# INCORPORATING FLY-ASH FOR STABILIZED LAYER IN TO PAVEMENT DESIGN

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## Abstract:

*The standard target this examination is to utilize a class F fly trash as base material in street asphalts. Since class F fly remains don't show attractive designing properties for this reason, it was chosen to settle the material with concrete. Fly debris might be used with or without total as an asphalt layer. It ought to be noticed that, in this exploration just total free balanced out combinations (fly debris and concrete just) were utilized since the point was to use high volumes of this waste material. Concrete substance in the settled, research center arranged examples were between 5%, 10%, 15%, and 20% by complete weight. At first, Texas triaxial test was completed to legitimize the reasonableness of the fly debris as asphalt material. At that point, mechanical tests were performed to acquire the key properties of the concrete settled material to dissect the asphalt structure. Under rehashed wheel stacking, weakness breaking is the essential method of disappointment of balanced out materials wherein breaks start because of the rehashed malleable anxieties. Using a quickened full scale street test information for the exhaustion execution of concrete settled fly debris and playing out a robotic observational plan technique, required layer thickness for various lives were acquired for various measure of concrete substance.*

**Keywords:** *Fly ash, Cement stabilization, pavement design*

## INTRODUCTION

Soil is a free gift for human being. More often than not structural architects see soil as a piece of nature at the site where various designs have been built. Soil assumes an inactive part which is developed upon, and must be held. It is through which water streams. It assumes a functioning part just when it is utilized as a development material by structural specialists. In the development of high ways and rail ways, soil assumes a critical part in base

filling. The fill should be designed so it has properties that are fit to withstand the heaps which will be forced on it by the roads & rail way tracks. There are different types of soil having different load bearing capacity. The geotechnical engineers always try to find out the solutions for the construction problems occurred during the construction in weak soil. That solution is nothing but their attempt is swell the behavior ability of soil for which fly ash is one of the materials used by them in day to day construction work. Hence there exists a vast scope of application of fly ash in geotechnical constructions such as light weight embankments, road sub-bases, & structural landfills as a replacement to conventional earth materials. It will serve two problems in single effort namely; elimination of solid waste on one hand & provision of needed construction material on the other hand. Generally, geotechnical engineers always conducted different tests on soil for different construction work such as liquid limit test, compaction factor test, CBR test etc. Fly garbage is one of the different substances that cause air, water and soil defilement, upset normal cycles and set off biological risks. The beginning of powdered coal in nuclear energy stations produces fly garbage. High temperature of devouring coal turn the earth minerals of present in the coal powder into joined well particle fundamentally including aluminum silicate. Fly waste passed on as such has both amazing and pozzolanic properties. Decisively when beat coal is seared to pass on warmth, the improvement contains 80% fly refuse and 20% base garbage. The garbage is redirected by pipe gas gathered at economiser, air pre-radiator and ESP compartments. Clinker type garbage amassed in the water-gripped compartment under the boilers is called base rubbish. The World Bank has impelled by India from 2015 , freeing from coal trash would need 1000 square Kilometers . Coal straightforwardly in the end tends to 70% of force creation of the country; the Bank has featured the central for new and innovative frameworks for decreasing implications for climate. Instance coal start accomplishes fly trash. The issue and fly reject fabrication in the way that not exclusively does not its removal need huge degrees of land; water; and energy. Its good particles are not composed fine, in ethics of the lightness. As of now, 90 million tons of the fly waste is individual made yearly in India, with 65000 areas where there is land individual merged on garbage lakes. The particularly monster all out presents testing issues, as land use, accomplishment threats, and brand name prospects. Both in ejection, in like way as being utilized, most uncommon idea have to taken, interest of human existence, conventional time and climate.

## LITERATURE ABOUT THE TEST

George vorobieff and Greg Murphy [1] proposed between time configuration approach for lime adjustment of sub grade material. The research facility subgrade CBR is resolved utilizing AS 1289.6.1.1. It is noticed that norm and not altered compaction is utilized in the arrangement of test. The plan sub grade CBR might be determined by either utilizing the same CBR approach or utilizing the sub layering strategies. Field execution consistently indicated that lime adjustment functioned admirably and easy routes taken in the detail or by project worker ought to be kept away from. Swapan Kumar Bangui [2] revealed that width of the soil-solid base or soil lime base reduction, modulus of soil-strong base or soil lime base upgrades used for a specific digit of riches and CBR. CBR increments from 3 to 5 or 7or 10, the depth of soil strong base/soil lime base decreases altogether for a specific number of

redundancies and CBR. Likewise total utilization is less for the situation of balanced out base contrasted with that of the customary technique. Moustafa Ahmed Kamel, Mohamed EL-Shabrawy Ali and Hamad M.EL-Ajmi [3] led a similar report for streamlining and evaluation of the helpful impacts of adjustment of subgrade soils in adaptable asphalt framework. They chose six distinct gatherings of stabilizers for example concrete, lime, a combination of concrete and polystyrene filaments, concrete and lime. In view of the explored materials with the decided ideal measure of stabilizers, the help life of the recreated asphalt area was expanded by 67% to 231%. Niroj Kumar Mishra, Sudhir Rath [4] contemplated the expense viability of clayey soil and moorum, treated with fly-debris lime for development of low volume streets and examined that greatest saving was workable for mix of 70 % soil + 30 % lime +2 % limes. Nafi Abdel Rahman Youssef, Omer Nawaf Maaitah and Khaldon Qdeshat [5] did soil examination with lime adjustment on high pliancy mud and announced that the shear strength of soil expanded as lime focus expanded up to 4% CBR was improved when the dirt was treated with lime. Koteswara Rao;D. Anuaha; P.R.T. Pranav; G. V. Venkatesh [6] performed lab examination on the adjustment of marine dirt utilizing saw residue and lime and saw that the CBR estimation of marine earth has been expanded by 129.76% on option 15% sawdust, it is additionally improved on 283.12% ,when 4% lime added. Nagrale Prashant P. and P. Srivastava [7] presumed that dry thickness of soil decrease with lime substance and C.B.R. assessment of soil increments from 1% to 2.74, 3.89 and 6.51% because of advance with 2.5, 5 and 7.5% lime content. There is immense decrease in layer thicknesses. The thickness of sub-base diminishes from 610 to 320 mm, where as the DBM thickness is diminished from 215 to 130 mm for 7.5 ideal lime rates. O.O. Amu, O. Bamisaye and I. Komolafe [8] investigated adequacy , lime change need of a few picked lateritic soil tests utilizing 2, 4, 6, 8 and 10 % of lime and announced that expansion in dry thickness was because of the expanding lime particles that were prepared to play out the trading of feline particles of dirt particles, subsequently occupying the void space and thickly pressing the dirt particles together. Notwithstanding, the drop in thickness came about because of the overabundance water and lime staying after the expanding amount has been spent for adjustment measure. J. Trivedi, S. Nair and C. Iyyunni [9] did trial studies to explore ideal usage of fly debris for adjustment of subgrade soil and reasoned that OMC accomplishes its most noteworthy estimation of 29.27 % for 10 % of fly debris as contrast with 21.38 % for unstabilized soil though, CBR esteem increments from 5.64 % to 20.53 % for 20 % of fly debris. L. Yadu, R. Tripathi and D. Singh [10] directed number of investigation for the correlation of fly debris and rice husk debris settled dark cotton soil .Based on the CBR and UCS tests they revealed the ideal measure of fly debris and rice husk debris was 12% and 9% individually. Saving in the expense per km length of street has been assessed to be roughly 14% and 20% for RHA and FA separately. B. Phanikumar and R. Sharma [11] examined the impact of fly debris on designing properties of far reaching soils and expressed that ideal dampness content diminished and greatest dry unit weight expanded with an increment in fly debris content. There are huge uses of soil change admixture to improved poor sub grade soil execution by controlling volume change and growing strength. V. Pasupuleti, S. Kolluru and T. Blessingstone [12] led trial concentrate on impact of fiber and fly debris settled subgrade and expressed that ideal CBR esteem was acquired at 15% of fly debris with 1.5 % fiber content. E. Geliga and D. Ismail [13] explored geotechnical property of fly debris and its application of soil adjustment and revealed that shear strength saw of test combination

restored for 7 days be diminishing as measure of fly debris was 80% of complete load of the blend. R. Sharma [14] contemplated the sub evaluation attributes of locally accessible extensive soil blended in with fly debris and haphazardly circulated strands. According to the consequences of examination, it was accounted for that extent of 70 % soil and 30 % fly debris was the best extent having most extreme dry thickness and greatest CBR esteem. Accessible writing shows that the greater part of the examination chips away at concrete, fiber, saw residue, lime and fly debris adjustment is identified with geotechnical perspectives as it were. Not many endeavors have been utilized lime or fly debris in roadway subgrade. Clashing outcomes have been accounted for in writing with respect to ideal level of lime and fly debris needed for soil adjustment. Genuine advantages of balancing out the subgrade soil with lime and fly debris likewise discovering its ideal measurements and which one (lime or fly debris) is generally appropriate as far as economy and layer thickness decrease has not been accounted for anyplace in the past writing. Compaction and seepage are the case of the previous sort, which improve the inborn shear strength of soil. Instances of the later kind are adjustment with fly debris, concrete, lime, bitumen and synthetic substances and so forth The measure of fly debris required, communicated as a rate by weight of dry soil, by and large shifts between 5% to 20%. Fly debris, as an added substance, has likewise been discovered helpful in the adjustment of soil. The fly debris goes about as puzzolana additionally as filler for expanding the thickness. Consequently, legitimate compaction assumes a vital part in the adjustment. Compaction greatly affects soil properties.

## MATERIAL AND METHOD

Soils happening are made out of particle of different size in fluctuating rates. Soils container a monstrous heap of empty space. Compactions are utilization of the automatic power to an earth of re-attempt the particle and reducing the null and void degree. Compactions of presented soil are necessary for the advancement of the earth dam, stream barriers, roads, runways and in various other setting everything straight applications. Compaction of free fills is a short framework for getting more grounded and weight bearing major of soils. The central inspirations driving compaction is to expand the shear strength of earth, decline coming about resolution below working loads, the void degree construction it basically extra hard water to experience soils improvement of titanic water force that cause soil to gather through shakes. The factor affecting compactions are water substance of the earth, kind of soil being compressed, and level of the compactive power used and improvement of admixtures. The amount of each particle impacts the lead of soils. All around soil can be alluded to into rock, sand, progress and earth subject to their particle size. Rock and sand are the coarse grained soil while progressions as well as earth are the fine grained soil.

### CALIFORNIA BEARING RATIO

This is likely the most generally utilized technique for the plan of adaptable asphalt.

The CBR tests are confined level entrance analysis in which a barrel molded unclogged of 3sq.in (5cm expansiveness) cross fragment is gone into an earth mass at the speed of 0.05 in. Each second for instance 1.25 mm/min. Discernments are taken between the passages securities of the unclogged into a normal delineation of solid rock of the relating infiltration are called standard weight. It is depicted of degree of experiment weight to the normal weight of a given section unclogged.

$$CBR=\frac{TEST\ LOAD}{STANDARD\ LOAD}\times 100$$

The standard weights embraced used for different invasions for standard materials with a CBR assessment of 100% are given underneath

| Entrance of plunger in mm | Standard load in kg |
|---|---|
| 2.5 | 1370 |
| 5.0 | 2055 |
| 7.5 | 2630 |
| 10 | 3180 |
| 12.5 | 3600 |

## LIQUID LIMIT TEST

Take 120gm air dried soil test passing 420 micron strainer is taken and is blended altogether with refined water on a marble to frame a thick glue. At that point the cup is loaded up with arranged soil test, taking consideration that no air is ensnared. The outside of the example is stepped up by eliminating abundance soil. At that point the cup is put CBR test are done on a compacted soil in a CBR shape 150mm appraisal and 175 mm height, outfitted with a conspicuous neck an area of 50 mm height of a distinct entered bottom plate. A displacer plates of 50 mm necessary to the reserved in the development throughout the model masterminding, draws in an outline of 125 mm important to be gotten.

## COMPACTION TEST

## MATERIALS & EQUIPMENTS

| Sl. No. | Equipments | Specification |
|---|---|---|
| 1 | Cylindrical metal mould | 1000cc (internal dia. of 100±.1 mm & internal effective height 127.3± .1mm ). |
| 2 | Metal rammer | 50 mm breadth roundabout face; weighing 2.6 kg and having drop of 310 mm |
| 3 | IS sieve | 4.75 mm |
| 4 | Balances | 10 kg limit touchy to 1 g, and 200 limit delicate to 0.01 g. |
| 5 | Thermostatically controlled broiler | 105 -110°$c$ |

| | | |
|---|---|---|
| 6 | Measuring cylinder of glass | 100 ml capacity |

## PROCEDURE

A delegate test weighing roughly 2.5 kg of altogether blended air dried material passing 4.75 mm IS sifter is taken. Required amount of water for clayey soil is taken. The dirt is blended completely .Then soil is saved for 15 minutes to get developed. The shape is fixed to its base. The heaviness of void shape is taken. The collar is appended to the form. The dirt mass is isolated into three equivalent layers and put the dirt mass individually layer. Every layer are living being given 25 blow from the rammer weighing 2.6kg tumbling from height of 310 mm with the end goal that the heap ought to be consistently disseminated over the dirt surface. The overabundance measure of soil mass is stroked off after the evacuation of collar. At that point we take the heaviness of the compacted soil mass and a dirt example is taken from the compacted soil for assurance of water content. Comparative method was rehashed for 4 to 5 number of tests.

## CALIFORNIA BEARING RATIO TEST

The CBR test is entrance tests are recommended for the valuation of sub level strength of streets and dark tops. The result got by these tests is used with the observational curves to pick the thickness of dull top and its piece layers. This is the most all around used methodology for the approach of versatile dim top. About 4.5 to 5.5 kg of soil was taken and mixed totally with the critical water. The extension collar was and the base plate to the plan. Augmentation the spacer floats over the base. See the channel paper on the most significant motivation behind the spacer plate. The blended soil was compacted in the shape utilizing significant compaction. The earth was compacted in 5 layers with 56 hits to each layers by the 4.89 kg rammer. The collar was discarded with soil was regulated off. The shape was flipped around and the base plate and the displacer circle was slaughtered. The channel paper was put on the most significant reason for the compacted soil (collar side) and catches the entered base plate on to it. The test was composed for unsoaked conditions. Put annular loads to make an additional charge undefined from weight of base material and dim top expected in ensured unexpected turn of events. Each 2.5 kg weight is unclear from 7cm new development. In any occasion two weights ought to be put.

## STRATEGY FOR PENETRATION TEST

The design was set get-together with the extra charge loads on the attack test machine. The entrance chamber was set at the purpose of combination of the model with the humblest conceivable weight, now for no circumstance in exceed of 4 kg so that full contact of the chamber on the models are set up. Set the worry call check to get zero. Chamber in to the store was applied and the passage velocity is about 1.25 mm/min. The piles reading was recorded at methods of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 7.5, 10 and 12.5 mm. The shape from the stacking gear was passed on.

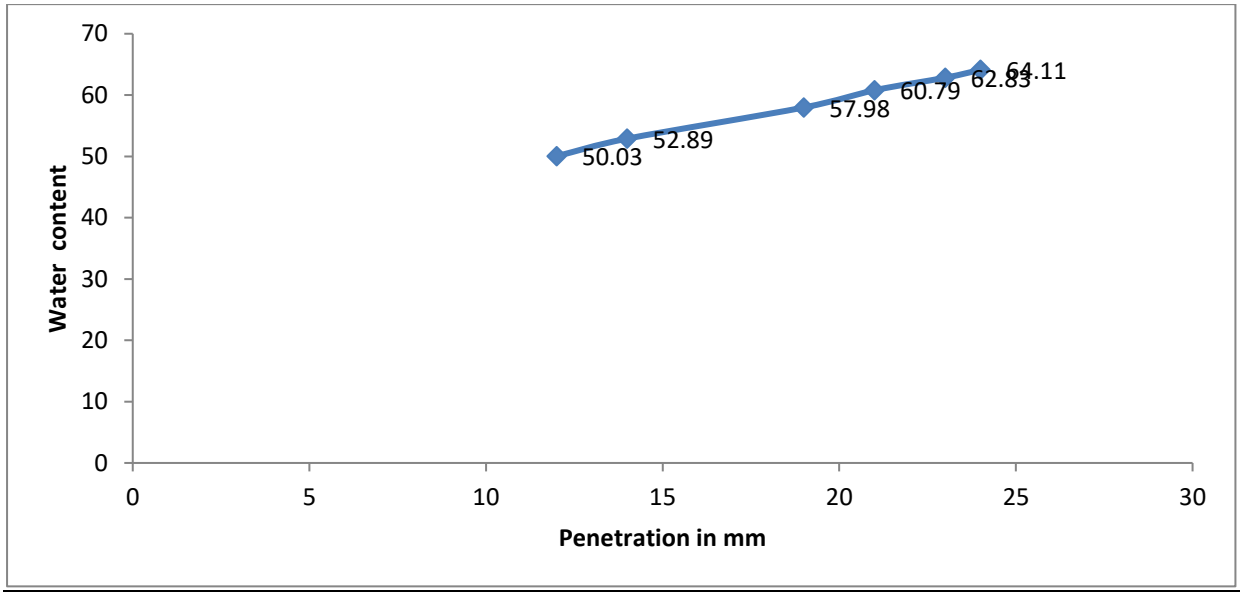
$$\text{CBR}=\frac{\text{CORRECTED LOAD}}{\text{STANDARD LOAD}}\times 100$$

The CBR values are usually settled path for 2.5 mm and 5 mm. For the most part the CBR respect on the 2.5 mm determination be very obvious than 5 mm and such a case of the before will be taken as CBR used for configuration reason. In the result that CBR for 5 mm beats that 2.5 mm; the test must be rehash. The chance of the undefined outcome are acquired, CBR for 5mm is taken.

## TABULATION AND GRPAPHS

### LIQUID LIMIT BY CONE PENETRATION METHOD

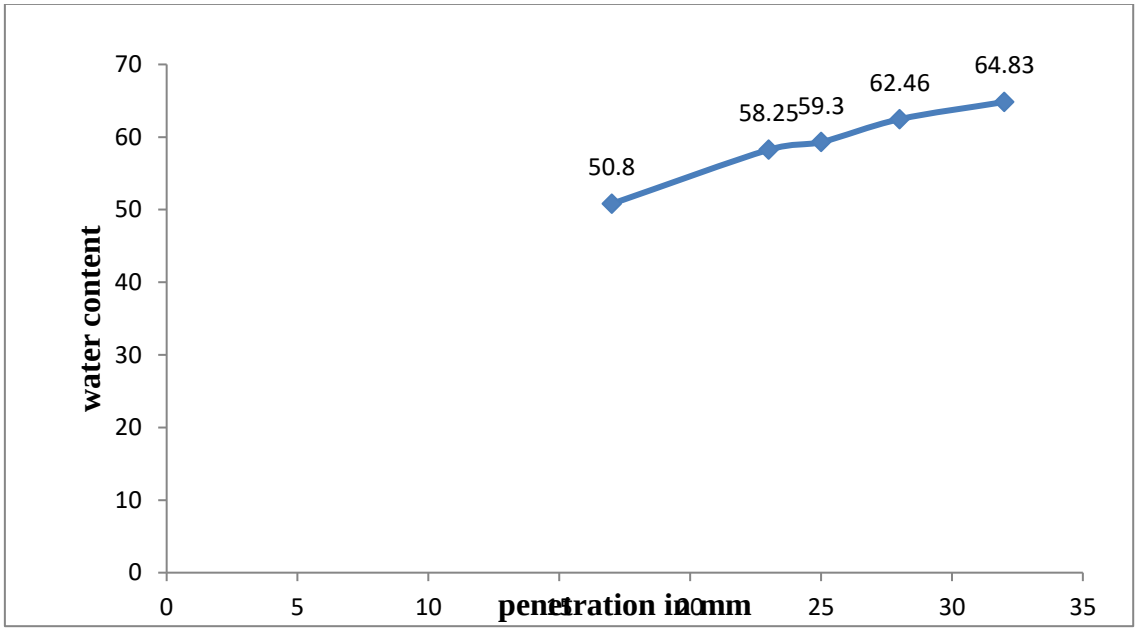
| TIN NO. | 52 | 12 | 10 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|
| WEIGHT OF EMPTY TIN | 14.406 | 12.329 | 12.575 | 14.103 | 13.762 | 14.852 |
| WEIGHT OF TIN PLUS WET SOIL | 26.029 | 23.38 | 21.94 | 26.553 | 26.907 | 28.132 |
| WEIGHT OF TIN PLUS DRY SOIL | 22.153 | 19.557 | 18.503 | 21.846 | 21.835 | 22.944 |
| WEIGHT OF WATER | 3.876 | 3.823 | 3.437 | 4.707 | 5.072 | 5.188 |
| WEIGHT OF DRY SOIL | 7.747 | 7.228 | 5.928 | 7.743 | 8.073 | 8.092 |
| WATER CONTENT | 50.03 | 52.89 | 57.98 | 60.79 | 62.83 | 64.11 |
| PENETRATION DEPTH | 12 | 14 | 19 | 21 | 23 | 24 |




**WATER CONTENT=59.5**

| TIN NO. | 12 | 21 | 11 | 54 | 0 |
|---|---|---|---|---|---|

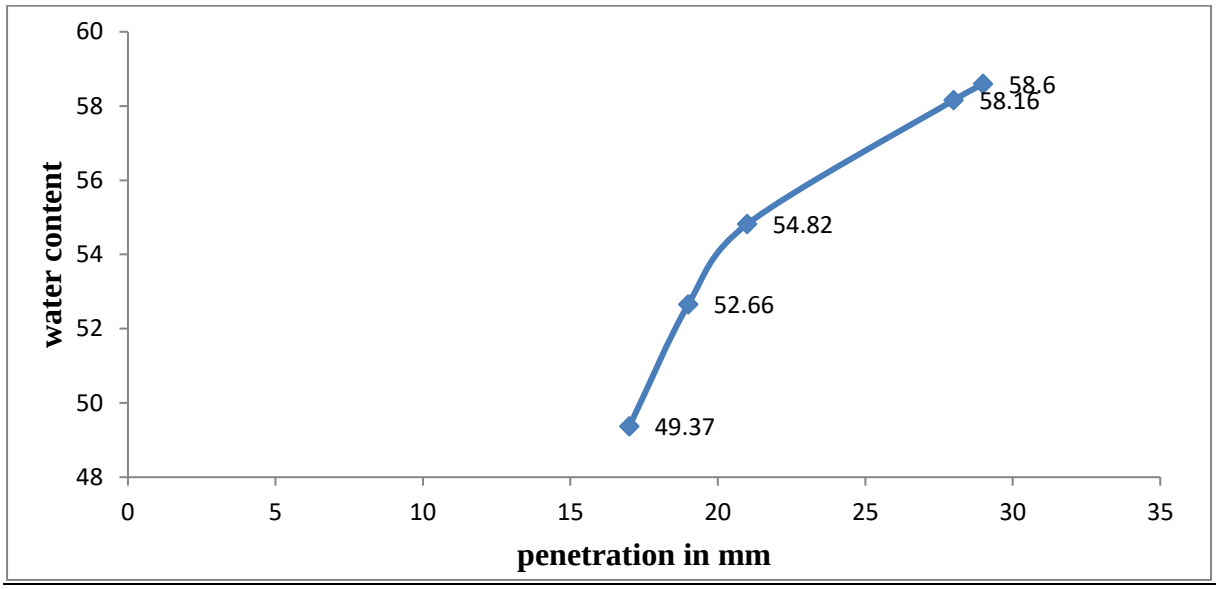
| | | | | | |
|---|---|---|---|---|---|
| WEIGHT OF EMPTY TIN | 13.007 | 13.760 | 13.972 | 13.209 | 14.983 |
| WEIGHT OF TIN PLUS WET SOIL | 22.399 | 23.336 | 26.245 | 27.473 | 25.318 |
| WEIGHT OF TIN PLUS DRY SOIL | 19.235 | 19.811 | 21.676 | 21.989 | 21.253 |
| WEIGHT OF WATER | 3.164 | 3.525 | 4.569 | 5.484 | 4.065 |
| WEIGHT OF DRY SOIL | 6.228 | 6.051 | 7.704 | 8.780 | 6.270 |
| WATER CONTENT | 50.80 | 58.25 | 59.30 | 62.46 | 64.83 |
| PENETRATION DEPTH | 17 | 23 | 25 | 28 | 32 |




**WATER CONTENT=54.**

| | | | | | |
|---|---|---|---|---|---|
| TIN NO. | 10 | 3 | 8 | 22 | 02 |
| WEIGHT OF EMPTY TIN | 12.577 | 13.287 | 12.894 | 14.851 | 13.724 |
| WEIGHT OF TIN PLUS WET SOIL | 27.407 | 26.662 | 27.717 | 31.490 | 30.426 |
| WEIGHT OF TIN PLUS DRY SOIL | 22.505 | 22.048 | 22.468 | 25.371 | 24.255 |
| WEIGHT OF WATER | 4.902 | 4.614 | 5.249 | 6.119 | 6.171 |

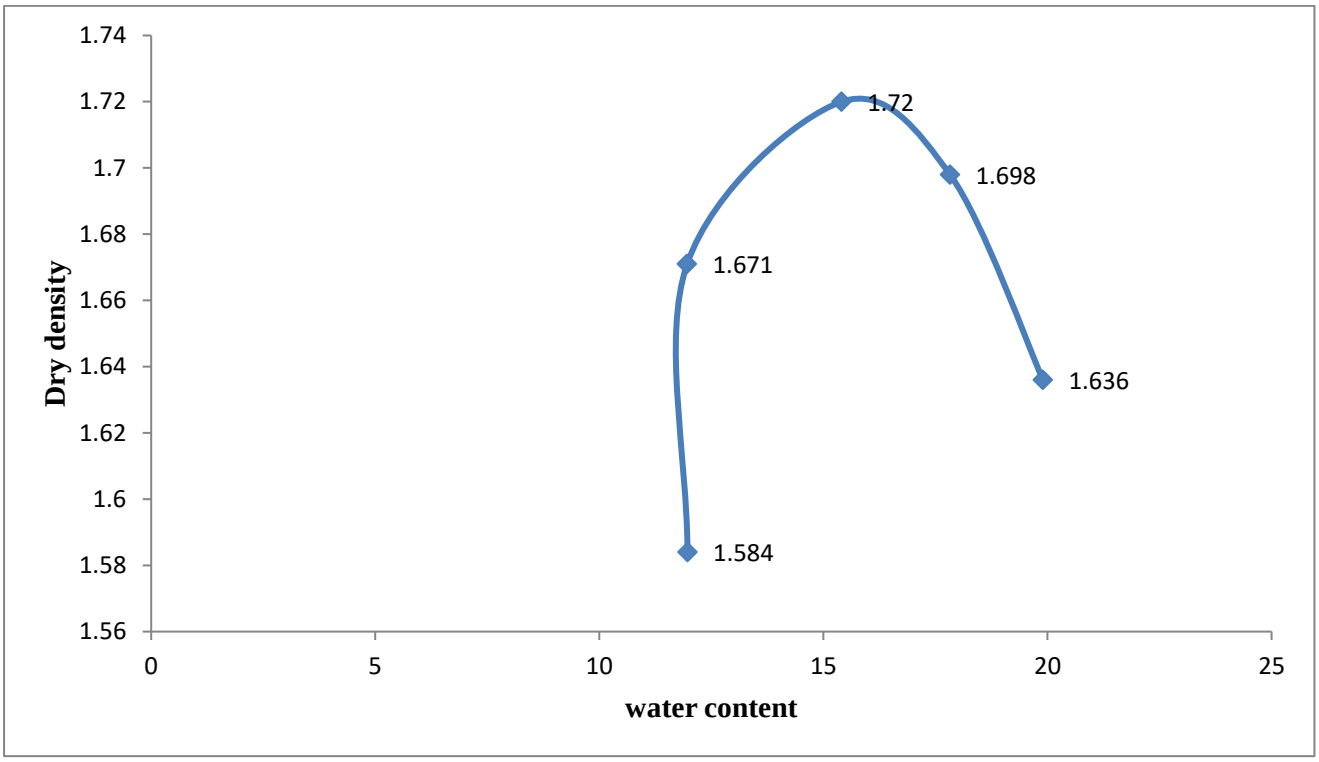
| | | | | | |
|---|---|---|---|---|---|
| WEIGHT OF DRY SOIL | 9.928 | 8.761 | 9.574 | 10.52 | 10.531 |
| WATER CONTENT | 49.37 | 52.66 | 54.82 | 58.16 | 58.60 |
| PENETRATION DEPTH | 17 | 19 | 21 | 28 | 29 |




**Compaction for Normal soil**

| Sample number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Empty weight of the mould in gm | 3792 | 3792 | 3792 | 3792 | 3792 |
| Volume of the mould in $cm^3$ | 997.456 | 997.456 | 997.456 | 997.456 | 997.456 |
| Weight of soil + weight of mould in gm | 5489 | 5658 | 5710 | 5788 | 5749 |
| Weight of soil in gm | 1767 | 1866 | 1918 | 1996 | 1957 |
| Bulk density ($gm/cm^3$) | 1.772 | 1.871 | 1.986 | 2.001 | 1.962 |
| Container Number | 0 | 1 | 3 | 2 | 4 |
| Mass of container | 14.986 | 12.452 | 13.286 | 13.722 | 13.578 |
| Mass of container +Wetsoil | 22.929 | 23.630 | 29.729 | 28.324 | 28.545 |
| Mass of container + Dry soil | 22.080 | 22.436 | 27.534 | 26.115 | 26.061 |
| Mass of water | 0.849 | 1.194 | 2.195 | 2.209 | 2.489 |
| Mass of dry soil | 7.094 | 9.984 | 14.248 | 12.393 | 12.483 |
| Water content (%) | 11.967 | 11.959 | 15.405 | 17.824 | 19.899 |

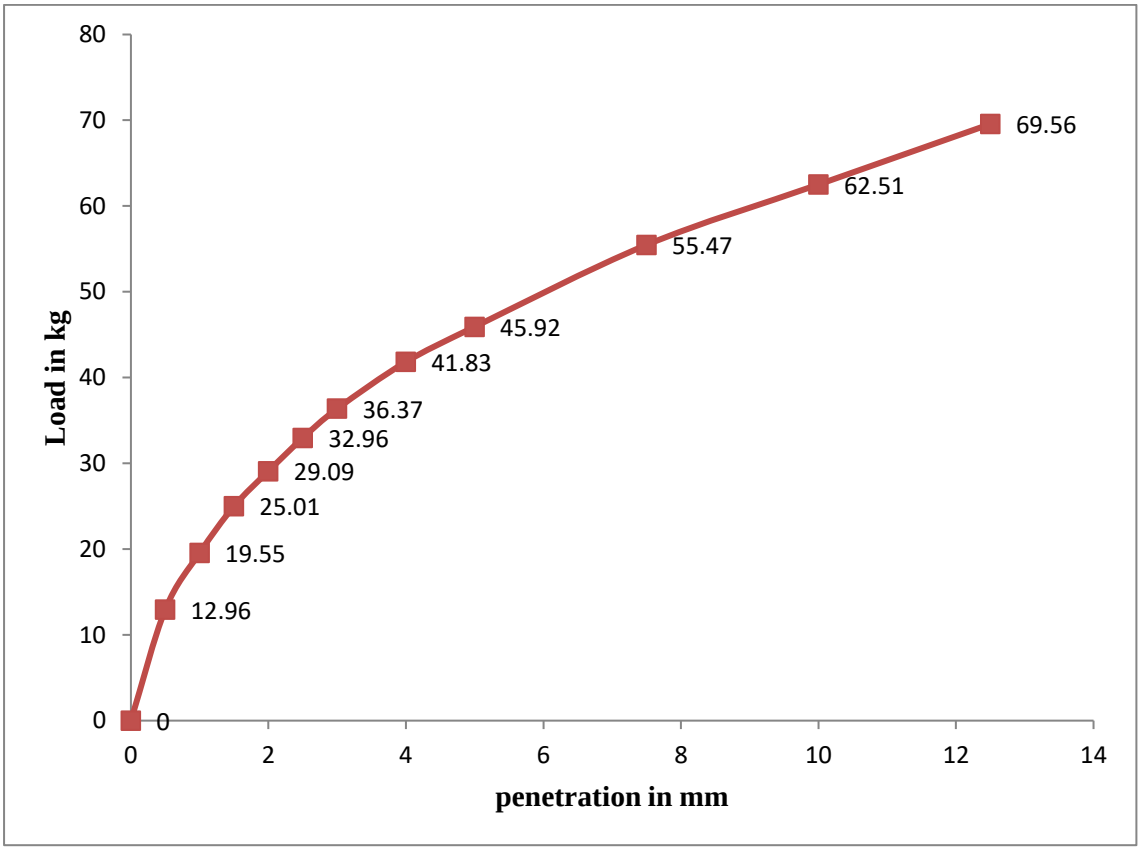
| | | | | | |
|---|---|---|---|---|---|
| Dry density | 1.584 | 1.671 | 1.720 | 1.698 | 1.636 |




**WATER CONTENT=15.405**
**DRY DENSITY=1.72**

## CBR Test For Plane Soil

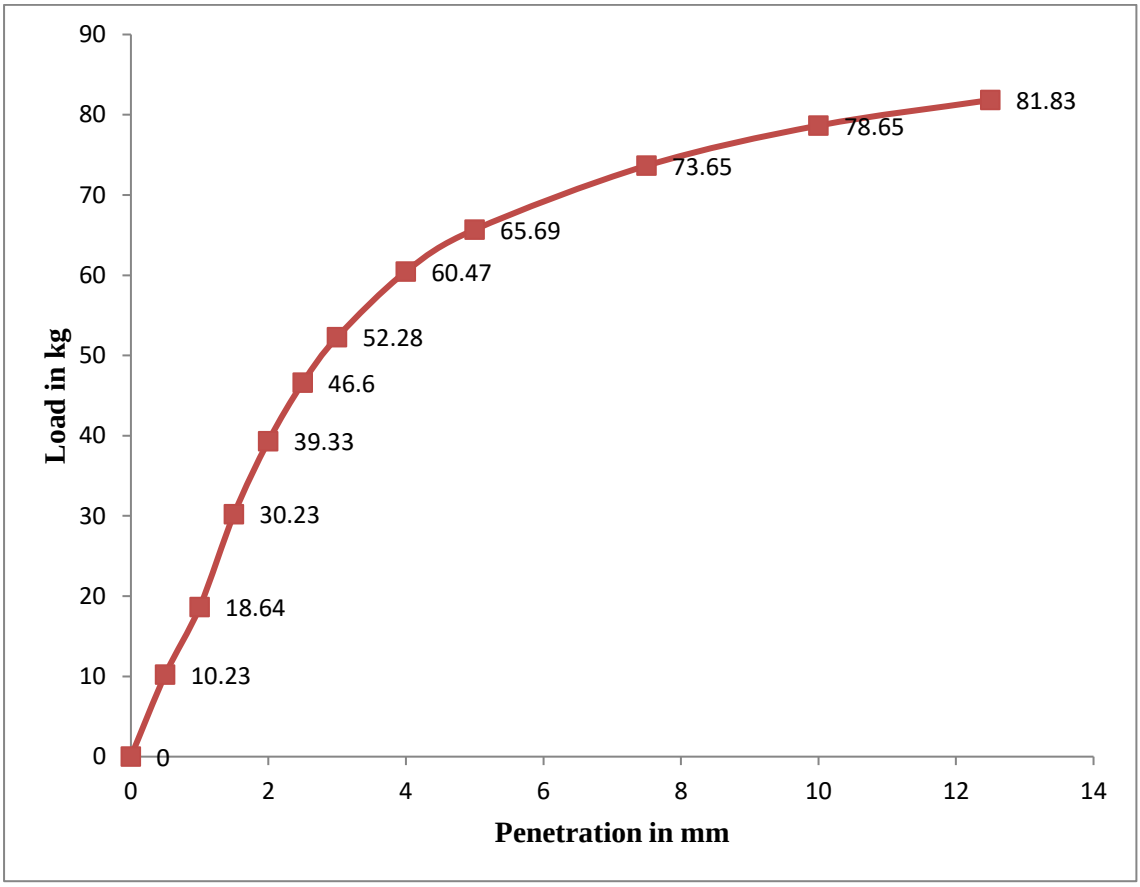
| Penetration | Load reading | Load in KG |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 57 | 12.96 |
| 1 | 86 | 19.55 |
| 1.5 | 110 | 25.01 |
| 2 | 128 | 29.09 |
| 2.5 | 145 | 32.96 |
| 3 | 160 | 36.37 |
| 4 | 184 | 41.83 |
| 5 | 202 | 45.92 |
| 7.5 | 244 | 55.47 |
| 10 | 275 | 62.51 |
| 12.5 | 306 | 69.56 |




**CBR at 2.5mm=2.4**
**CBR at 5mm=2.23**
**RESULT= 2.40**

**CBR Test For Soil with 5% fly ash**

| Penetration | Load reading | Load in KG |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 45 | 10.23 |
| 1 | 82 | 18.64 |
| 1.5 | 133 | 30.23 |
| 2 | 173 | 39.33 |
| 2.5 | 205 | 46.6 |
| 3 | 230 | 52.28 |
| 4 | 266 | 60.47 |
| 5 | 289 | 65.69 |
| 7.5 | 324 | 73.65 |
| 10 | 346 | 78.65 |
| 12.5 | 360 | 81.83 |

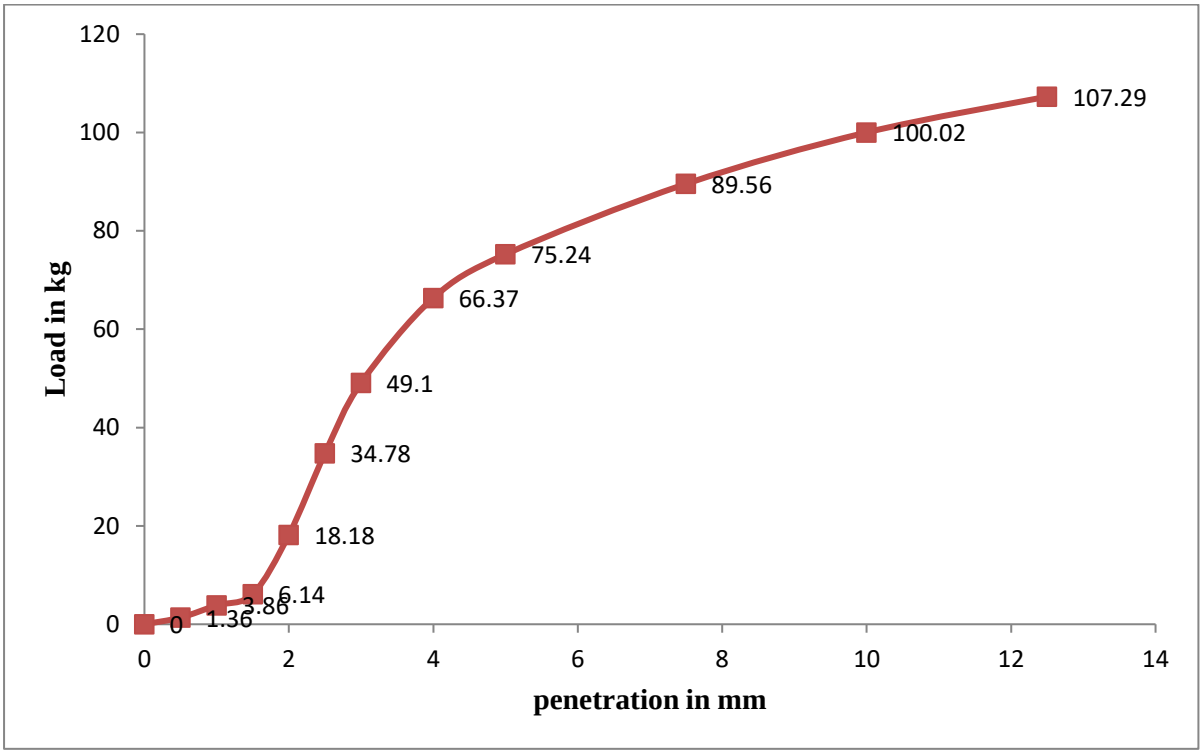



**CBR at 2.5 mm=3.4**
**CBR at 5 mm=3.19**
**RESULT=3.40**

**CBR Test For Soil with 10% fly ash**

| Penetration | Load reading | Load in KG |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 6 | 1.36 |
| 1 | 17 | 3.86 |
| 1.5 | 27 | 6.14 |
| 2 | 80 | 18.18 |
| 2.5 | 153 | 34.78 |
| 3 | 216 | 49.1 |

| | | |
|---|---|---|
| 4 | 292 | 66.37 |
| 5 | 331 | 75.24 |
| 7.5 | 394 | 89.56 |
| 10 | 440 | 100.02 |
| 12.5 | 472 | 107.29 |

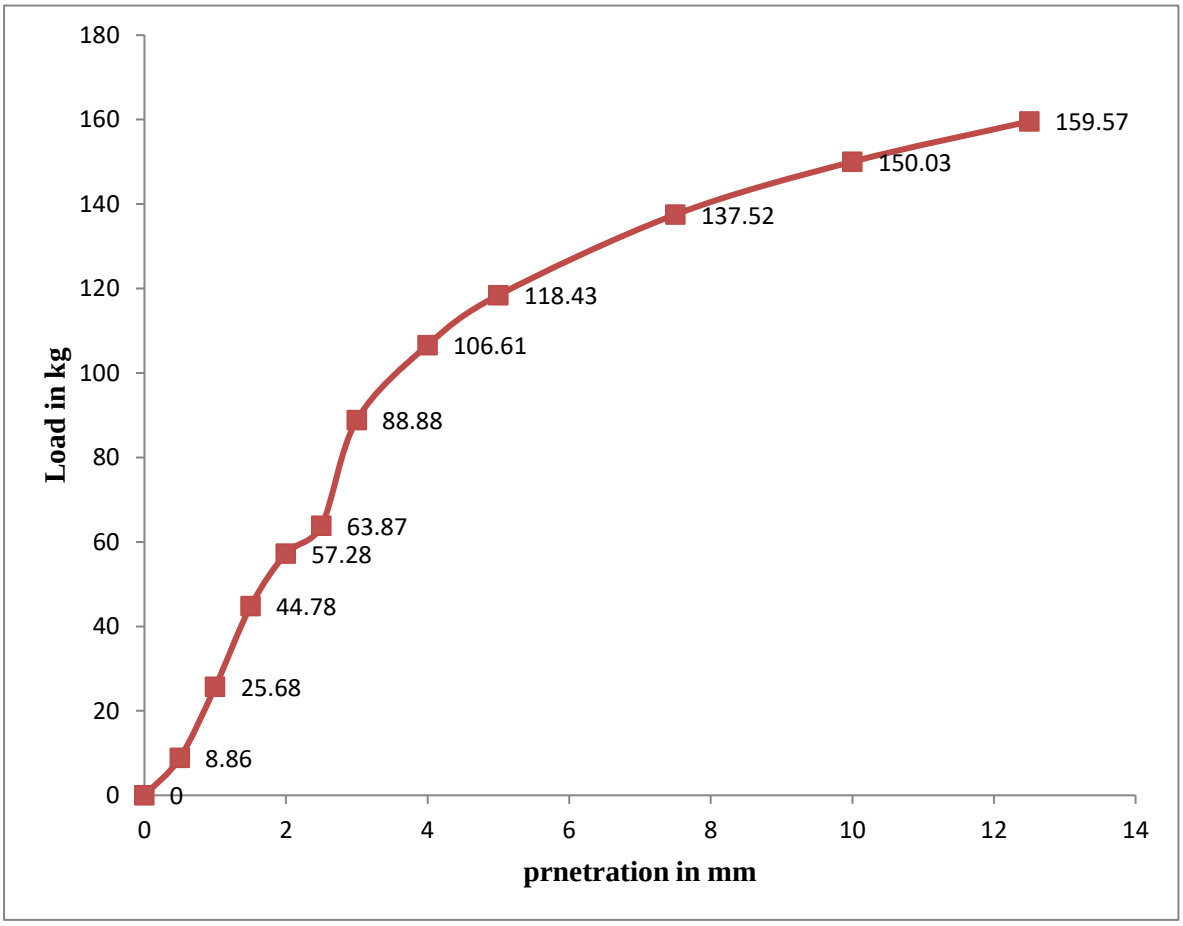



**Corrected CBR at 2.5mm=4.52**
**Corrected CBR at 5mm=4.04**
**RESULT=4.52**

## CBR Test For Soil with 15% fly ash

| Penetration | Load reading | Load in KG |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 39 | 8.86 |
| 1 | 113 | 25.68 |
| 1.5 | 197 | 44.78 |
| 2 | 252 | 57.28 |
| 2.5 | 281 | 63.87 |
| 3 | 391 | 88.88 |
| 4 | 469 | 106.61 |
| 5 | 521 | 118.43 |

| | | |
|---|---|---|
| 7.5 | 605 | 137.52 |
| 10 | 660 | 150.03 |
| 12.5 | 702 | 159.57 |

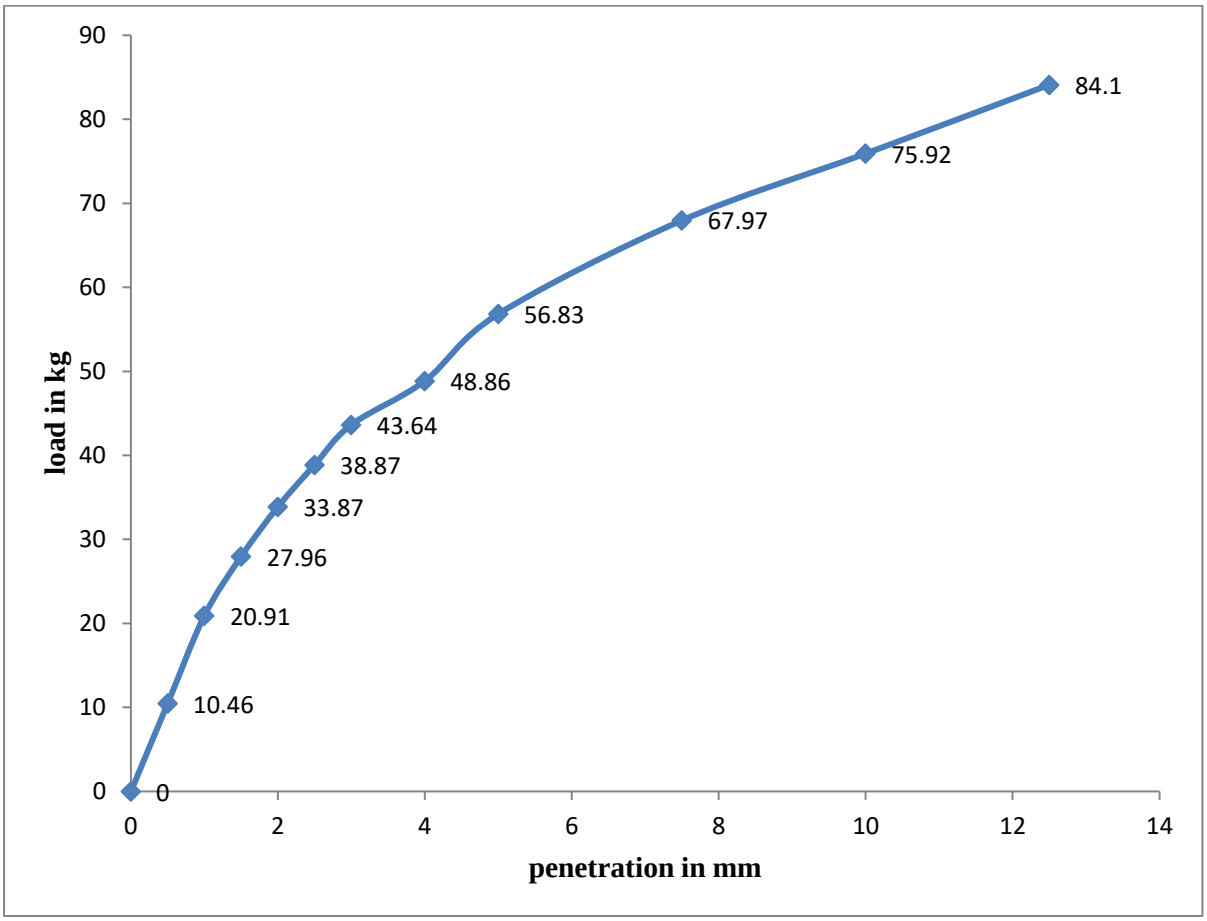



**CBR at 2.5mm=4.66**
**CBR at 5mm=5.76**
**RESULT= 5.76**

**CBR Test For Soil with 20% fly ash**

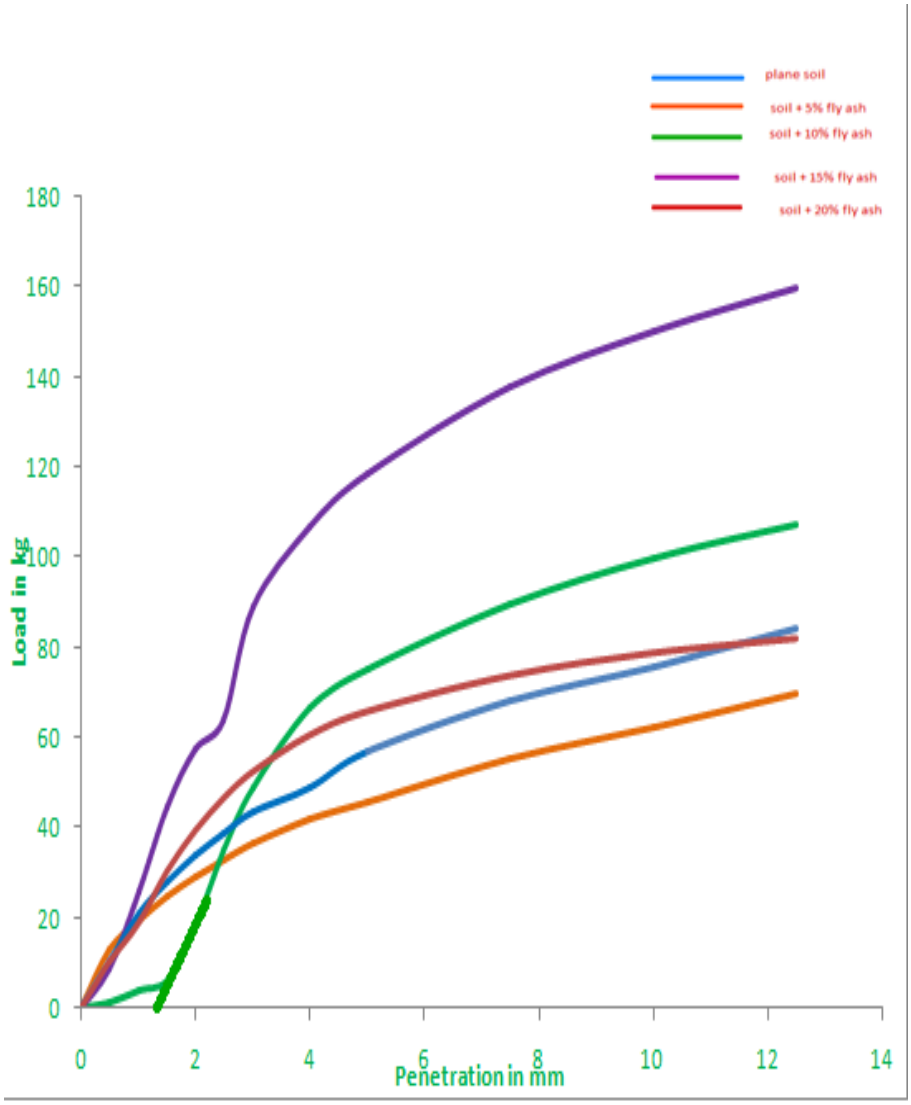
| Penetration | Load reading | Load in KG |
|---|---|---|
| 0 | 0 | 0 |
| 0.5 | 46 | 10.46 |
| 1 | 92 | 20.91 |
| 1.5 | 123 | 27.96 |
| 2 | 149 | 33.87 |
| 2.5 | 171 | 38.87 |
| 3 | 192 | 43.64 |
| 4 | 223 | 48.86 |
| 5 | 250 | 56.83 |

| | | |
|---|---|---|
| 7.5 | 299 | 67.97 |
| 10 | 334 | 75.92 |
| 12.5 | 370 | 84.1 |



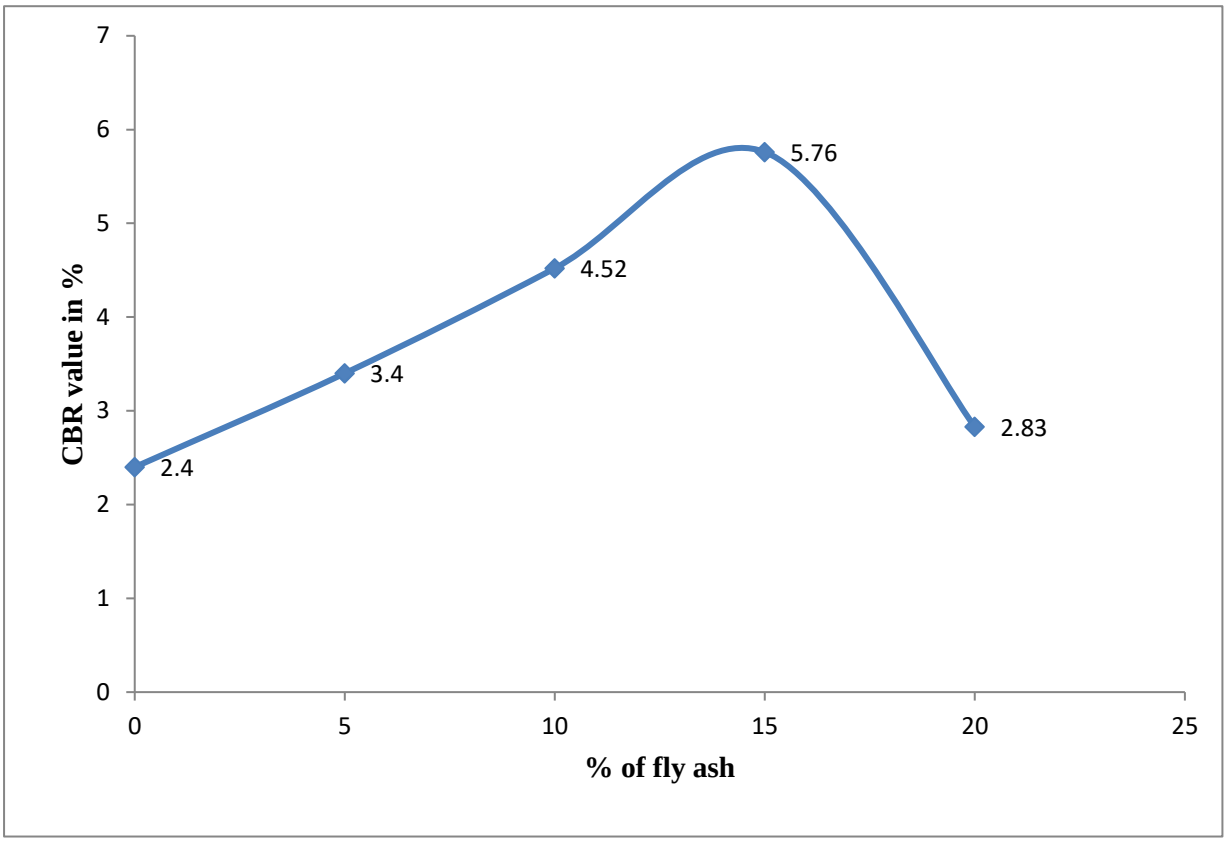

**CBR at 2.5mm=2.83**
**CBR at 5mm=2.76**
**RESULT= 2.83**

# RESULT & DISCUSSION




**Combined result of CBR**

| % of fly ash | 0 | 5 | 10 | 15 | 20 |
|---|---|---|---|---|---|
| CBR | 2.4 | 3.4 | 4.52 | 5.76 | 2.83 |




From the above diagram obviously the CBR estimation of soil increments with increment of fly debris from 5% to 15% and it diminishes at 20%. Along these lines, the dirt invigorates more with fly debris at 15%.

## CONCLUSI ON

The construction work is increasing rapidly. Engineers always search for alternative use of soil for pavement design to provide more strength. Now fly ash is such a material which is dangerous for environment. To avoid this danger & to utilize fly ash in an effective manner we attempted for CBR test. We found the result that soil with 15% of fly ash giv es more CBR value than plane soil & soil with 5% & 10% fly ash. The addition of fly ash should be restricted to a limited %age. The increase in CBR value of soil due to expansion of fly debris might be because of the high dry density, that is attained. The fine particles of fly ash gets accommodated into the voids in the soil mass. The reduced void ratio results in high dry density and subsequently high CBR value. Hence, we conclude that the soil with fly ash gives more strength & it can be used in pavement design to save the soil, to reduce the height of pavement, & bear more wheel loads.

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