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Research Paper

A mathematical model for compaction laboratory tests

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Introduction
Background
Vibratory roller compaction equipment densities in the field are not attainable in laboratory. the optimum moisture content (omc) obtained in the laboratory is often higher than that in the field, and so the (omc) density lower than that in the laboratory, the primary benefit of compacting soil is to increase its strength ,determine (omc) and maximum dry densities, the standard proctor test originally developed in 1930 to represent the higher densities of compaction, higher compaction efforts routinely seen in the field. Higher unit weights and lower omc,in addition the impact compaction method does not work well ,with pure sandy soil.

ABSTRACT:- The state of compactness is an important soil structure ,and quality attribute. The use of some relative bulk density value, particularly the degree of compaction,it makes results of soil compaction applicable. Quantitative data showed that there was significantly more volume change, for sand at relative densities below 60%, the method induced to take in to consideration the effect on the nonlinear relations The test produces densities greater than that in the field. Compaction for field simulation, the objectives included standard test procedure, for compacting silty and sandy soils

Methodology:
The analyses of the points, determined in the lab test represents a curve, seems to be a parabola and taking three points to make the parabola, which is afunction representation.

Litterature of review:
Background:
The original proctor test, astm /aashto" uses a4 inch diameter (100mm) mold which Holds1/30 cubic foot of soil, and calls for compaction of three separate lifts of soil using 25, blows by 5.5 lb. hammer falling 12 inches. forcompactive effort. the modivied proctor test uses, same mold 6 inches but uses 10 lb hammer falling through 18 inch while 25 blows, of each obvious lifts.astm similar to aashto American society, for testing and material for state higher and transportation officials.

Problem of study:
It is to find amathematical review for a laboratory test ,to represent graphical solution with parabola,as an approximate solution, rather than graphical one.
Motivation:
Availability of the computer in the laboratory ,and quicker solution obtained.
Conclusions:
Higher field compaction efforts results , are higher unit weight and lower omc, than that obtained by modified proctor compaction test .
In addition, the impact compaction method ,does not work well with the pure sandy soil.the test produces densities, greater than that in the field. The main objective to compact soil samples ,with other compaction methods impact ,revealed laboratory compaction procedures ,was evaluated to determine , which would best replicate the field effort, will be explored to determine if it showes more precise,than the impact compaction method
Static: to under impact under pressure,knealing a small foot loaded than unloaded.

Vibratory : vibratedas it is compacted. The quality of compacted material, is generally specified items of dry density unit weight .

Results:
Fieldtest results density from the modified proctor test is, approximately 113 lbs /ft3. It is less than the peak density, achieved after low passes of the field compaction, a 1.0 lbs/ft3 lower than the eight passes peak densities. Required densities, 110.4 lbs. /ft3 lower than the densities during the field test.example Thomasville road field compaction results

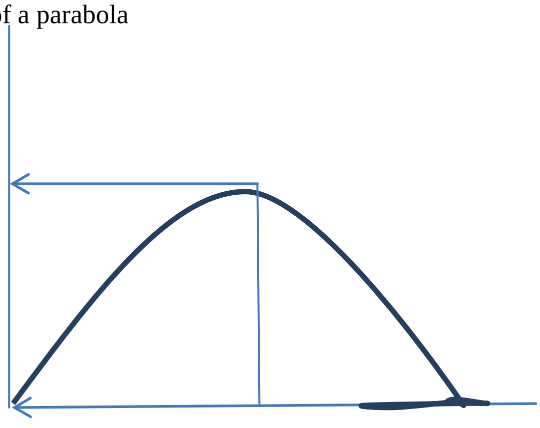
Number of passes water content % dry unit weight (pcf)
8 passes 7 111.6 at 12 inch depth
8.6 111.5
10.6 111.3

10.6112.5

10.8	10.6	10.6	8.6	7
113.8	112.5	111.3	111.5	111.6

16 passes
Water content %dry unit weight
9.1 108.9
10.6 110.9
10.6 111.5
10.8 112.8
11 112.7
Assumed w (water content %) saturated calculated dry unit weight (gm. /cm3)
8 1.5
11 1.71
12.8 1.86
15.65 1.69

The graph of a parabola
y



Dry density 1.87Maximum dry density(g/cm3)
Moisture content (%) dry density vs moiturecontent

Appendix

Y=ax^2+bx+c

1.71=121a+11b+c

1.69=245a+15.65b+c ……………………………………(2)

-0.02 = 124a+4.65b by elimination of the two equations…………………………(1)

1.86=12.8^2*a+12.8b+c

1.86=163.84a+12.8b+c

(1.69=145a+15.65b+c)*0.2971…………………………………(2)

-.17=81.16a+2.85b…by elimination of the two last equations……………………………………….(3)

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.5021=43.08a+4.65b+.2971c…………………………………(2a)

-0.17=18.84a+2.85b…………………………(3)

1.86=163.84a+12.8b+c…………………………………………………………………

1.69=145a+15.65b+c……………………………………………………………..(2b)

1.63158*(-.17=-81.16a+2.85b)…………………………………………………………(3b)

-.02=124a+4.65b………………………………(1)

-.2773686=-132.414a+4.65b……………………   … (3b)

Subtracting

a=-0.03059

-.02=-124*0.03059+4.65b

b=0.8114

1.86=163.84*-.03059+12.8*.8114+c

C=-3.5141

Y=-.03059x^2+-.8114*x+-3.5141…………………………………………………(4)

dy/dx=-.06118x+.8114=0

x=%13.3

y=1.8668g/cm3

Exact 1.87g/cm3 by lab

Program for gauss elimination method

```
#include<&tdio.h>

Intmain(   )

(

Inti,j,k,n

Float A(20)(20),C,X(10),sum=0.0;

Print f("\n enter the code of matrix:";)

Scanf("%d,&n);

Printf("\n enter the element of augmented matrix row-wise:n\n);

For(i=1;i<=n,i++)

(

For(i=1;j<=(n+1);j++)

(

For( j=1;j<=(n+1);j++)

(

Print f("A(%d)(%d):",i,j);

Scanf("%f",&A(i)(j));

)

)

For(j=1,j<=n; j++)/*loop for the generation of upper triangular matrix*/

(
```

```
For(i=1;i<n;i++)
(
If(i>j)
(
C=A(i)(j)/A(j)(j)
For(k=1;k<=n+1;k+1)
(
A(i)(k)=A(i)(k)-c*A(j)(k)
)
)
)
)
X(n)=A(n)(n+1)/A(n)(n)
/*this loop is for backward substitution
For(i=n-1;i>=1,i--)
(
Sum=0;
For(j=i+1;j<=n;j++)
(
Sum=sum+A(i)(j)*x(j)
X(i)=(A(i)(n+1)-sum)/A(i)(i));
)
Printf("\n the solution is ;\n");
For(i=1;i<=n;i++)
Printf("\nx%d,%f\t),i,(i);/*x1,x2.x3 are the regular solutions/
)
Return(0)
)
Print("\n%d,%f\t",i,x(i))
```

Recommendations:

Using computer to find maximum dry density, and optimum moisture content, for quantity quality approximated solutions

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