Kentucky Method 64-512-08~~2~~
Revised ~~11/19/02~~02/26/08
Supersedes KM 64-512-~~99~~02
Dated ~~6/1/99~~11/19/02

ONE POINT PROCTOR METHOD

1. SCOPE: The “One-Point Method” is a test for the rapid determination of the maximum density and optimum moisture content of a soil sample utilizing a family of curves and a one-point determination.

2. DEFINITION: A Family of Curves is a group of typical soil moisture-density relationships determined using T 99, which reveal certain similarities and trends characteristic of the soil type and source. Soils sampled from one source will have many different moisture-density curves, but if a group of these curves are plotted together certain relationships usually become apparent. In general it will be found that higher unit mass soils assume steeper slopes with maximum dry densities at lower optimum moisture contents, while the lower unit mass soils assume flatter more gently sloped curves with higher optimum moisture. The one-point proctor method should not be used in lieu of the “multi-point” moisture density test. It may be used to verify changes in maximum density and optimum moisture indicated by a nuclear density test that fails to meet specified density requirements even though operations have not changed and previous tests have passed. It may be used when time does not permit a “multi-point” test, i.e., the inspector is unsure which target density to use when the contractor is placing material.

3. PROCEDURE:

   3.1. Obtain a representative sample of soil, approximately 3000 grams should be sufficient, however if the sample contains plus No. 4 material a larger sample may be needed. When verifying a nuclear density test the sample should be taken directly below where the test was run.

   3.2. Sieve the material through a No. 4 sieve. Make sure all soil particles pass and only granular material, if any, is retained. Allow the –4 material to dry or add water until the sample is approximately 2 to 4 percentage points below optimum. The moisture content should never exceed optimum.

   3.3. Weigh the –4 and + 4 material separately and record. The plus 4 material may be discarded after weighing.

   3.4. Using the –4 material, compact 3 equal layers in the proctor mold by 25 uniformly distributed blows from a 12 inch height. Make sure the mold is setting on a solid foundation such as a headwall or concrete pavement.

   3.5. Remove the top collar and trim the compacted material with a straight edge knife until it is even with the top of the mold.

   3.6. Brush any loose material from the outside of the mold and base plate. Weigh and record the weight of the mold and sample.

3.7. Extrude the sample from the mold and perform a moisture test on a representative sample from the center of the plug using the Speedy Moisture Tester or other approved methods.

3.8. Calculate the wet weight per cubic foot of the compacted material as follows:

F = Mold constant (D-E)

Where:

F = Weight per cubic foot
D = Weight of wet soil and mold
E = Weight of mold

Example:

D =5901, E = 4034
F = .06614 (5901-4034)
F = 123.5 pcf

3.9. Using the Family of Curves determine the maximum density and optimum moisture of the minus No.4 material.

Example: Given wet weight = 123.5, moisture = 16.3

Follow the horizontal line representing the wet weight of 123.5 across the chart until it intersects the vertical line representing the moisture of 16.3. The typical curve lying nearest the point of intersection is curve 19. From the dry density chart the maximum dry density for curve 19 is 107 pcf and an optimum moisture of 18%.

3.10. Calculate the percent of sample retained on the No. 4 sieve as follows:

C = A/(A+B') x 100
C = percent retained on the No. 4 sieve
A = weight of plus No. 4 material
B' = dry weight of minus No. 4 material =B/ 1+ moisture of –4 material (M)

Example: A = 1000 grams, B = 4000 grams, B' = 4000/ 1.163 = 3439 grams

C = 1000/ (3439 + 1000) x 100 = 22.5%

When the amount of plus No. 4 material exceeds 5% the maximum dry density adjusted for the plus No. 4 material shall be determined in accordance with AASHTO T- 224 by using the chart in Figure 1 or by the following equation:

H = (1.0 – C') G + 149C'
H = adjusted maximum dry density
C' = percent retained on the No. 4 sieve expressed as a decimal
G = maximum dry density of the minus No. 4 material

Example: C’ = .225 (22.5%), G = 107 pcf

H = (1.0 - .225) 107 + (149 x .225)
H = 83 + 33.5 = 116.5 pcf

The optimum moisture is adjusted by the following equation:

J = I x 1-(C/100) + (C/50)
J = optimum moisture of the total sample
I = Optimum moisture of the minus No. 4 material
C = percent retained on the No. 4 sieve

Example: I = 18%, C = 22.5%

J = 18 x 1-(22.5/100) + (22.5/50)
J = 18(.775) + .45
J = 14.5 %

Therefore the adjusted maximum dry density and optimum moisture for the sample used in our example would be 116 pcf and 14.5%.

APPROVED ____________________________
DIRECTOR
DIVISION OF MATERIALS

DATE 02/26/08

~~APPROVED~~

~~Director~~
~~Division of Materials~~

~~DATE 11/19/02~~

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Attachments

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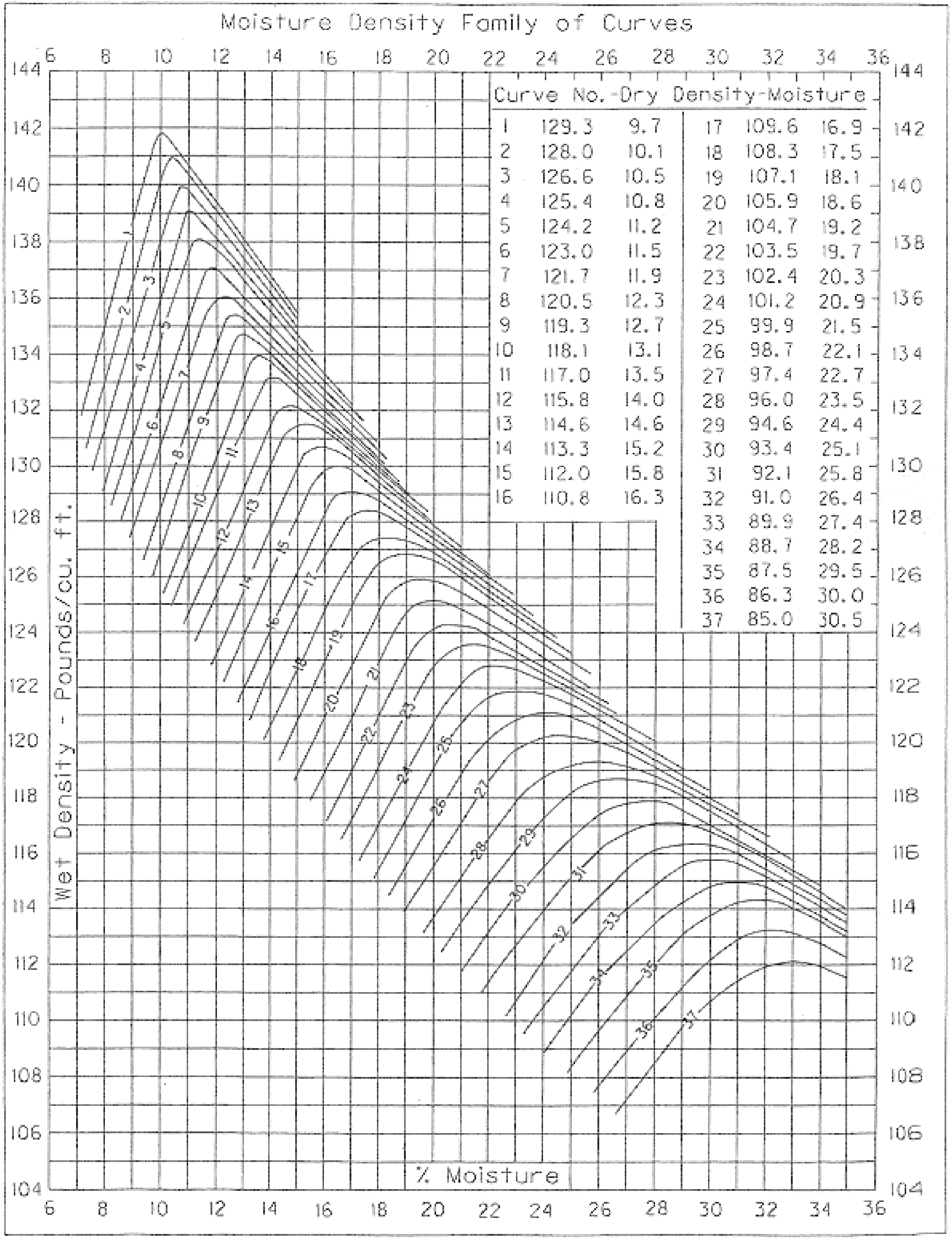

Moisture Density Family of Curves
Curve No.-Dry Density-Moisture
1 129.3 9.7
2 128.0 10.1
3 126.6 10.5
4 125.4 10.8
5 124.2 11.2
6 123.0 11.5
7 121.7 11.9
8 120.5 12.3
9 119.3 12.7
10 118.1 13.1
11 117.0 13.5
12 115.8 14.0
13 114.6 14.6
14 113.3 15.2
15 112.0 15.8
16 110.8 16.3
17 109.6 16.9
18 108.3 17.5
19 107.1 18.1
20 105.9 18.6
21 104.7 19.2
22 103.5 19.7
23 102.4 20.3
24 101.2 20.9
25 99.9 21.5
26 98.7 22.1
27 97.4 22.7
28 96.0 23.5
29 94.6 24.4
30 93.4 25.1
31 92.1 25.8
32 91.0 26.4
33 89.9 27.4
34 88.7 28.2
35 87.5 29.5
36 86.3 30.0
37 85.0 30.5
Wet Density - Pounds/cu. ft.
% Moisture

Kentucky Transportation Cabinet
Department of Highways
Division of Materials, Geotechnical Branch
One Point Procter Data Sheet

COUNTY: ____________ **PROJECT NUMBER:** ____________
STATION: ____________

Sieve Analysis

Wt. of +4 Material ____________ (A)
Wet Wt. of −4 Material ____________ (B)

One-Point Proctor on -4 Material

Wt. of Compacted Sample and Mold ____________ (D)
− Weight of Mold ____________ (E)
= Wet Wt. of Compacted Sample ____________
x Mold Factor (0.06614 if not on Mold) ____________
= Wet Density of Compacted Sample ____________ (F)

Speedy Moisture ____________ % (M)

From Family of Curves:
Maximum Dry Density (PCF) ____________ (G)
Optimum Moisture (%) ____________ (I)

Percent of +4 Material

Wet Wt. of −4 Field Sample ____________ (B)
÷ Dry Wt. Factor: X=1+(M/100) ____________ (X)
= Dry Wt. −4 Field Sample ____________ (Y)

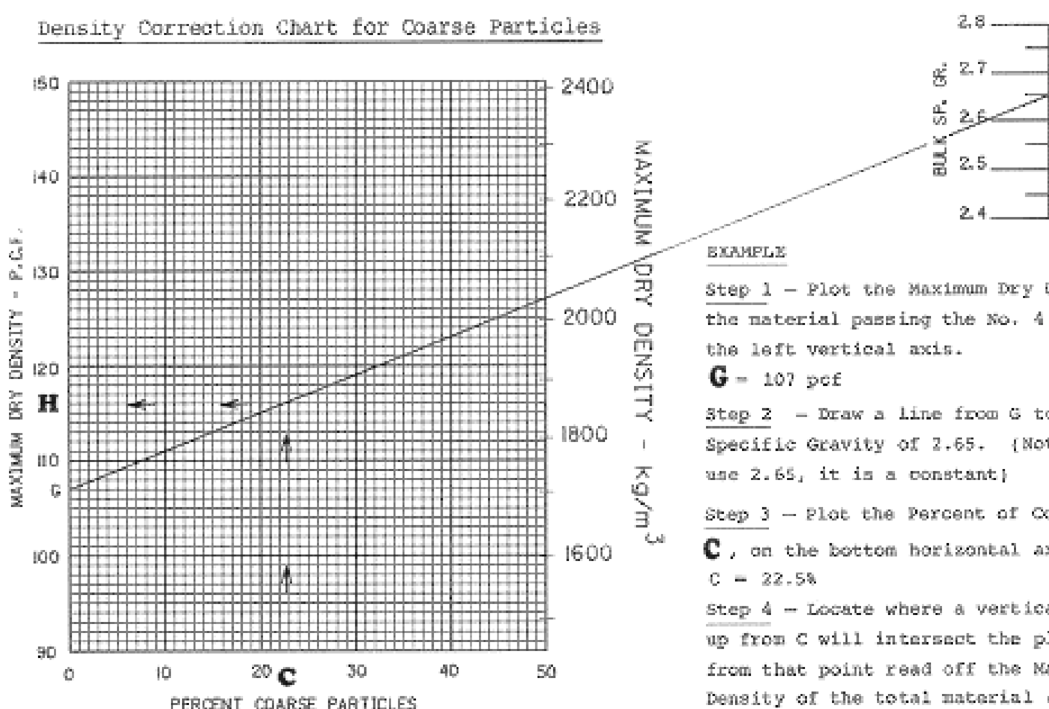
Percent Coarse Particles: ____________ (A)
÷ ____________ (A+Y)
x 100
= ____________ % (C)

If C > 5% then Adjust Density and Moisture for +4 Material

Moisture Adjustment: ____________ (I)
x ____________ 1-(C÷100))
\+ ____________ (C÷50)
= ____________ (J)

Optimum Moisture of Total Sample (J)= ____________ %
Maximum Dry Density of Total Sample (H)= ____________ PCF

Density Correction Chart for Coarse Particles



EXAMPLE

Step 1 – Plot the Maximum Dry Density of the material passing the No. 4 sieve, G, on the left vertical axis.
G = 107 pcf

Step 2 – Draw a line from G to the Bulk Specific Gravity of 2.65. (Note: Always use 2.65, it is a constant)

Step 3 – Plot the Percent of Coarse Particles, **C**, on the bottom horizontal axis.
C = 22.5%

Step 4 – Locate where a vertical line traced up from C will intersect the plotted line, and from that point read off the Maximum Dry Density of the total material (H).
H = 116 pcf