
280	2.8000	3.5651	0.9643	296	399.6000	1156.9345	345.3955
300	3.0000	3.8197	0.9618	318	429.3000	1159.9976	370.0870
320	3.2000	4.0744	0.9593	339	457.6500	1163.0770	393.4821
340	3.4000	4.3290	0.9567	352	475.2000	1166.1727	407.4868
360	3.6000	4.5837	0.9542	364	491.4000	1169.2850	420.2568
380	3.8000	4.8383	0.9516	372	502.2000	1172.4139	428.3470
400	4.0000	5.0929	0.9491	375	506.2500	1175.5597	430.6459



8% lime,30% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2648	0.9974	20	27.0000	1118.6508	24.1362
40	0.4000	0.5295	0.9947	24	32.4000	1121.6283	28.8866

80	0.8000	1.0590	0.9894	42	56.7000	1127.6311	50.2824
100	1.0000	1.3238	0.9868	52	70.2000	1130.6567	62.0878
120	1.2000	1.5886	0.9841	61	82.3500	1133.6986	72.6384
140	1.4000	1.8533	0.9815	71	95.8500	1136.7568	84.3188
160	1.6000	2.1181	0.9788	81	109.3500	1139.8316	95.9352
180	1.8000	2.3828	0.9762	91	122.8500	1142.9231	107.4875
200	2.0000	2.6476	0.9735	102	137.7000	1146.0314	120.1538
220	2.2000	2.9124	0.9709	114	153.9000	1149.1567	133.9243
240	2.4000	3.1771	0.9682	135	182.2500	1152.2990	158.1621
260	2.6000	3.4419	0.9656	150	202.5000	1155.4586	175.2551
280	2.8000	3.7066	0.9629	165	222.7500	1158.6356	192.2520
300	3.0000	3.9714	0.9603	175	236.2500	1161.8300	203.3430
320	3.2000	4.2362	0.9576	185	249.7500	1165.0422	214.3699
340	3.4000	4.5009	0.9550	197	265.9500	1168.2721	227.6439
360	3.6000	4.7657	0.9523	210	283.5000	1171.5200	241.9933
380	3.8000	5.0304	0.9497	218	294.3000	1174.7860	250.5137
400	4.0000	5.2952	0.9470	225	303.7500	1178.0703	257.8369
420	4.2000	5.5600	0.9444	232	313.2000	1181.3730	265.1152
440	4.4000	5.8247	0.9418	242	326.7000	1184.6943	275.7673
460	4.6000	6.0895	0.9391	248	334.8000	1188.0343	281.8101
480	4.8000	6.3542	0.9365	254	342.9000	1191.3931	287.8143

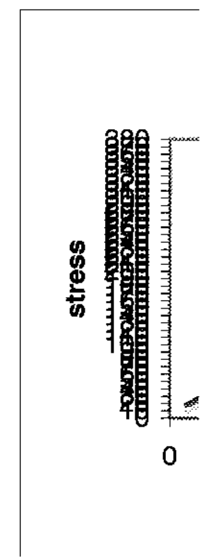
8% lime,30% moisture content
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2551	0.9974	5	6.7500	1118.5425	6.0346
40	0.4000	0.5102	0.9949	10	13.5000	1121.4105	12.0384
60	0.6000	0.7653	0.9923	15	20.2500	1124.2933	18.0113
80	0.8000	1.0204	0.9898	20	27.0000	1127.1910	23.9533
100	1.0000	1.2755	0.9872	22	29.7000	1130.1036	26.2808
120	1.2000	1.5306	0.9847	25	33.7500	1133.0314	29.7873
140	1.4000	1.7857	0.9821	32	43.2000	1135.9743	38.0290
160	1.6000	2.0408	0.9796	44	59.4000	1138.9326	52.1541
180	1.8000	2.2959	0.9770	55	74.2500	1141.9063	65.0228

220	2.2000	2.8061	0.9719	75	101.2500	1147.9005	88.2045
240	2.4000	3.0612	0.9694	87	117.4500	1150.9213	102.0487
260	2.6000	3.3163	0.9668	102	137.7000	1153.9581	119.3284
280	2.8000	3.5714	0.9643	115	155.2500	1157.0109	134.1820
300	3.0000	3.8265	0.9617	130	175.5000	1160.0799	151.2827
320	3.2000	4.0816	0.9592	145	195.7500	1163.1652	168.2908
340	3.4000	4.3367	0.9566	155	209.2500	1166.2670	179.4186
360	3.6000	4.5918	0.9541	160	216.0000	1169.3853	184.7124
380	3.8000	4.8469	0.9515	165	222.7500	1172.5204	189.9754
400	4.0000	5.1020	0.9490	170	229.5000	1175.6723	195.2075
420	4.2000	5.3571	0.9464	172	232.2000	1178.8413	196.9731
440	4.4000	5.6122	0.9439	176	237.6000	1182.0273	201.0106
460	4.6000	5.8673	0.9413	181	244.3500	1185.2306	206.1624
480	4.8000	6.1224	0.9388	185	249.7500	1188.4514	210.1474
500	5.0000	6.3776	0.9362	190	256.5000	1191.6897	215.2406
520	5.2000	6.6327	0.9337	192	259.2000	1194.9457	216.9136
540	5.4000	6.8878	0.9311	193	260.5500	1198.2195	217.4476

8% lime,35% moisture content
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2653	0.9973	15	20.2500	1118.6563	18.1021
40	0.4000	0.5305	0.9947	27	36.4500	1121.6394	32.4971
60	0.6000	0.7958	0.9920	42	56.7000	1124.6384	50.4162
80	0.8000	1.0610	0.9894	60	81.0000	1127.6535	71.8306
100	1.0000	1.3263	0.9867	77	103.9500	1130.6849	91.9354
120	1.2000	1.5915	0.9841	97	130.9500	1133.7325	115.5034
140	1.4000	1.8568	0.9814	112	151.2000	1136.7967	133.0053
160	1.6000	2.1220	0.9788	124	167.4000	1139.8774	146.8579
180	1.8000	2.3873	0.9761	140	189.0000	1142.9749	165.3580
200	2.0000	2.6525	0.9735	150	202.5000	1146.0893	176.6878
220	2.2000	2.9178	0.9708	165	222.7500	1149.2207	193.8270
240	2.4000	3.1830	0.9682	178	240.3000	1152.3692	208.5269
260	2.6000	3.4483	0.9655	192	259.2000	1155.5351	224.3117



300	3.0000	3.9788	0.9602	218	294.3000	1161.9193	253.2878
320	3.2000	4.2440	0.9576	231	311.8500	1165.1379	267.6507
340	3.4000	4.5093	0.9549	241	325.3500	1168.3744	278.4638
360	3.6000	4.7745	0.9523	255	344.2500	1171.6289	293.8217
380	3.8000	5.0398	0.9496	266	359.1000	1174.9016	305.6426
400	4.0000	5.3050	0.9469	277	373.9500	1178.1926	317.3929
420	4.2000	5.5703	0.9443	286	386.1000	1181.5022	326.7874
440	4.4000	5.8355	0.9416	296	399.6000	1184.8303	337.2635
460	4.6000	6.1008	0.9390	302	407.7000	1188.1773	343.1306
480	4.8000	6.3660	0.9363	310	418.5000	1191.5433	351.2252
500	5.0000	6.6313	0.9337	314	423.9000	1194.9283	354.7493

8% lime,35% moisture content
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2979	0.9970	13	17.5500	1119.0225	15.6833
40	0.4000	0.5958	0.9940	21	28.3500	1122.3758	25.2589
60	0.6000	0.8937	0.9911	25	33.7500	1125.7494	29.9800
80	0.8000	1.1915	0.9881	31	41.8500	1129.1432	37.0635
100	1.0000	1.4894	0.9851	40	54.0000	1132.5577	47.6797
120	1.2000	1.7873	0.9821	50	67.5000	1135.9928	59.4194
140	1.4000	2.0852	0.9791	60	81.0000	1139.4488	71.0870
160	1.6000	2.3831	0.9762	70	94.5000	1142.9259	82.6825
180	1.8000	2.6810	0.9732	77	103.9500	1146.4243	90.6732
200	2.0000	2.9789	0.9702	85	114.7500	1149.9442	99.7875
220	2.2000	3.2767	0.9672	92	124.2000	1153.4857	107.6736
240	2.4000	3.5746	0.9643	101	136.3500	1157.0492	117.8429
260	2.6000	3.8725	0.9613	107	144.4500	1160.6347	124.4578
280	2.8000	4.1704	0.9583	114	153.9000	1164.2425	132.1890
300	3.0000	4.4683	0.9553	117	157.9500	1167.8728	135.2459
320	3.2000	4.7662	0.9523	120	162.0000	1171.5259	138.2812
340	3.4000	5.0640	0.9494	123	166.0500	1175.2018	141.2949
360	3.6000	5.3619	0.9464	127	171.4500	1178.9009	145.4321
380	3.8000	5.6598	0.9434	131	176.8500	1182.6234	149.5404

420	4.2000	6.2556	0.9374	134	180.9000	1190.1392	151.9990
440	4.4000	6.5535	0.9345	135	182.2500	1193.9331	152.6467
460	4.6000	6.8514	0.9315	138	186.3000	1197.7512	155.5415
480	4.8000	7.1492	0.9285	145	195.7500	1201.5939	162.9086
500	5.0000	7.4471	0.9255	150	202.5000	1205.4613	167.9855
520	5.2000	7.7450	0.9225	157	211.9500	1209.3536	175.2589
540	5.4000	8.0429	0.9196	162	218.7000	1213.2712	180.2565
560	5.6000	8.3408	0.9166	165	222.7500	1217.2142	182.9998
580	5.8000	8.6387	0.9136	171	230.8500	1221.1830	189.0380
600	6.0000	8.9366	0.9106	176	237.6000	1225.1777	193.9311
620	6.2000	9.2344	0.9077	178	240.3000	1229.1986	195.4932
640	6.4000	9.5323	0.9047	180	243.0000	1233.2460	197.0410
660	6.6000	9.8302	0.9017	181	244.3500	1237.3202	197.4832

8% lime,35% moisture content
sample 3

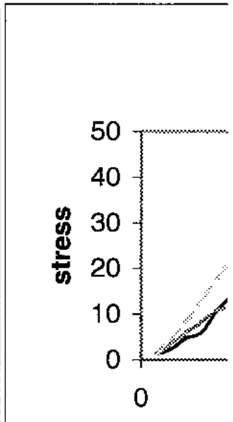
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2653	0.9973	7	9.4500	1118.6563	8.4476
40	0.4000	0.5305	0.9947	15	20.2500	1121.6394	18.0539
60	0.6000	0.7958	0.9920	25	33.7500	1124.6384	30.0096
80	0.8000	1.0610	0.9894	33	44.5500	1127.6535	39.5068
100	1.0000	1.3263	0.9867	41	55.3500	1130.6849	48.9526
120	1.2000	1.5915	0.9841	51	68.8500	1133.7325	60.7286
140	1.4000	1.8568	0.9814	60	81.0000	1136.7967	71.2528
160	1.6000	2.1220	0.9788	65	87.7500	1139.8774	76.9820
180	1.8000	2.3873	0.9761	75	101.2500	1142.9749	88.5846
200	2.0000	2.6525	0.9735	88	118.8000	1146.0893	103.6568
220	2.2000	2.9178	0.9708	98	132.3000	1149.2207	115.1215
240	2.4000	3.1830	0.9682	110	148.5000	1152.3692	128.8649
260	2.6000	3.4483	0.9655	120	162.0000	1155.5351	140.1948
280	2.8000	3.7135	0.9629	130	175.5000	1158.7184	151.4604
300	3.0000	3.9788	0.9602	141	190.3500	1161.9193	163.8238
320	3.2000	4.2440	0.9576	151	203.8500	1165.1379	174.9578
340	3.4000	4.5093	0.9549	160	216.0000	1168.3744	184.8723
360	3.6000	4.7745	0.9523	168	226.8000	1171.6289	193.5767

400	4.0000	5.3050	0.9469	186	251.1000	1178.1926	213.1230
420	4.2000	5.5703	0.9443	194	261.9000	1181.5022	221.6670
440	4.4000	5.8355	0.9416	200	270.0000	1184.8303	227.8807
460	4.6000	6.1008	0.9390	208	280.8000	1188.1773	236.3284
480	4.8000	6.3660	0.9363	216	291.6000	1191.5433	244.7246
500	5.0000	6.6313	0.9337	224	302.4000	1194.9283	253.0696
520	5.2000	6.8966	0.9310	229	309.1500	1198.3327	257.9834
540	5.4000	7.1618	0.9284	233	314.5500	1201.7565	261.7419
560	5.6000	7.4271	0.9257	240	324.0000	1205.1999	268.8351
580	5.8000	7.6923	0.9231	246	332.1000	1208.6631	274.7664
600	6.0000	7.9576	0.9204	252	340.2000	1212.1463	280.6592
620	6.2000	8.2228	0.9178	257	346.9500	1215.6496	285.4030
640	6.4000	8.4881	0.9151	262	353.7000	1219.1733	290.1146
660	6.6000	8.7533	0.9125	265	357.7500	1222.7174	292.5860
680	6.8000	9.0186	0.9098	269	363.1500	1226.2821	296.1390
700	7.0000	9.2838	0.9072	270	364.5000	1229.8678	296.3733

2% lime,25% moisture content(after 1 day)

sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3416	0.9966	1	1.3500	1119.5138	1.2059
40	0.4000	0.6833	0.9932	2	2.7000	1123.3649	2.4035
60	0.6000	1.0249	0.9898	4	5.4000	1127.2426	4.7905
80	0.8000	1.3666	0.9863	5	6.7500	1131.1472	5.9674
100	1.0000	1.7082	0.9829	9	12.1500	1135.0789	10.7041
120	1.2000	2.0499	0.9795	12	16.2000	1139.0380	14.2225
140	1.4000	2.3915	0.9761	17	22.9500	1143.0248	20.0783
160	1.6000	2.7332	0.9727	21	28.3500	1147.0396	24.7158
180	1.8000	3.0748	0.9693	26	35.1000	1151.0828	30.4930
200	2.0000	3.4165	0.9658	30	40.5000	1155.1545	35.0602
220	2.2000	3.7581	0.9624	35	47.2500	1159.2552	40.7589
240	2.4000	4.0998	0.9590	38	51.3000	1163.3851	44.0955



2% lime,25% moisture content(after 1 day)
sample 2

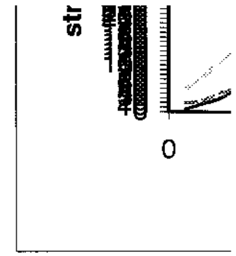
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3667	0.9963	1	1.3500	1119.7954	1.2056
40	0.4000	0.7334	0.9927	3	4.0500	1123.9320	3.6034
60	0.6000	1.1001	0.9890	5	6.7500	1128.0994	5.9835
80	0.8000	1.4668	0.9853	7	9.4500	1132.2977	8.3459
100	1.0000	1.8335	0.9817	9	12.1500	1136.5275	10.6905
120	1.2000	2.2002	0.9780	10	13.5000	1140.7889	11.8339
140	1.4000	2.5669	0.9743	12	16.2000	1145.0824	14.1475
160	1.6000	2.9336	0.9707	18	24.3000	1149.4084	21.1413
180	1.8000	3.3003	0.9670	21	28.3500	1153.7672	24.5717
200	2.0000	3.6670	0.9633	24	32.4000	1158.1591	27.9754
220	2.2000	4.0337	0.9597	26	35.1000	1162.5847	30.1913
240	2.4000	4.4004	0.9560	29	39.1500	1167.0441	33.5463
260	2.6000	4.7671	0.9523	31	41.8500	1171.5379	35.7223

2% lime,25% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3588	0.9964	1	1.3500	1119.7067	1.2057
40	0.4000	0.7176	0.9928	4	5.4000	1123.7533	4.8053
60	0.6000	1.0764	0.9892	7	9.4500	1127.8293	8.3789
80	0.8000	1.4352	0.9856	11	14.8500	1131.9350	13.1191
100	1.0000	1.7940	0.9821	15	20.2500	1136.0707	17.8246
120	1.2000	2.1529	0.9785	19	25.6500	1140.2367	22.4953
140	1.4000	2.5117	0.9749	23	31.0500	1144.4333	27.1313
160	1.6000	2.8705	0.9713	28	37.8000	1148.6610	32.9079
180	1.8000	3.2293	0.9677	33	44.5500	1152.9201	38.6410
200	2.0000	3.5881	0.9641	37	49.9500	1157.2108	43.1641

2% lime,30% moisture content(after 1 day)

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2644	0.9974	5	6.7500	1118.6473	6.0341
40	0.4000	0.5289	0.9947	15	20.2500	1121.6212	18.0542
60	0.6000	0.7933	0.9921	26	35.1000	1124.6110	31.2108
80	0.8000	1.0578	0.9894	46	62.1000	1127.6168	55.0719
100	1.0000	1.3222	0.9868	67	90.4500	1130.6387	79.9990
120	1.2000	1.5867	0.9841	88	118.8000	1133.6768	104.7918
140	1.4000	1.8511	0.9815	108	145.8000	1136.7313	128.2625
160	1.6000	2.1156	0.9788	121	163.3500	1139.8023	143.3143
180	1.8000	2.3800	0.9762	142	191.7000	1142.8899	167.7327
200	2.0000	2.6445	0.9736	173	233.5500	1145.9943	203.7968
220	2.2000	2.9089	0.9709	208	280.8000	1149.1157	244.3618
240	2.4000	3.1733	0.9683	240	324.0000	1152.2540	281.1880
260	2.6000	3.4378	0.9656	271	365.8500	1155.4096	316.6410
280	2.8000	3.7022	0.9630	302	407.7000	1158.5825	351.8955
300	3.0000	3.9667	0.9603	330	445.5000	1161.7729	383.4657
320	3.2000	4.2311	0.9577	349	471.1500	1164.9809	404.4272
340	3.4000	4.4956	0.9550	362	488.7000	1168.2066	418.3335



2% lime,30% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3527	0.9965	16	21.6000	1119.6384	19.2919
40	0.4000	0.7055	0.9929	21	28.3500	1123.6158	25.2310
60	0.6000	1.0582	0.9894	35	47.2500	1127.6216	41.9024
80	0.8000	1.4109	0.9859	43	58.0500	1131.6560	51.2965
100	1.0000	1.7637	0.9824	45	60.7500	1135.7194	53.4903
120	1.2000	2.1164	0.9788	53	71.5500	1139.8121	62.7735
140	1.4000	2.4691	0.9753	65	87.7500	1143.9343	76.7089
160	1.6000	2.8219	0.9718	80	108.0000	1148.0866	94.0696
180	1.8000	3.1746	0.9683	92	124.2000	1152.2690	107.7873
200	2.0000	3.5273	0.9647	101	136.3500	1156.4821	117.9007
220	2.2000	3.8801	0.9612	111	149.8500	1160.7260	129.1002
240	2.4000	4.2328	0.9577	129	174.1500	1165.0013	149.4848
260	2.6000	4.5855	0.9541	142	191.7000	1169.3081	163.9431

300	3.0000	5.2910	0.9471	166	224.1000	1178.0181	190.2348
320	3.2000	5.6437	0.9436	178	240.3000	1182.4219	203.2270
340	3.4000	5.9965	0.9400	188	253.8000	1186.8587	213.8418
360	3.6000	6.3492	0.9365	189	255.1500	1191.3290	214.1726

2% lime,30% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2762	0.9972	41	55.3500	1118.7796	49.4736
40	0.4000	0.5525	0.9945	64	86.4000	1121.8873	77.0131
60	0.6000	0.8287	0.9917	91	122.8500	1125.0124	109.1988
80	0.8000	1.1050	0.9890	114	153.9000	1128.1549	136.4174
100	1.0000	1.3812	0.9862	145	195.7500	1131.3150	173.0287
120	1.2000	1.6575	0.9834	174	234.9000	1134.4928	207.0529
140	1.4000	1.9337	0.9807	202	272.7000	1137.6886	239.6965
160	1.6000	2.2099	0.9779	222	299.7000	1140.9024	262.6868
180	1.8000	2.4862	0.9751	251	338.8500	1144.1344	296.1628
200	2.0000	2.7624	0.9724	270	364.5000	1147.3848	317.6790
220	2.2000	3.0387	0.9696	291	392.8500	1150.6537	341.4146
240	2.4000	3.3149	0.9669	305	411.7500	1153.9412	356.8206
260	2.6000	3.5912	0.9641	324	437.4000	1157.2477	377.9658
280	2.8000	3.8674	0.9613	338	456.3000	1160.5731	393.1678
300	3.0000	4.1436	0.9586	351	473.8500	1163.9177	407.1164
320	3.2000	4.4199	0.9558	368	496.8000	1167.2816	425.6042
340	3.4000	4.6961	0.9530	374	504.9000	1170.6650	431.2933
360	3.6000	4.9724	0.9503	380	513.0000	1174.0681	436.9423
380	3.8000	5.2486	0.9475	390	526.5000	1177.4911	447.1371
400	4.0000	5.5249	0.9448	396	534.6000	1180.9340	452.6925
420	4.2000	5.8011	0.9420	397	535.9500	1184.3972	452.5087

2% lime,35% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2654	0.9973	18	24.3000	1118.6579	21.7225
40	0.4000	0.5308	0.9947	22	29.7000	1121.6426	26.4790

80	0.8000	1.0616	0.9894	46	62.1000	1127.6600	55.0698
100	1.0000	1.3270	0.9867	62	83.7000	1130.6929	74.0254
120	1.2000	1.5924	0.9841	76	102.6000	1133.7423	90.4968
140	1.4000	1.8577	0.9814	89	120.1500	1136.8081	105.6907
160	1.6000	2.1231	0.9788	100	135.0000	1139.8906	118.4324
180	1.8000	2.3885	0.9761	112	151.2000	1142.9898	132.2846
200	2.0000	2.6539	0.9735	132	178.2000	1146.1059	155.4830
220	2.2000	2.9193	0.9708	151	203.8500	1149.2390	177.3782
240	2.4000	3.1847	0.9682	163	220.0500	1152.3894	190.9511
260	2.6000	3.4501	0.9655	196	264.6000	1155.5570	228.9805
280	2.8000	3.7155	0.9628	205	276.7500	1158.7421	238.8366
300	3.0000	3.9809	0.9602	215	290.2500	1161.9448	249.7967
320	3.2000	4.2463	0.9575	225	303.7500	1165.1653	260.6926
340	3.4000	4.5117	0.9549	232	313.2000	1168.4037	268.0580
360	3.6000	4.7771	0.9522	238	321.3000	1171.6601	274.2263

stress

2% lime,35% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3185	0.9968	38	51.3000	1119.2536	45.8341
40	0.4000	0.6369	0.9936	61	82.3500	1122.8409	73.3408
60	0.6000	0.9554	0.9904	80	108.0000	1126.4513	95.8763
80	0.8000	1.2739	0.9873	100	135.0000	1130.0850	119.4600
100	1.0000	1.5924	0.9841	123	166.0500	1133.7423	146.4619
120	1.2000	1.9108	0.9809	141	190.3500	1137.4233	167.3520
140	1.4000	2.2293	0.9777	154	207.9000	1141.1282	182.1881
160	1.6000	2.5478	0.9745	165	222.7500	1144.8574	194.5657
180	1.8000	2.8662	0.9713	175	236.2500	1148.6110	205.6832
200	2.0000	3.1847	0.9682	184	248.4000	1152.3894	215.5521
220	2.2000	3.5032	0.9650	190	256.5000	1156.1926	221.8488
240	2.4000	3.8217	0.9618	193	260.5500	1160.0211	224.6080

2% lime,35% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ

40	0.4000	0.5311	0.9947	24	32.4000	1121.6457	28.8861
60	0.6000	0.7966	0.9920	31	41.8500	1124.6480	37.2116
80	0.8000	1.0621	0.9894	44	59.4000	1127.6664	52.6752
100	1.0000	1.3277	0.9867	61	82.3500	1130.7010	72.8309
120	1.2000	1.5932	0.9841	80	108.0000	1133.7520	95.2589
140	1.4000	1.8587	0.9814	100	135.0000	1136.8195	118.7524
160	1.6000	2.1243	0.9788	121	163.3500	1139.9037	143.3016
180	1.8000	2.3898	0.9761	140	189.0000	1143.0046	165.3537
200	2.0000	2.6553	0.9734	157	211.9500	1146.1225	184.9279
220	2.2000	2.9209	0.9708	168	226.8000	1149.2574	197.3448
240	2.4000	3.1864	0.9681	178	240.3000	1152.4095	208.5196
260	2.6000	3.4519	0.9655	189	255.1500	1155.5789	220.7984
280	2.8000	3.7175	0.9628	198	267.3000	1158.7659	230.6765
300	3.0000	3.9830	0.9602	208	280.8000	1161.9704	241.6585
320	3.2000	4.2485	0.9575	215	290.2500	1165.1927	249.1004
340	3.4000	4.5141	0.9549	225	303.7500	1168.4330	259.9636
360	3.6000	4.7796	0.9522	231	311.8500	1171.6913	266.1537
380	3.8000	5.0451	0.9495	239	322.6500	1174.9678	274.6033
400	4.0000	5.3107	0.9469	248	334.8000	1178.2628	284.1471
420	4.2000	5.5762	0.9442	254	342.9000	1181.5762	290.2056
440	4.4000	5.8417	0.9416	258	348.3000	1184.9083	293.9468
460	4.6000	6.1073	0.9389	264	356.4000	1188.2593	299.9345
480	4.8000	6.3728	0.9363	266	359.1000	1191.6293	301.3521
500	5.0000	6.6383	0.9336	267	360.4500	1195.0185	301.6271
520	5.2000	6.9039	0.9310	268	361.8000	1198.4270	301.8957

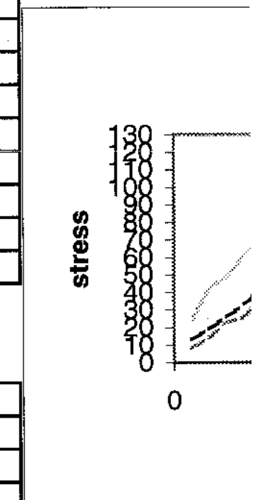
4% lime,25% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.4294	0.9957	11	14.8500	1120.5001	13.2530
40	0.4000	0.8587	0.9914	16	21.6000	1125.3529	19.1940
60	0.6000	1.2881	0.9871	22	29.7000	1130.2478	26.2774
80	0.8000	1.7175	0.9828	28	37.8000	1135.1856	33.2985
100	1.0000	2.1468	0.9785	36	48.6000	1140.1667	42.6253

140	1.4000	3.0056	0.9699	47	63.4500	1150.2611	55.1614
160	1.6000	3.4350	0.9657	53	71.5500	1155.3756	61.9279
180	1.8000	3.8643	0.9614	59	79.6500	1160.5359	68.6321
200	2.0000	4.2937	0.9571	65	87.7500	1165.7424	75.2739
220	2.2000	4.7231	0.9528	71	95.8500	1170.9959	81.8534

4% lime,25% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4090	0.9959	7	9.4500	1120.2709	8.4355
40	0.4000	0.8180	0.9918	12	16.2000	1124.8906	14.4014
60	0.6000	1.2270	0.9877	19	25.6500	1129.5485	22.7082
80	0.8000	1.6360	0.9836	22	29.7000	1134.2452	26.1848
100	1.0000	2.0450	0.9796	33	44.5500	1138.9811	39.1139
120	1.2000	2.4540	0.9755	47	63.4500	1143.7567	55.4751
140	1.4000	2.8630	0.9714	60	81.0000	1148.5725	70.5223
160	1.6000	3.2720	0.9673	76	102.6000	1153.4291	88.9522
180	1.8000	3.6810	0.9632	86	116.1000	1158.3269	100.2308
200	2.0000	4.0900	0.9591	93	125.5500	1163.2664	107.9288
220	2.2000	4.4990	0.9550	104	140.4000	1168.2483	120.1799



4% lime,25% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4198	0.9958	20	27.0000	1120.3926	24.0987
40	0.4000	0.8396	0.9916	35	47.2500	1125.1360	41.9949
60	0.6000	1.2594	0.9874	41	55.3500	1129.9198	48.9858
80	0.8000	1.6793	0.9832	52	70.2000	1134.7444	61.8642
100	1.0000	2.0991	0.9790	61	82.3500	1139.6103	72.2615
120	1.2000	2.5189	0.9748	68	91.8000	1144.5182	80.2084
140	1.4000	2.9387	0.9706	75	101.2500	1149.4686	88.0842
160	1.6000	3.3585	0.9664	77	103.9500	1154.4619	90.0419
180	1.8000	3.7783	0.9622	81	109.3500	1159.4988	94.3080

sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2970	0.9970	20	27.0000	1119.0130	24.1284
40	0.4000	0.5941	0.9941	41	55.3500	1122.3568	49.3159
60	0.6000	0.8911	0.9911	56	75.6000	1125.7207	67.1570
80	0.8000	1.1882	0.9881	84	113.4000	1129.1048	100.4335
100	1.0000	1.4852	0.9851	100	135.0000	1132.5093	119.2043
120	1.2000	1.7823	0.9822	116	156.6000	1135.9344	137.8601
140	1.4000	2.0793	0.9792	125	168.7500	1139.3803	148.1068
160	1.6000	2.3764	0.9762	140	189.0000	1142.8472	165.3764
180	1.8000	2.6734	0.9733	157	211.9500	1146.3352	184.8936
200	2.0000	2.9704	0.9703	161	217.3500	1149.8445	189.0256

stress

4% lime,30% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2950	0.9971	5	6.7500	1118.9899	6.0322
40	0.4000	0.5900	0.9941	35	47.2500	1122.3104	42.1007
60	0.6000	0.8850	0.9912	52	70.2000	1125.6506	62.3639
80	0.8000	1.1799	0.9882	68	91.8000	1129.0107	81.3101
100	1.0000	1.4749	0.9853	79	106.6500	1132.3910	94.1813
120	1.2000	1.7699	0.9823	86	116.1000	1135.7916	102.2195
140	1.4000	2.0649	0.9794	98	132.3000	1139.2126	116.1328

4% lime,30% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2525	0.9975	8	10.8000	1118.5136	9.6557
40	0.4000	0.5051	0.9949	18	24.3000	1121.3524	21.6703
60	0.6000	0.7576	0.9924	28	37.8000	1124.2058	33.6237
80	0.8000	1.0101	0.9899	41	55.3500	1127.0736	49.1095
100	1.0000	1.2626	0.9874	51	68.8500	1129.9562	60.9316
120	1.2000	1.5152	0.9848	66	89.1000	1132.8535	78.6509
140	1.4000	1.7677	0.9823	75	101.2500	1135.7657	89.1469
160	1.6000	2.0202	0.9798	85	114.7500	1138.6930	100.7734

200	2.0000	2.5253	0.9747	110	148.5000	1144.5929	129.7405
220	2.2000	2.7778	0.9722	124	167.4000	1147.5659	145.8740
240	2.4000	3.0303	0.9697	141	190.3500	1150.5543	165.4420
260	2.6000	3.2828	0.9672	158	213.3000	1153.5584	184.9061
280	2.8000	3.5354	0.9646	176	237.6000	1156.5782	205.4336
300	3.0000	3.7879	0.9621	191	257.8500	1159.6138	222.3585
320	3.2000	4.0404	0.9596	212	286.2000	1162.6654	246.1585
340	3.4000	4.2929	0.9571	234	315.9000	1165.7332	270.9883
360	3.6000	4.5455	0.9545	252	340.2000	1168.8171	291.0635
380	3.8000	4.7980	0.9520	263	355.0500	1171.9174	302.9650
400	4.0000	5.0505	0.9495	276	372.6000	1175.0342	317.0971
420	4.2000	5.3030	0.9470	286	386.1000	1178.1676	327.7123

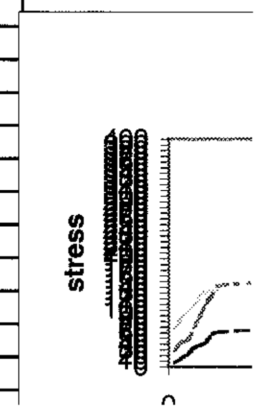
4% lime,35% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2581	0.9974	6	8.1000	1118.5757	7.2414
40	0.4000	0.5161	0.9948	12	16.2000	1121.4773	14.4452
60	0.6000	0.7742	0.9923	19	25.6500	1124.3940	22.8123
80	0.8000	1.0323	0.9897	28	37.8000	1127.3260	33.5307
100	1.0000	1.2903	0.9871	32	43.2000	1130.2732	38.2208
120	1.2000	1.5484	0.9845	37	49.9500	1133.2359	44.0773
140	1.4000	1.8065	0.9819	49	66.1500	1136.2142	58.2197
160	1.6000	2.0645	0.9794	52	70.2000	1139.2082	61.6217
180	1.8000	2.3226	0.9768	64	86.4000	1142.2180	75.6423
200	2.0000	2.5806	0.9742	81	109.3500	1145.2437	95.4819
220	2.2000	2.8387	0.9716	96	129.6000	1148.2855	112.8639
240	2.4000	3.0968	0.9690	111	149.8500	1151.3436	130.1523
260	2.6000	3.3548	0.9665	124	167.4000	1154.4179	145.0081
280	2.8000	3.6129	0.9639	140	189.0000	1157.5087	163.2817
300	3.0000	3.8710	0.9613	155	209.2500	1160.6161	180.2922
320	3.2000	4.1290	0.9587	174	234.9000	1163.7403	201.8492
340	3.4000	4.3871	0.9561	189	255.1500	1166.8813	218.6598
360	3.6000	4.6452	0.9535	205	276.7500	1170.0393	236.5305

400	4.0000	5.1613	0.9484	235	317.2500	1176.4068	269.6771
420	4.2000	5.4194	0.9458	250	337.5000	1179.6167	286.1099
440	4.4000	5.6774	0.9432	255	344.2500	1182.8441	291.0358
460	4.6000	5.9355	0.9406	265	357.7500	1186.0892	301.6215
480	4.8000	6.1935	0.9381	277	373.9500	1189.3522	314.4149
500	5.0000	6.4516	0.9355	292	394.2000	1192.6331	330.5291
520	5.2000	6.7097	0.9329	303	409.0500	1195.9322	342.0344
540	5.4000	6.9677	0.9303	313	422.5500	1199.2497	352.3453
560	5.6000	7.2258	0.9277	323	436.0500	1202.5856	362.5937
580	5.8000	7.4839	0.9252	334	450.9000	1205.9401	373.8992
600	6.0000	7.7419	0.9226	340	459.0000	1209.3133	379.5542

4% lime,35% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2552	0.9974	25	33.7500	1118.5439	30.1732
40	0.4000	0.5105	0.9949	36	48.6000	1121.4135	43.3382
60	0.6000	0.7657	0.9923	40	54.0000	1124.2978	48.0300
80	0.8000	1.0209	0.9898	58	78.3000	1127.1969	69.4643
100	1.0000	1.2762	0.9872	75	101.2500	1130.1111	89.5930
120	1.2000	1.5314	0.9847	94	126.9000	1133.0404	111.9995
140	1.4000	1.7866	0.9821	107	144.4500	1135.9849	127.1584
160	1.6000	2.0419	0.9796	121	163.3500	1138.9447	143.4222
180	1.8000	2.2971	0.9770	135	182.2500	1141.9200	159.5996
200	2.0000	2.5523	0.9745	152	205.2000	1144.9109	179.2279
220	2.2000	2.8076	0.9719	173	233.5500	1147.9175	203.4554
240	2.4000	3.0628	0.9694	190	256.5000	1150.9399	222.8613
260	2.6000	3.3180	0.9668	205	276.7500	1153.9783	239.8225
280	2.8000	3.5733	0.9643	221	298.3500	1157.0327	257.8579
300	3.0000	3.8285	0.9617	237	319.9500	1160.1034	275.7944
320	3.2000	4.0837	0.9592	254	342.9000	1163.1904	294.7927
340	3.4000	4.3389	0.9566	267	360.4500	1166.2939	309.0559
360	3.6000	4.5942	0.9541	278	375.3000	1169.4140	320.9300
380	3.8000	4.8494	0.9515	286	386.1000	1172.5509	329.2821
400	4.0000	5.1046	0.9490	294	396.9000	1175.7046	337.5848



440	4.4000	5.6151	0.9438	304	410.4000	1182.0632	347.1896
460	4.6000	5.8703	0.9413	305	411.7500	1185.2684	347.3897

4% lime,35% moisture content(after 1 day)
sample 3

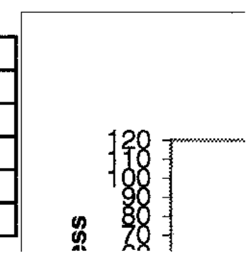
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3546	0.9965	56	75.6000	1119.6595	67.5205
40	0.4000	0.7092	0.9929	71	95.8500	1123.6583	85.3017
60	0.6000	1.0638	0.9894	82	110.7000	1127.6857	98.1656
80	0.8000	1.4184	0.9858	90	121.5000	1131.7421	107.3566
100	1.0000	1.7730	0.9823	105	141.7500	1135.8278	124.7988
120	1.2000	2.1277	0.9787	112	151.2000	1139.9432	132.6382
140	1.4000	2.4823	0.9752	114	153.9000	1144.0884	134.5176
160	1.6000	2.8369	0.9716	116	156.6000	1148.2639	136.3798

6% lime,25% moisture content(after 1 day)
sample 1

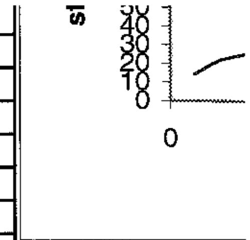
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4210	0.9958	16	21.6000	1120.4056	19.2787
40	0.4000	0.8419	0.9916	25	33.7500	1125.1621	29.9957
60	0.6000	1.2629	0.9874	35	47.2500	1129.9592	41.8157
80	0.8000	1.6839	0.9832	50	67.5000	1134.7974	59.4820
100	1.0000	2.1048	0.9790	60	81.0000	1139.6772	71.0728
120	1.2000	2.5258	0.9747	61	82.3500	1144.5992	71.9466

6% lime,25% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3754	0.9962	12	16.2000	1119.8929	14.4657
40	0.4000	0.7508	0.9925	18	24.3000	1124.1285	21.6167
60	0.6000	1.1261	0.9887	21	28.3500	1128.3962	25.1242
80	0.8000	1.5015	0.9850	25	33.7500	1132.6965	29.7962
100	1.0000	1.8769	0.9812	30	40.5000	1137.0297	35.6191



140	1.4000	2.6276	0.9737	45	60.7500	1145.7963	53.0199
160	1.6000	3.0030	0.9700	52	70.2000	1150.2305	61.0312
180	1.8000	3.3784	0.9662	58	78.3000	1154.6992	67.8099
200	2.0000	3.7538	0.9625	64	86.4000	1159.2027	74.5340
220	2.2000	4.1291	0.9587	69	93.1500	1163.7414	80.0436
240	2.4000	4.5045	0.9550	70	94.5000	1168.3159	80.8857
260	2.6000	4.8799	0.9512	72	97.2000	1172.9265	82.8696
280	2.8000	5.2553	0.9474	75	101.2500	1177.5735	85.9819
300	3.0000	5.6306	0.9437	80	108.0000	1182.2576	91.3506
320	3.2000	6.0060	0.9399	86	116.1000	1186.9791	97.8113
340	3.4000	6.3814	0.9362	92	124.2000	1191.7384	104.2175
360	3.6000	6.7568	0.9324	99	133.6500	1196.5361	111.6974
380	3.8000	7.1321	0.9287	101	136.3500	1201.3725	113.4952



6% lime,25% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3263	0.9967	8	10.8000	1119.3411	9.6485
40	0.4000	0.6525	0.9935	12	16.2000	1123.0171	14.4254
60	0.6000	0.9788	0.9902	18	24.3000	1126.7173	21.5671
80	0.8000	1.3051	0.9869	21	28.3500	1130.4420	25.0787
100	1.0000	1.6313	0.9837	25	33.7500	1134.1914	29.7569
120	1.2000	1.9576	0.9804	26	35.1000	1137.9657	30.8445
140	1.4000	2.2838	0.9772	27	36.4500	1141.7653	31.9243
160	1.6000	2.6101	0.9739	29	39.1500	1145.5903	34.1745
180	1.8000	2.9364	0.9706	31	41.8500	1149.4410	36.4090
200	2.0000	3.2626	0.9674	33	44.5500	1153.3177	38.6277
220	2.2000	3.5889	0.9641	41	55.3500	1157.2206	47.8301
240	2.4000	3.9152	0.9608	50	67.5000	1161.1501	58.1320
260	2.6000	4.2414	0.9576	59	79.6500	1165.1063	68.3629
280	2.8000	4.5677	0.9543	68	91.8000	1169.0896	78.5226
300	3.0000	4.8940	0.9511	76	102.6000	1173.1002	87.4606
320	3.2000	5.2202	0.9478	85	114.7500	1177.1384	97.4822
340	3.4000	5.5465	0.9445	95	128.2500	1181.2045	108.5756
360	3.6000	5.8728	0.9413	105	141.7500	1185.2988	119.5901

400	4.0000	6.5253	0.9347	118	159.3000	1193.5731	133.4648
420	4.2000	6.8515	0.9315	125	168.7500	1197.7537	140.8887
440	4.4000	7.1778	0.9282	130	175.5000	1201.9638	146.0111
460	4.6000	7.5041	0.9250	135	182.2500	1206.2035	151.0939
480	4.8000	7.8303	0.9217	142	191.7000	1210.4733	158.3678
500	5.0000	8.1566	0.9184	149	201.1500	1214.7733	165.5864
520	5.2000	8.4829	0.9152	150	202.5000	1219.1041	166.1056

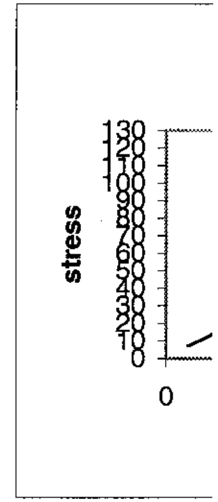
6% lime,30% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4420	0.9956	4	5.4000	1120.6422	4.8187
40	0.4000	0.8840	0.9912	5	6.7500	1125.6395	5.9966
60	0.6000	1.3260	0.9867	8	10.8000	1130.6815	9.5518
80	0.8000	1.7680	0.9823	11	14.8500	1135.7689	13.0748
100	1.0000	2.2099	0.9779	14	18.9000	1140.9024	16.5658
120	1.2000	2.6519	0.9735	16	21.6000	1146.0824	18.8468
140	1.4000	3.0939	0.9691	19	25.6500	1151.3097	22.2790
160	1.6000	3.5359	0.9646	21	28.3500	1156.5849	24.5118
180	1.8000	3.9779	0.9602	24	32.4000	1161.9086	27.8852
200	2.0000	4.4199	0.9558	26	35.1000	1167.2816	30.0699
220	2.2000	4.8619	0.9514	28	37.8000	1172.7045	32.2332
240	2.4000	5.3039	0.9470	31	41.8500	1178.1781	35.5209
260	2.6000	5.7459	0.9425	34	45.9000	1183.7029	38.7766
280	2.8000	6.1878	0.9381	36	48.6000	1189.2799	40.8651
300	3.0000	6.6298	0.9337	38	51.3000	1194.9096	42.9321

6% lime,30% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2971	0.9970	6	8.1000	1119.0135	7.2385
40	0.4000	0.5942	0.9941	11	14.8500	1122.3578	13.2311
60	0.6000	0.8913	0.9911	18	24.3000	1125.7222	21.5861
80	0.8000	1.1884	0.9881	21	28.3500	1129.1068	25.1083

120	1.2000	1.7825	0.9822	31	41.8500	1135.9375	36.8418
140	1.4000	2.0796	0.9792	34	45.9000	1139.3839	40.2849
160	1.6000	2.3767	0.9762	37	49.9500	1142.8513	43.7065
180	1.8000	2.6738	0.9733	39	52.6500	1146.3399	45.9288
200	2.0000	2.9709	0.9703	42	56.7000	1149.8498	49.3108
220	2.2000	3.2680	0.9673	46	62.1000	1153.3813	53.8417
240	2.4000	3.5651	0.9643	49	66.1500	1156.9345	57.1770
260	2.6000	3.8622	0.9614	52	70.2000	1160.5097	60.4907
280	2.8000	4.1592	0.9584	55	74.2500	1164.1071	63.7828
300	3.0000	4.4563	0.9554	56	75.6000	1167.7268	64.7412
320	3.2000	4.7534	0.9525	57	76.9500	1171.3691	65.6924
340	3.4000	5.0505	0.9495	60	81.0000	1175.0342	68.9342
360	3.6000	5.3476	0.9465	63	85.0500	1178.7223	72.1544
380	3.8000	5.6447	0.9436	64	86.4000	1182.4337	73.0696
400	4.0000	5.9418	0.9406	67	90.4500	1186.1685	76.2539
420	4.2000	6.2389	0.9376	69	93.1500	1189.9269	78.2821



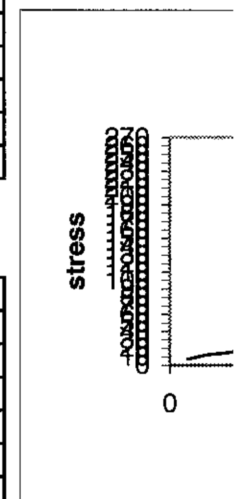
6% lime,30% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3411	0.9966	6	8.1000	1119.5079	7.2353
40	0.4000	0.6822	0.9932	11	14.8500	1123.3531	13.2194
60	0.6000	1.0234	0.9898	18	24.3000	1127.2247	21.5574
80	0.8000	1.3645	0.9864	23	31.0500	1131.1231	27.4506
100	1.0000	1.7056	0.9829	26	35.1000	1135.0486	30.9238
120	1.2000	2.0467	0.9795	31	41.8500	1139.0014	36.7427
140	1.4000	2.3879	0.9761	36	48.6000	1142.9818	42.5204
160	1.6000	2.7290	0.9727	41	55.3500	1146.9902	48.2567
180	1.8000	3.0701	0.9693	45	60.7500	1151.0267	52.7790
200	2.0000	3.4112	0.9659	48	64.8000	1155.0918	56.0994
220	2.2000	3.7523	0.9625	52	70.2000	1159.1857	60.5598
240	2.4000	4.0935	0.9591	58	78.3000	1163.3087	67.3080
260	2.6000	4.4346	0.9557	63	85.0500	1167.4612	72.8504
280	2.8000	4.7757	0.9522	71	95.8500	1171.6434	81.8082
300	3.0000	5.1168	0.9488	77	103.9500	1175.8556	88.4037

340	3.4000	5.7991	0.9420	91	122.8500	1184.3717	103.7259
360	3.6000	6.1402	0.9386	96	129.6000	1188.6762	109.0289
380	3.8000	6.4813	0.9352	100	135.0000	1193.0120	113.1590
400	4.0000	6.8224	0.9318	104	140.4000	1197.3796	117.2560
420	4.2000	7.1636	0.9284	106	143.1000	1201.7793	119.0734

6% lime,35% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4494	0.9955	15	20.2500	1120.7260	18.0686
40	0.4000	0.8989	0.9910	23	31.0500	1125.8087	27.5802
60	0.6000	1.3483	0.9865	27	36.4500	1130.9377	32.2299
80	0.8000	1.7978	0.9820	42	56.7000	1136.1136	49.9070
100	1.0000	2.2472	0.9775	50	67.5000	1141.3371	59.1412
120	1.2000	2.6966	0.9730	65	87.7500	1146.6088	76.5300
140	1.4000	3.1461	0.9685	75	101.2500	1151.9295	87.8960
160	1.6000	3.5955	0.9640	85	114.7500	1157.2998	99.1532
180	1.8000	4.0449	0.9596	105	141.7500	1162.7204	121.9124
200	2.0000	4.4944	0.9551	125	168.7500	1168.1921	144.4540
220	2.2000	4.9438	0.9506	152	205.2000	1173.7154	174.8294
240	2.4000	5.3933	0.9461	155	209.2500	1179.2913	177.4371
260	2.6000	5.8427	0.9416	170	229.5000	1184.9204	193.6839



6% lime,35% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2762	0.9972	6	8.1000	1118.7796	7.2400
40	0.4000	0.5525	0.9945	10	13.5000	1121.8873	12.0333
60	0.6000	0.8287	0.9917	12	16.2000	1125.0124	14.3998
80	0.8000	1.1050	0.9890	15	20.2500	1128.1549	17.9497
100	1.0000	1.3812	0.9862	25	33.7500	1131.3150	29.8325
120	1.2000	1.6575	0.9834	40	54.0000	1134.4928	47.5984
140	1.4000	1.9337	0.9807	64	86.4000	1137.6886	75.9435
160	1.6000	2.2099	0.9779	72	97.2000	1140.9024	85.1957

200	2.0000	2.7624	0.9724	108	145.8000	1147.3848	127.0716
220	2.2000	3.0387	0.9696	140	189.0000	1150.6537	164.2545
240	2.4000	3.3149	0.9669	180	243.0000	1153.9412	210.5826
260	2.6000	3.5912	0.9641	220	297.0000	1157.2477	256.6434

6% lime,35% moisture content(after 1 day)
sample 3

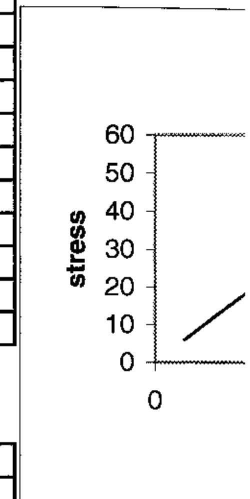
deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.3738	0.9963	10	13.5000	1119.8755	12.0549
40	0.4000	0.7477	0.9925	15	20.2500	1124.0935	18.0145
60	0.6000	1.1215	0.9888	26	35.1000	1128.3434	31.1076
80	0.8000	1.4953	0.9850	34	45.9000	1132.6255	40.5253
100	1.0000	1.8692	0.9813	47	63.4500	1136.9403	55.8077
120	1.2000	2.2430	0.9776	58	78.3000	1141.2880	68.6067
140	1.4000	2.6168	0.9738	64	86.4000	1145.6692	75.4144
160	1.6000	2.9907	0.9701	72	97.2000	1150.0841	84.5156
180	1.8000	3.3645	0.9664	80	108.0000	1154.5332	93.5443
200	2.0000	3.7383	0.9626	91	122.8500	1159.0168	105.9950
220	2.2000	4.1121	0.9589	103	139.0500	1163.5354	119.5065

8% lime,25% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4751	0.9952	1	1.3500	1121.0145	1.2043
40	0.4000	0.9501	0.9905	2	2.7000	1126.3911	2.3970
60	0.6000	1.4252	0.9857	5	6.7500	1131.8195	5.9638
80	0.8000	1.9002	0.9810	6	8.1000	1137.3005	7.1221
100	1.0000	2.3753	0.9762	7	9.4500	1142.8348	8.2689
120	1.2000	2.8504	0.9715	8	10.8000	1148.4232	9.4042
140	1.4000	3.3254	0.9667	8.5	11.4750	1154.0666	9.9431
160	1.6000	3.8005	0.9620	9	12.1500	1159.7657	10.4763

8% lime,25% moisture content(after 1 day)

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4301	0.9957	2	2.7000	1120.5084	2.4096
40	0.4000	0.8602	0.9914	4	5.4000	1125.3697	4.7984
60	0.6000	1.2903	0.9871	5	6.7500	1130.2732	5.9720
80	0.8000	1.7204	0.9828	8	10.8000	1135.2197	9.5136
100	1.0000	2.1505	0.9785	10	13.5000	1140.2097	11.8399
120	1.2000	2.5806	0.9742	12	16.2000	1145.2437	14.1455
140	1.4000	3.0108	0.9699	15	20.2500	1150.3224	17.6038
160	1.6000	3.4409	0.9656	18	24.3000	1155.4463	21.0308
180	1.8000	3.8710	0.9613	20	27.0000	1160.6161	23.2635
200	2.0000	4.3011	0.9570	21	28.3500	1165.8324	24.3174
220	2.2000	4.7312	0.9527	26	35.1000	1171.0957	29.9719



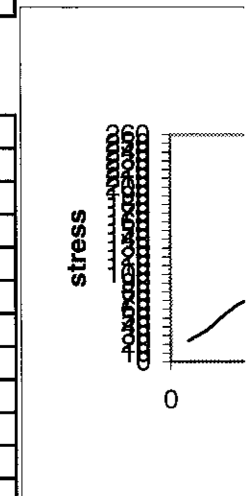
8% lime,25% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.4425	0.9956	5	6.7500	1120.6477	6.0233
40	0.4000	0.8850	0.9912	10	13.5000	1125.6506	11.9931
60	0.6000	1.3274	0.9867	15	20.2500	1130.6983	17.9093
80	0.8000	1.7699	0.9823	20	27.0000	1135.7916	23.7720
100	1.0000	2.2124	0.9779	23	31.0500	1140.9309	27.2146
120	1.2000	2.6549	0.9735	32	43.2000	1146.1169	37.6925
140	1.4000	3.0973	0.9690	35	47.2500	1151.3503	41.0388
160	1.6000	3.5398	0.9646	44	59.4000	1156.6318	51.3560

8% lime,30% moisture content(after 1 day)
sample 1

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2963	0.9970	12	16.2000	1119.0046	14.4772
40	0.4000	0.5926	0.9941	19	25.6500	1122.3400	22.8540
60	0.6000	0.8889	0.9911	25	33.7500	1125.6952	29.9815
80	0.8000	1.1852	0.9881	27	36.4500	1129.0706	32.2832
100	1.0000	1.4815	0.9852	29	39.1500	1132.4663	34.5706
120	1.2000	1.7778	0.9822	32	43.2000	1135.8825	38.0321

160	1.6000	2.3704	0.9763	40	54.0000	1142.7771	47.2533
180	1.8000	2.6667	0.9733	46	62.1000	1146.2559	54.1764
200	2.0000	2.9630	0.9704	51	68.8500	1149.7559	59.8823
220	2.2000	3.2593	0.9674	58	78.3000	1153.2774	67.8935
240	2.4000	3.5556	0.9644	63	85.0500	1156.8204	73.5205
260	2.6000	3.8519	0.9615	69	93.1500	1160.3854	80.2751
280	2.8000	4.1481	0.9585	74	99.9000	1163.9724	85.8268
300	3.0000	4.4444	0.9556	77	103.9500	1167.5816	89.0302
320	3.2000	4.7407	0.9526	81	109.3500	1171.2132	93.3647
340	3.4000	5.0370	0.9496	84	113.4000	1174.8676	96.5215
360	3.6000	5.3333	0.9467	85	114.7500	1178.5448	97.3658
380	3.8000	5.6296	0.9437	87	117.4500	1182.2451	99.3449



8% lime,30% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2759	0.9972	20	27.0000	1118.7753	24.1335
40	0.4000	0.5517	0.9945	30	40.5000	1121.8787	36.1002
60	0.6000	0.8276	0.9917	45	60.7500	1124.9994	54.0000
80	0.8000	1.1034	0.9890	57	76.9500	1128.1375	68.2098
100	1.0000	1.3793	0.9862	61	82.3500	1131.2931	72.7928
120	1.2000	1.6552	0.9834	70	94.5000	1134.4664	83.2991
140	1.4000	1.9310	0.9807	86	116.1000	1137.6576	102.0518
160	1.6000	2.2069	0.9779	104	140.4000	1140.8668	123.0643
180	1.8000	2.4828	0.9752	120	162.0000	1144.0941	141.5967
200	2.0000	2.7586	0.9724	132	178.2000	1147.3398	155.3158
220	2.2000	3.0345	0.9697	147	198.4500	1150.6039	172.4746
240	2.4000	3.3103	0.9669	161	217.3500	1153.8867	188.3634
260	2.6000	3.5862	0.9641	175	236.2500	1157.1882	204.1587
280	2.8000	3.8621	0.9614	184	248.4000	1160.5087	214.0441
300	3.0000	4.1379	0.9586	191	257.8500	1163.8483	221.5495
320	3.2000	4.4138	0.9559	197	265.9500	1167.2072	227.8516
340	3.4000	4.6897	0.9531	201	271.3500	1170.5855	231.8071
360	3.6000	4.9655	0.9503	204	275.4000	1173.9834	234.5859
380	3.8000	5.2414	0.9476	209	282.1500	1177.4011	239.6380

420	4.2000	5.7931	0.9421	215	290.2500	1184.2966	245.0822

8% lime,30% moisture content(after 1 day)
sample 3

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm²)	Axial stress,σ
20	0.2000	0.2801	0.9972	11	14.8500	1118.8230	13.2729
40	0.4000	0.5602	0.9944	15	20.2500	1121.9746	18.0485
60	0.6000	0.8403	0.9916	22	29.7000	1125.1440	26.3966
80	0.8000	1.1204	0.9888	31	41.8500	1128.3314	37.0902
100	1.0000	1.4006	0.9860	36	48.6000	1131.5369	42.9504
120	1.2000	1.6807	0.9832	41	55.3500	1134.7607	48.7768
140	1.4000	1.9608	0.9804	45	60.7500	1138.0028	53.3830
160	1.6000	2.2409	0.9776	46	62.1000	1141.2636	54.4134
180	1.8000	2.5210	0.9748	47	63.4500	1144.5431	55.4370
200	2.0000	2.8011	0.9720	49	66.1500	1147.8415	57.6299
220	2.2000	3.0812	0.9692	51	68.8500	1151.1589	59.8093
240	2.4000	3.3613	0.9664	52	70.2000	1154.4956	60.8058
260	2.6000	3.6415	0.9636	55	74.2500	1157.8517	64.1274
280	2.8000	3.9216	0.9608	58	78.3000	1161.2274	67.4287
300	3.0000	4.2017	0.9580	60	81.0000	1164.6228	69.5504
320	3.2000	4.4818	0.9552	67	90.4500	1168.0381	77.4375
340	3.4000	4.7619	0.9524	71	95.8500	1171.4735	81.8200
360	3.6000	5.0420	0.9496	79	106.6500	1174.9292	90.7714
380	3.8000	5.3221	0.9468	90	121.5000	1178.4053	103.1054
400	4.0000	5.6022	0.9440	102	137.7000	1181.9021	116.5071
420	4.2000	5.8824	0.9412	115	155.2500	1185.4196	130.9663
440	4.4000	6.1625	0.9384	127	171.4500	1188.9582	144.2019
460	4.6000	6.4426	0.9356	135	182.2500	1192.5179	152.8279
480	4.8000	6.7227	0.9328	146	197.1000	1196.0991	164.7857
500	5.0000	7.0028	0.9300	152	205.2000	1199.7018	171.0425
520	5.2000	7.2829	0.9272	155	209.2500	1203.3263	173.8930

8% lime,35% moisture content(after 1 day)
sample 1

20	0.2000	0.2548	0.9975	6	8.1000	1118.5388	7.2416
40	0.4000	0.5096	0.9949	10	13.5000	1121.4032	12.0385
60	0.6000	0.7643	0.9924	15	20.2500	1124.2823	18.0115
80	0.8000	1.0191	0.9898	18	24.3000	1127.1762	21.5583
100	1.0000	1.2739	0.9873	23	31.0500	1130.0850	27.4758
120	1.2000	1.5287	0.9847	26	35.1000	1133.0089	30.9795
140	1.4000	1.7834	0.9822	30	40.5000	1135.9480	35.6530
160	1.6000	2.0382	0.9796	35	47.2500	1138.9023	41.4873
180	1.8000	2.2930	0.9771	38	51.3000	1141.8721	44.9262
200	2.0000	2.5478	0.9745	43	58.0500	1144.8574	50.7050
220	2.2000	2.8025	0.9720	49	66.1500	1147.8583	57.6291
240	2.4000	3.0573	0.9694	54	72.9000	1150.8750	63.3431
260	2.6000	3.3121	0.9669	61	82.3500	1153.9077	71.3662
280	2.8000	3.5669	0.9643	70	94.5000	1156.9563	81.6798
300	3.0000	3.8217	0.9618	81	109.3500	1160.0211	94.2655
320	3.2000	4.0764	0.9592	91	122.8500	1163.1021	105.6227
340	3.4000	4.3312	0.9567	105	141.7500	1166.1996	121.5487
360	3.6000	4.5860	0.9541	118	159.3000	1169.3136	136.2338
380	3.8000	4.8408	0.9516	131	176.8500	1172.4443	150.8387
400	4.0000	5.0955	0.9490	152	205.2000	1175.5918	174.5504
420	4.2000	5.3503	0.9465	170	229.5000	1178.7563	194.6967
440	4.4000	5.6051	0.9439	185	249.7500	1181.9378	211.3055
460	4.6000	5.8599	0.9414	202	272.7000	1185.1365	230.1001
480	4.8000	6.1146	0.9389	220	297.0000	1188.3527	249.9258
500	5.0000	6.3694	0.9363	235	317.2500	1191.5863	266.2417
520	5.2000	6.6242	0.9338	248	334.8000	1194.8375	280.2055
540	5.4000	6.8790	0.9312	260	351.0000	1198.1066	292.9623
560	5.6000	7.1338	0.9287	264	356.4000	1201.3936	296.6555
580	5.8000	7.3885	0.9261	270	364.5000	1204.6986	302.5653
600	6.0000	7.6433	0.9236	277	373.9500	1208.0219	309.5556
620	6.2000	7.8981	0.9210	286	386.1000	1211.3636	318.7317
640	6.4000	8.1529	0.9185	291	392.8500	1214.7239	323.4068
660	6.6000	8.4076	0.9159	294	396.9000	1218.1028	325.8346
680	6.8000	8.6624	0.9134	298	402.3000	1221.5006	329.3490
700	7.0000	8.9172	0.9108	302	407.7000	1224.9174	332.8388

8% lime,35% moisture content(after 1 day)
sample 2

deformation gauge reading	ΔL (mm)	Strain,ε	1-ε	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress,σ
20	0.2000	0.2567	0.9974	9	12.1500	1118.5608	10.8622
40	0.4000	0.5135	0.9949	21	28.3500	1121.4474	25.2798
60	0.6000	0.7702	0.9923	30	40.5000	1124.3490	36.0208
80	0.8000	1.0270	0.9897	49	66.1500	1127.2656	58.6818
100	1.0000	1.2837	0.9872	66	89.1000	1130.1974	78.8358
120	1.2000	1.5404	0.9846	86	116.1000	1133.1444	102.4583
140	1.4000	1.7972	0.9820	108	145.8000	1136.1069	128.3330
160	1.6000	2.0539	0.9795	130	175.5000	1139.0849	154.0710
180	1.8000	2.3107	0.9769	150	202.5000	1142.0785	177.3083
200	2.0000	2.5674	0.9743	171	230.8500	1145.0880	201.6002
220	2.2000	2.8241	0.9718	190	256.5000	1148.1133	223.4100
240	2.4000	3.0809	0.9692	210	283.5000	1151.1547	246.2745
260	2.6000	3.3376	0.9666	231	311.8500	1154.2122	270.1843
280	2.8000	3.5944	0.9641	253	341.5500	1157.2860	295.1302
300	3.0000	3.8511	0.9615	272	367.2000	1160.3762	316.4491
320	3.2000	4.1078	0.9589	290	391.5000	1163.4830	336.4897
340	3.4000	4.3646	0.9564	305	411.7500	1166.6064	352.9468
360	3.6000	4.6213	0.9538	320	432.0000	1169.7467	369.3107
380	3.8000	4.8780	0.9512	330	445.5000	1172.9039	379.8265
400	4.0000	5.1348	0.9487	345	465.7500	1176.0782	396.0196
420	4.2000	5.3915	0.9461	357	481.9500	1179.2697	408.6851
440	4.4000	5.6483	0.9435	370	499.5000	1182.4786	422.4178
460	4.6000	5.9050	0.9409	380	513.0000	1185.7050	432.6540
480	4.8000	6.1617	0.9384	391	527.8500	1188.9491	443.9635
500	5.0000	6.4185	0.9358	400	540.0000	1192.2109	452.9400
520	5.2000	6.6752	0.9332	405	546.7500	1195.4907	457.3436
540	5.4000	6.9320	0.9307	412	556.2000	1198.7887	463.9684
560	5.6000	7.1887	0.9281	418	564.3000	1202.1048	469.4266
580	5.8000	7.4454	0.9255	420	567.0000	1205.4394	470.3679

8% lime,35% moisture content(after 1 day)

stress

deformation gauge reading	ΔL (mm)	Strain, ε	$1-\varepsilon$	proving ring reading	Axial force(P)	Corr. Area(mm^2)	Axial stress, σ
20	0.2000	0.2557	0.9974	18	24.3000	1118.5494	21.7246
40	0.4000	0.5114	0.9949	30	40.5000	1121.4245	36.1148
60	0.6000	0.7672	0.9923	35	47.2500	1124.3144	42.0256
80	0.8000	1.0229	0.9898	48	64.8000	1127.2192	57.4866
100	1.0000	1.2786	0.9872	57	76.9500	1130.1391	68.0890
120	1.2000	1.5343	0.9847	62	83.7000	1133.0742	73.8698
140	1.4000	1.7901	0.9821	68	91.8000	1136.0245	80.8081
160	1.6000	2.0458	0.9795	79	106.6500	1138.9902	93.6356
180	1.8000	2.3015	0.9770	91	122.8500	1141.9715	107.5771
200	2.0000	2.5572	0.9744	106	143.1000	1144.9684	124.9816
220	2.2000	2.8129	0.9719	120	162.0000	1147.9811	141.1173
240	2.4000	3.0687	0.9693	131	176.8500	1151.0096	153.6477
260	2.6000	3.3244	0.9668	142	191.7000	1154.0542	166.1100
280	2.8000	3.5801	0.9642	149	201.1500	1157.1150	173.8375
300	3.0000	3.8358	0.9616	155	209.2500	1160.1920	180.3581
320	3.2000	4.0915	0.9591	157	211.9500	1163.2854	182.1995
340	3.4000	4.3473	0.9565	161	217.3500	1166.3954	186.3433
360	3.6000	4.6030	0.9540	165	222.7500	1169.5221	190.4624
380	3.8000	4.8587	0.9514	183	247.0500	1172.6655	210.6739
400	4.0000	5.1144	0.9489	197	265.9500	1175.8259	226.1814
420	4.2000	5.3702	0.9463	207	279.4500	1179.0034	237.0222
440	4.4000	5.6259	0.9437	208	280.8000	1182.1981	237.5236

APPENDIX 2 : LAB EXPERIMENTS

Figure 16 : Crushing of Oven-Dried Soil Sample

Figure 17 : Soil Samples Extruded after Compaction to be stored for 1 day in cling foil wrap for Unconfined Compression Test.

Figure 18 : Soft Soil samples after undergoing Unconfined Compression Test

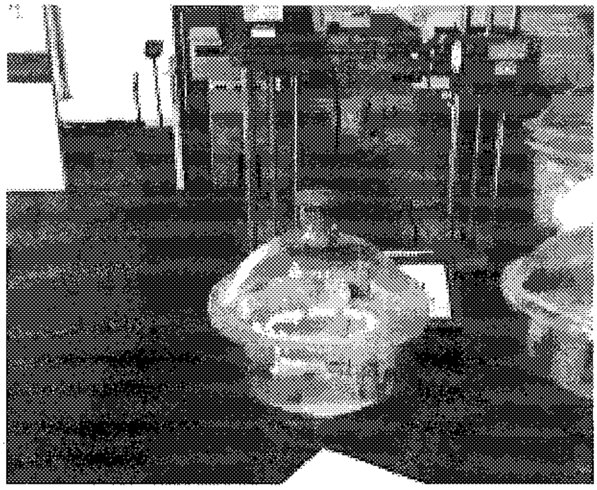


Figure 19 : Extruded Soil Samples stored for 1 day in the air tight container

Figure 20 : Extruded Soil Samples after the Unconfined Compressive Strength Test

Figure 21 : 3 Soil Samples extruded directly after every compaction test.

Figure 22 : Extruding Compacted Sample from the mould

Figure 23 : Electronic Weighing Scale

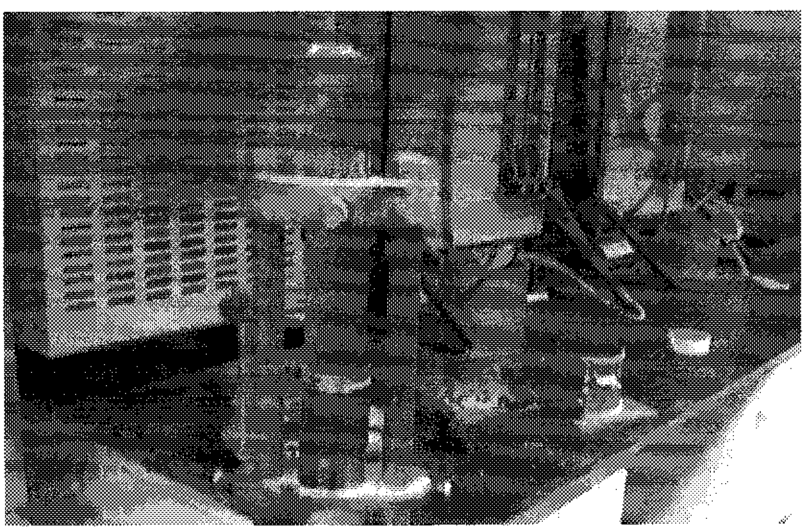


Figure 24 : Extruding individual samples for unconfined compression test

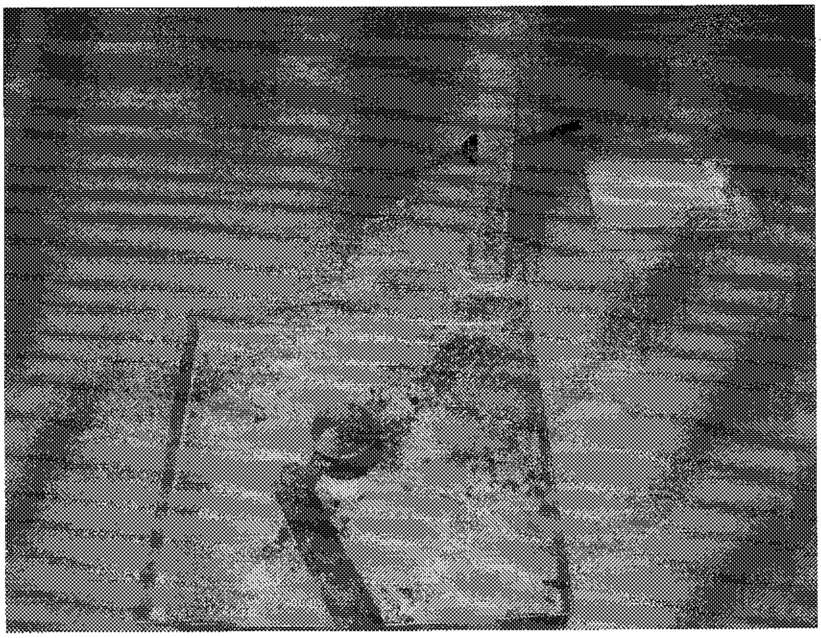


Figure 25 : Standard 25kg Compaction Rammer

Figure 26 : Extruded Compacted Soil Sample

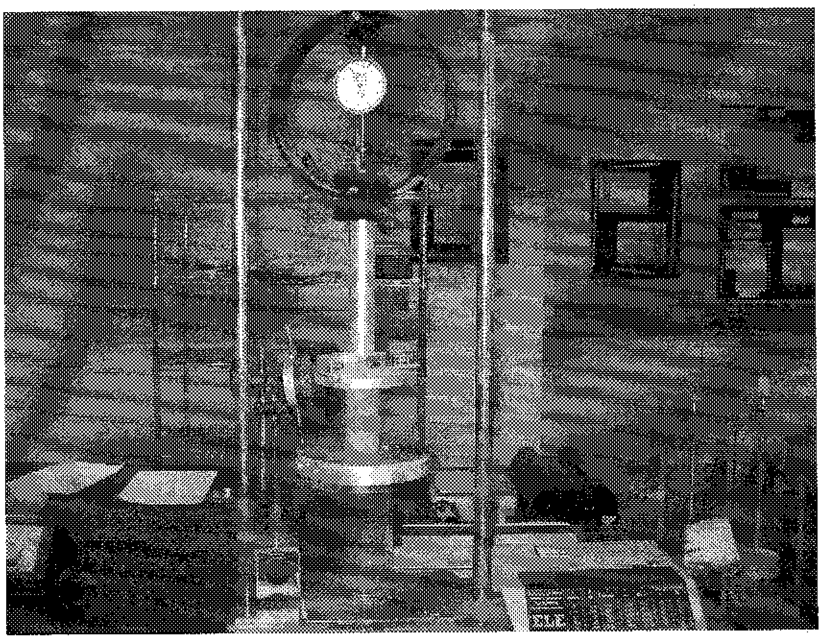


Figure 27 : Soil Sample undergoing Unconfined Compression Test

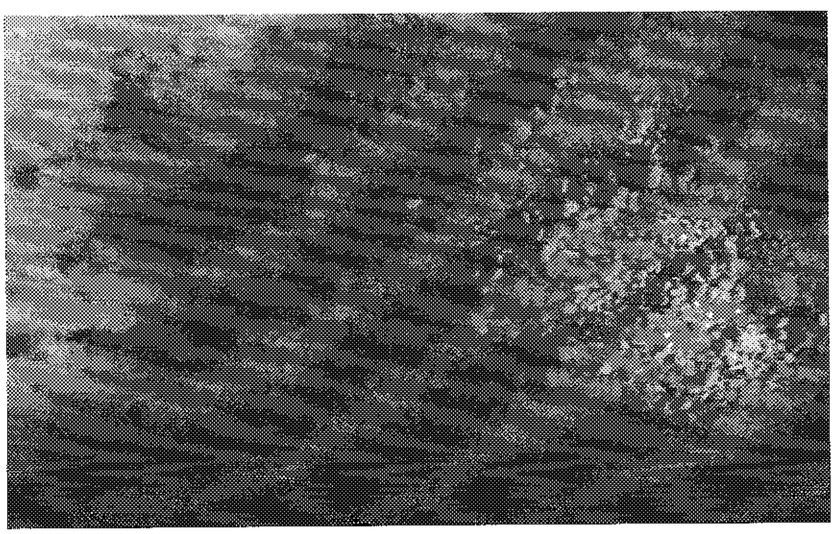


Figure 28 : Mix of Crushed Soil(passing 200mm dia sieve 37.5mm) and Lime(passing 600μm sieve)

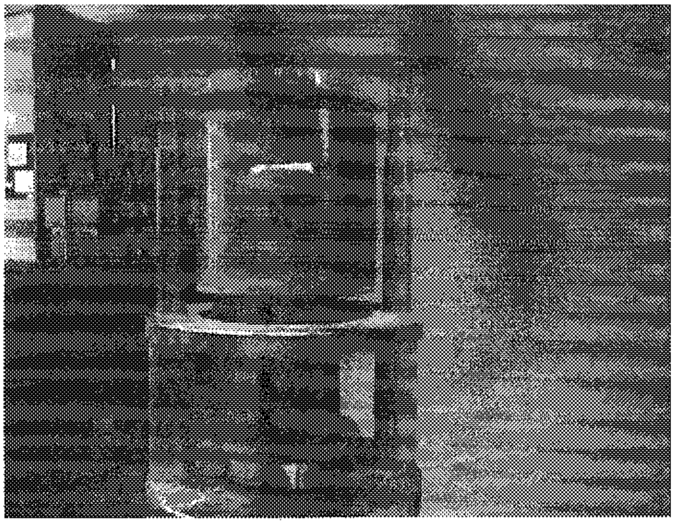


Figure 29 : Compaction mould with 3 containers at the bottom for extruding the sample

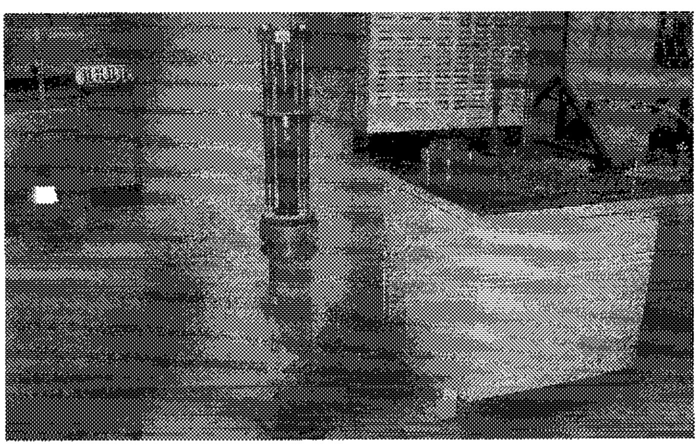


Figure 30 : Apparatus for Extruding Samples for Unconfined Compression Test

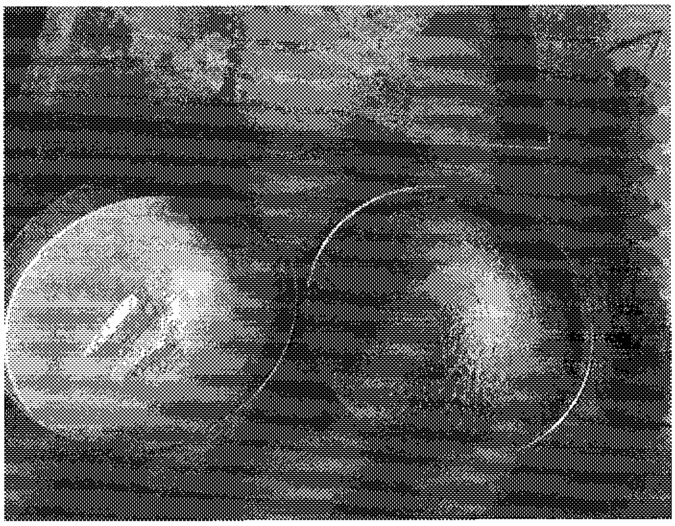


Figure 31 : Sieved lime(left) and soft soil sample (right) before compaction test