ELE
International

Operating Instructions

PRECISION AIR ENTRAINMENT METER

Model: 34-3265 (CT-126A)

ELE International, Inc. PO Box 608 Loveland, CO 80539 USA Phone: (970) 663-9780 Fax: (970) 663-9781 E-Mail: soiltest@eleusa.com Website: www.eleusa.com	**Distributor:**	**ELE International, Ltd.** Chartmoor Road Chartwell Business Park Leighton Buzzard, Bedfordshire LU7 4WG England Phone: + (0) 1525 249200 Fax: + (0) 1525 249249 E-Mail: ele@eleint.co.uk Website: www.eleint.co.uk

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PRECISION AIR ENTRAINMENT METER
MODEL 34-3265 (CT-126A)

I. GENERAL INFORMATION

Controlling entrained air in concrete is one of the biggest concerns in modern concrete manufacturing. The model 34-3265 (CT-126A) **Precision Air Entrainment Meter** offers the concrete engineer or technician the finest instrument available today for testing and designing concrete mixes. This superior meter can precisely determine the amount of air entrained in concrete, by simplifying the application of Boyle's Law. The direct reading requires no adjustment for barometric pressure changes, and one person can quickly and easily conduct the test.

The **34-3265 (CT-126A)** container is rigid, with a capacity of 0.250 cubic feet, providing a reliable device for precisely performing the unit weight test. The tare weight in grams is conveniently stamped on the bottom.

The meter's multi-range feature accurately measures entrained air to 22%. This feature, exclusive to the **34-3265 (CT-126A)**, allows the user to measure entrained air in numerous other materials besides concrete. For example, this cost-effective meter can also be used to test materials such as mortar, plaster, soil and lightweight concrete. The air meter, when used along with the supplied Nomograph, quickly and easily measures the aggregate's specific gravity and free-moisture percentage.

The instrument is constructed of the finest materials available, for superior durability and effective operation. It is supplied complete with a striking bar and syringe. The Air Meter and the Nomograph together offer an exceptional combination not found anywhere else in the industry.

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II. RELATED USER DOCUMENTATION

These operating instructions do not contain all the necessary information on the specific test procedures to measure entrained air in concrete. Please refer to ASTM C-231 or AASHTO T-152 for more information.

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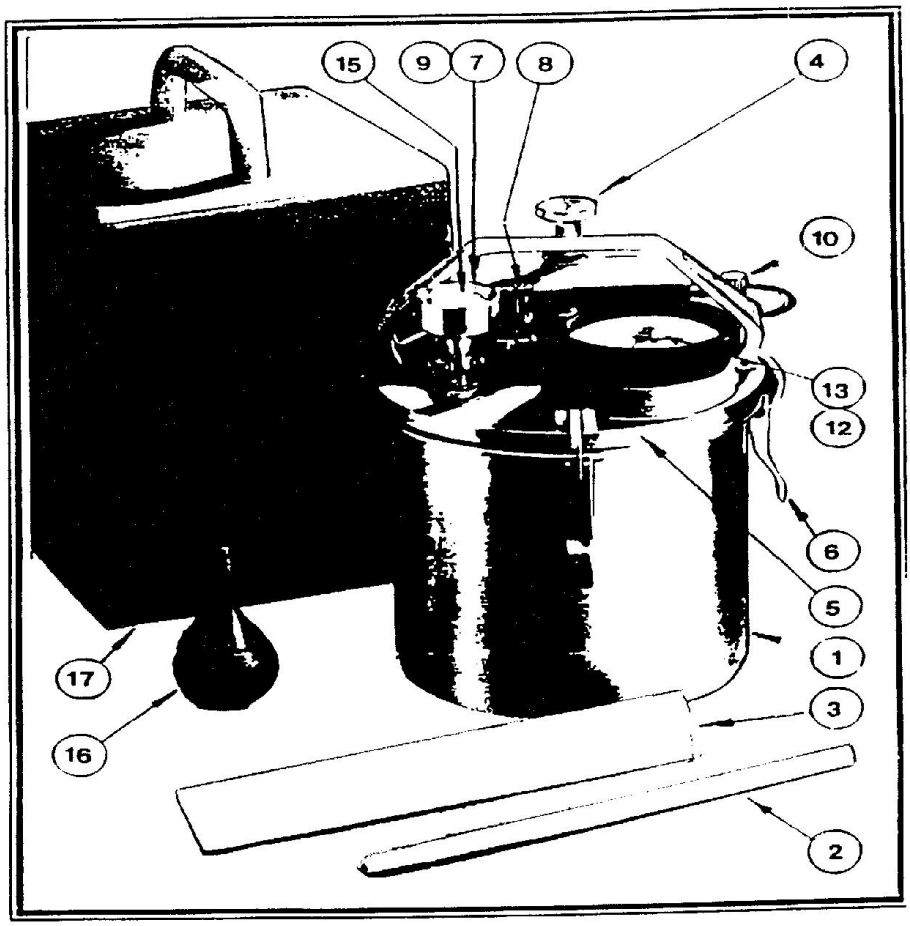
FIGURE 1 -- AIR ENTRAINMENT METER



1. Material Container
2. Tamping Rod
3. Striking Bar
4. Main Air Valve
5. Lid
6. Toggle Clamps
7. Funnel Assembly
8. Center Petcock
   Container Vent
9. Funnel Petcock
   incl. with item 7
10. Air Bleed Valve
11. Air Pump Handle
    (not shown)
12. Gauge Hand
13. Air Gauge
14. Standpipe
    (not shown)
15. Waterline
16. Syringe
17. Case

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III. USING THE METER (See Figure 1)

A. Remove the lid and place the concrete to be tested in three equal layers in the material container (#1). Rod each layer 25 times, using the tamping rod provided by ELE. Remove excess concrete by sliding the striking bar (#3) in a sawing motion across the top flange, until the container is full, but level.

B. Remove all sand and mortar from the lip of the container (#5). Ensure that the underside of the lid is free of any material, such as sand or grit, which may damage the lip and clamps.

C. Open both petcocks (#8 & #9) found on top of lid.

D. Carefully position the lid on the material container. Close the four toggle clamps (#6), making sure the handle is flush against the container.

CAUTION: NEVER PRESSURIZE CONTAINER UNTIL CLAMPS ARE COMPLETELY CLOSED.

E. Using a syringe, carefully pour water into funnel (#7) until it begins to come out of center petcock (#8) on lid.

NOTE: When using the syringe, force the water out slowly to avoid expulsion of air.

F. Gently jar the container or tap the lid until the air bubbles no longer come out of the center petcock. Add more water to be sure only water, no air, comes out. Close both petcocks (#8 & #9).

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G. The main air valve is always closed. Close air bleed valve (#10), located at end of air receiver. Use air pump handle (#11), located opposite of the air bleed valve, to gently pump air into receiver until the black gauge hand (#12) is on the yellow starting line.

NOTE: If the black gauge hand should go past the yellow starting line, gently tap the gauge while cracking the air bleed valve (#10), located at end of air receiver, until the gauge hand is situated exactly on the yellow starting line. Quickly close the air bleed valve.

H. Press the main air valve lever down for 5 - 7 seconds to pressurize container. After pressurizing, jar the container slightly to allow for possible rearrangement of the particles. Gently tap gauge until its black-hand stops moving, and note the reading. This reading is the air entrainment percentage.

I. After the reading is taken, release the main air valve lever to prevent pressure from going from the container into the air receiver.

J. **Before removing the lid,** release pressure from the container by slowly opening the center petcock (#8)and then opening the funnel petcock (#9). Some water will spurt out.

K. After the lid has been removed, open air bleed valve (#10) to release air from the air receiver.

L. In cases where there are large voids in the aggregate and it is necessary to deduct their volume from the measured air content, complete the following steps:

1. Place the same amount of each size aggregate used for the test in the material container.

2. Fill the container with water.

3. Complete steps B through H as in the regular determination for air content. This reading is the aggregate correction factor.

IV. OPERATING INSTRUCTIONS FOR MULTI-RANGE SCALE (See Figure 1)

For samples containing more than 10% air.

A. Follow Section III, Steps A through H in regular operating instructions up to gently tapping the gauge until its hand stops moving.

B. Close the main air valve (#4) and once again pump air into air receiver. To return gauge hand to the yellow starting point, bleed air from receiver through air bleed valve (#10). After pressure is applied to sample, do not open center and funnel petcocks (#8 & #9) until test is completed.

C. Open main air valve (#4) approximately one turn. After pressurizing, jar the container slightly to allow for possible rearrangement of the particles. Gently tap gauge until its black-hand stops moving. Read air percentage on extended scale (green section of gauge face).

NOTE: Always close main air valve (#4) before releasing pressure from either the material container (#1) or air receiver. If this is not done, water will be drawn into the air receiver, adversely affecting future measurements. If water is accidentally drawn into air receiver, open air bleed valve (#10) and tip the lid, letting the water run out of the bleeder valve. Stroke the pump handle several times to blow out the last traces of water.

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V. CALIBRATION CHECK TEST

A. Fill the material container with water. Making sure the container is level, remove standpipe screwed into center petcock (#8) and screw it tightly into funnel petcock (#9) on underside of lid.

B. Wipe the lip of container clean and dry.

C. Unscrew and remove the gauge window.

D. Close the main air valve (#4) located on the top of the air receiver. Open both the center and funnel petcocks (#8 & #9).

E. Carefully position the lid on material container and close the four toggle clamps (#6), making sure clamp handle is flush against the container.

CAUTION: NEVER PRESSURIZE CONTAINER UNTIL CLAMPS ARE COMPLETELY CLOSED.

F. Using a syringe, carefully pour water into funnel (#7) until it begins to come out of center petcock (#8) on lid.

NOTE: When using the syringe, force the water out slowly to avoid expulsion of air.

G. Gently jar the container or tap the lid until the air bubbles no longer come out of the center petcock. Add more water to be sure only water, no air, comes out. Close both petcocks (#8 & #9).

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H. Check that the main air valve (#4) is closed. Close air bleed valve (#10), located at end of air receiver. Use air pump handle (#11), located opposite of the air bleed valve, to gently pump air into receiver until the black gauge hand (#12) is on the yellow starting line.

If the black gauge hand should go past the yellow starting line, gently tap the gauge while cracking the air bleed valve (#10), located at end of air receiver, until the gauge hand is situated exactly on the yellow starting line. Quickly close the air bleed valve.

I. Use a syringe (#16) to remove all water from funnel (#7).

J. Open funnel petcock (#9). To allow water to enter the funnel, *slowly* and *carefully* open the main air valve lever #4.

K. When water exactly meets waterline (#15) inside funnel, release main air valve lever (#4) and close funnel petcock (#9).

L. Open the material container's main air valve (#4) about ½ turn. Tap gauge until hand stops moving. Gauge hand should stop on 1.2%; if it does not, the yellow starting point arrow should be readjusted, using the following steps:

1. **If gauge reads less than 1.2%,** move the yellow starting point arrow, in a *counterclockwise* direction, the distance that is equal to the amount the gauge hand is under 1.2%.

2. **If gauge reads more than 1.2%,** move the yellow starting point arrow, in a *clockwise* direction, the distance that is equal to the amount the gauge hand is over 1.2%.

M. After the calibration-check test is completed, release pressure by turning the air bleed valve (#10) so that the gauge hand will return to its initial position. Close the air bleed valve (#10).

N. Before removing the lid, release pressure from the container by slowly opening the center petcock (#8) first and then opening the funnel petcock (#9). Some water will spurt out.

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O. Return the standpipe to its proper location in center petcock (#8).

P. Replace the gauge window.

VI. CALIBRATING THE AIR METER TO ANY READING (OTHER THAN STANDARD)

The calibration method described in this section differs from the standard 1.2% calibration; the container's center vent petcock is opened to atmosphere and then closed *before* pressure is applied through the main air valve. This brings the air over the water in the container to atmospheric pressure.

The volume of the **34-3265 (CT-126A)** container is 1/4 cubic foot, or 432 cubic inches. The meter may be calibrated by removing 4.32 cubic inches (70.79cc) of water for each percentage point of gauge reading as follows:

A. Fill the container with water, following the steps outlined in Section III, Steps A through E of the operating instructions.

B. Use syringe to remove all water from funnel (#16).

C. Making sure air bleed valve (#10) is closed, pump air into chamber until pointer nears red line.

D. Open main air valve (#4). Crack the funnel petcock (#9), letting water rise in the funnel (#16) to desired level. Close the petcock (#9). **DO NOT LET THE FUNNEL OVERFLOW WITH WATER.**

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E. Use a graduated pipette to remove specific volume of water, using the values given in attached Table 1. If a sufficient amount of water was not removed from funnel, steps C and D in Section III may be repeated. **EXAMPLE:** To calibrate **34-3265 (CT-126A)** for 4%, take out 283.16cc of water; to calibrate for 7%, take out 495.54cc of water.

NOTE: The maximum volume of water that can be taken out through the funnel in this way is limited by the length of the standpipe, which should be under water at its lower end. The limit for the 34-3265 (CT-126A) is almost 850cc.

F. The main air valve is always closed. Slowly open the container's center vent petcock (#8), to equalize the inside pressure with the atmosphere.

G. Open the funnel petcock (#9), so that both petcocks are now open. Excess water in the funnel will flow back into the container (#1).

H. Close both petcocks (#8 & #9). Pump air into the reservoir until the pointer nears the red line.

I. Crack open the air bleed valve (#10) while gently tapping on the gauge (#13). When the pointer is exactly on the yellow starting line, close the air bleed valve (#10).

J. Slowly open the main air valve (#4) and tap gently on the gauge (#13) until the pointer comes to a steady position. The pointer should now show the exact percentage value given in Table 1 for the specific amount of water removed.

If the pointer does not read the exact percentage, investigate the following situations:

1. Was the wrong volume of water removed?

2. Is cement sticking to the inside of the container, changing its volume?

3. Are there leaks in the gaskets or fittings?

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4. Is the gauge inaccurate?

5. Is the position of the yellow pointer incorrect?

K. If the answer to questions 1 through 5 is "no," the pointer needs to be adjusted. Adjust the pointer as shown in the following examples:

1. If 283.16cc of water was removed from the **34-3265 (CT-126A)** (see Table 1), but the reading was 4.2% instead of the expected 4%, move the yellow pointer clockwise through an angle equivalent to 0.2% on the scale.

2. If the same amount of water was removed, but the reading was 3.9%, move the yellow pointer counterclockwise through an angle equivalent to 0.1% on the scale.

L. The air meter is now calibrated for an air entrainment range close to 4%.

VII. 34-3265 (CT-126A) AIR METER NOMOGRAPH

NOTE: The Nomograph was specially prepared for use with the 34-3265 (CT-126A), 0.250 cubic foot Air Meter. Do not attempt to use it with any other meter.

V = 101.28% = 7169cc

A. Procedure to Determine Specific Gravity (See Table 3)

1. Weigh 10,000 grams of material to be tested. (For samples other than 10,000 grams, see step 6.) Put into material container.

Note: For specific gravity test, sample must be SSD (Saturated, Surface Dry) for sand and gravel. When testing cement, water should be mixed with cement to avoid trapping or entraining air. This is to prevent the pressure reading from going off the scale when the user tests for remaining air.

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2. Add enough water to nearly fill the material container (see Table 2). *Example*: 2832 grams of water = 40.0% of material container volume.

3. Clamp lid onto material container, and test for any remaining air in material container and lid. *Example:* 6.8%.

4. The sum of the percent of water added and the percent of air remaining gives the value of "Y." *Example*: 40.0% + 6.8% = 46.8%.

5. Follow "Y" line (46.8%) horizontally to the zero moisture line, and read "G" (Moist Sample = G_M) from the diagonal lines. *Example*: 2.59 sp. gr.

Note: When testing sand and gravel, reading should be taken immediately after releasing air from air receiver into material container. Some types of sand and gravel will absorb more water than is normal when allowed to stand under pressure in material container.

6. The Nomograph gives readings for 10,000 gram samples only. If a sample other than a 10,000 gram sample (S) is used as S_1, determine "Y" as in Step A-1 through A-4 above. To determine specific gravity, follow "Y" line horizontally to zero moisture line. Read figure on the diagonal line, and multiply that reading by $\frac{S_1}{S}$ to find specific gravity.

Example: If Y = 52.0%, and a different size sample has been used, adjust for use with the Nomograph by the following formula:

$$Y_1 = \frac{YS_1}{S}$$

Example: $Y_1 = \frac{52.0 \times 9000}{10{,}000} = 46.8\%$

and G = 2.59 sp.gr.

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B. Procedure to Determine the Percent of Free Moisture by Weight (See Table 3)

1. "G" is known; determine "Y" as before, using steps 1-4 in Section VII-A.

NOTE: Do not dry sample to SSD (Saturated, Surface Dry), as is done for specific gravity test. Be sure that the sample of material to be tested is truly a representative sample.

Example: For 42.0%--follow this line horizontally to the known SSD specific gravity diagonal line: 2.59. Read the percent of free moisture by volume, vertically from point of intersection. The percent of free moisture would be 7.8% = M_V. To determine M_w, multiply M_V (7.8%) by 0.7079.

Example: 7.8% x 0.7079 = 5.5% M_W

2. General Formulas:

$$G \text{ or } G_M = \frac{141.275}{V - Y}$$

$$M_W = \frac{G - G_M}{G - 1} \times \frac{100}{G_M}$$

VIII. MAINTENANCE

A. To assure trouble-free operation, keep meter clean and dry between tests. Clean the meter effectively by either flushing it with a stream of pressurized water or washing it in water, using a brush. **DO NOT SUBMERGE THE GAUGE IN WATER.**

B. Before assembling the meter, remove any sand or grit from underside of material container lid and toggle clamps, in order to prevent damage to lip and clamps.

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C. Leave bleeder valve and both petcocks open when meter is not is use.

D. Apply a light, lubricating film of paraffin to the underside of material container lip after every 15-20 tests.

E. When meter is not in use, store it in carrying case. **DO NOT STORE METER WITH LID CLAMPED TO MATERIAL CONTAINER.**

F. Although the surface of the meter may begin to develop a dull appearance after prolonged use, this will not affect its performance. **DO NOT ATTEMPT TO POLISH THE METER,** as this may cause damage to meter.

G. The pressure gauge has an adjustable starting point. If replacing the rubber gasket providing the seal between the lid and the material container becomes necessary, the initial yellow starting point must be set to a new, true starting point. This is required because of the variations in gasket thickness. The following procedure is recommended:

1. Perform Calibration Check Test, as outlined in Section V.

2. If gauge reads less than 1.2%, move the starting point arrow, in a counterclockwise direction, the distance that is equal to the amount the gauge hand is under 1.2%.

3. If gauge reads more than 1.2%, move the starting point arrow, in a clockwise direction, the distance that is equal to the amount the gauge hand is over 1.2%.

H. If the pump needs to be cleaned or inspected, use the following procedure to remove it from the air receiver:

1. Unscrew the cap nut and pull the shaft out of the pump body.

2. Use a 10-inch adjustable wrench (preferably in vertical position) to unscrew the pump body and remove it.

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3. When replacing pump into air receiver, use a new gasket seal lubricated with a thin film of grease or heavy oil.

4. Using your fingers, thread pump into air receiver until gasket is touching air chamber. Tighten with a wrench until a good seal is formed. **DO NOT OVER TIGHTEN.**

5. Periodically clean the carrying case and check for damage.

IX. SPECIFICATIONS

Capacity	1/4 cu. ft. (0.007 m^3)
Readings	Up to 22% entrained air
Accuracy	$\pm$ 1/4% full scale
Aggregate Size	2" (50.8 mm) maximum
Container	With tare weight stamped on bottom; 2-piece clamping device for positive seal
Water	4 oz. required
Initial Pressure	Approximately 10 strokes needed
Pressure Gauge	In shockproof mounting
Tamping Rod	Aluminum
Dimensions	9-3/4" diam. x 13-1/4" h. (248 x 337)
Weight	Net 15 lbs. (6.8 kg)

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PARTS LIST

Description	Part Number
Carrying Case	3494-0085
Syringe	9401-0026
Strike Bar	3494-0037
Container	3494-0001
Lid Assembly	3494-0003
consists of the following items:	
Main Air Valve Lever Ass'y.	
consists of the following items:	
Main Air Valve Stem	
Rubber Insert	
O-Ring	9409-0036
Lid Gasket	3494-0004
Handle	3494-0080
Toggle Clamp Assembly	4699-0549
consists of the following items:	
Toggle clamp sub-ass'y (4)	3494-0007
Dowel pin 3/16 x 1-1/2 long (2)	8909-0051
Groove pin 3/16 x 3/4 long (2)	8909-0031
Air Gauge Cushion	9812-0029
Gauge Assembly	34-3265/12 (4699-5058) (Rev.2)
consists of the following items:	
Gauge (1)	
Elbow 1/4T x 1/8NPT	
Elbow 1/4T x 1/4NPT	
Tubing 5”lg	
Male Conn 3/16T x 1/8P	

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Parts List Cont'd.

Bleeder Valve Assembly	4699-0093
consists of the following items:	
Cap	3494-0022
"O" Ring	9409-0013
Elbow	8302-0007
Bushing (1)	8307-0019
Air Pump	34-3265/10 (3494-0086)
Lid Sub-assembly	3494-0057
consists of the following items:	
Lid	3494-0002
Funnel assembly	3494-0011
Center cock	8920-0061
Nipple	8306-0037

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TABLE 1 -- PERCENTAGE VALUES

Indicated % on Gauge	Volume of Water	
	Cubic In.	Cubic Cms.
0	0	0
1	4.32	70.79
2	8.64	141.58
3	12.96	212.37
4	17.28	283.16
5	21.60	353.96
6	25.92	424.75
7	30.24	495.54
8	34.56	566.33
9	38.88	637.13
10	43.20	707.91
11	47.52	778.71
12	51.84	849.50
13	56.16	920.29
14	60.48	991.08
15	64.80	1061.88
16	69.12	1132.67
17	73.44	1203.46
18	77.76	1274.25
19	82.08	1345.04
20	86.4	1415.84
21	90.72	1486.62
22	95.04	1557.42

(1 cu. inch = 16.387 cu. cm.)

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TABLE FOR ADDED WATER
Percent Added Water

PER CENT	GRAMS
15	1062
20	1416
25	1770
30	2124
35	2478
40	2832
45	3186
50	3540
55	3894
60	4248
65	4601
70	4955
75	5309
80	5663

NOTE:

For per cent of added water other than shown, add or subtract 70.79 grams for each per cent over or under.

Example: 2974 grams added water = 42%

Each 5% added water = 353.9

The use of a good Solution Balance with 20 KILO capacity, sensitivity to 1 gram, is recommended.

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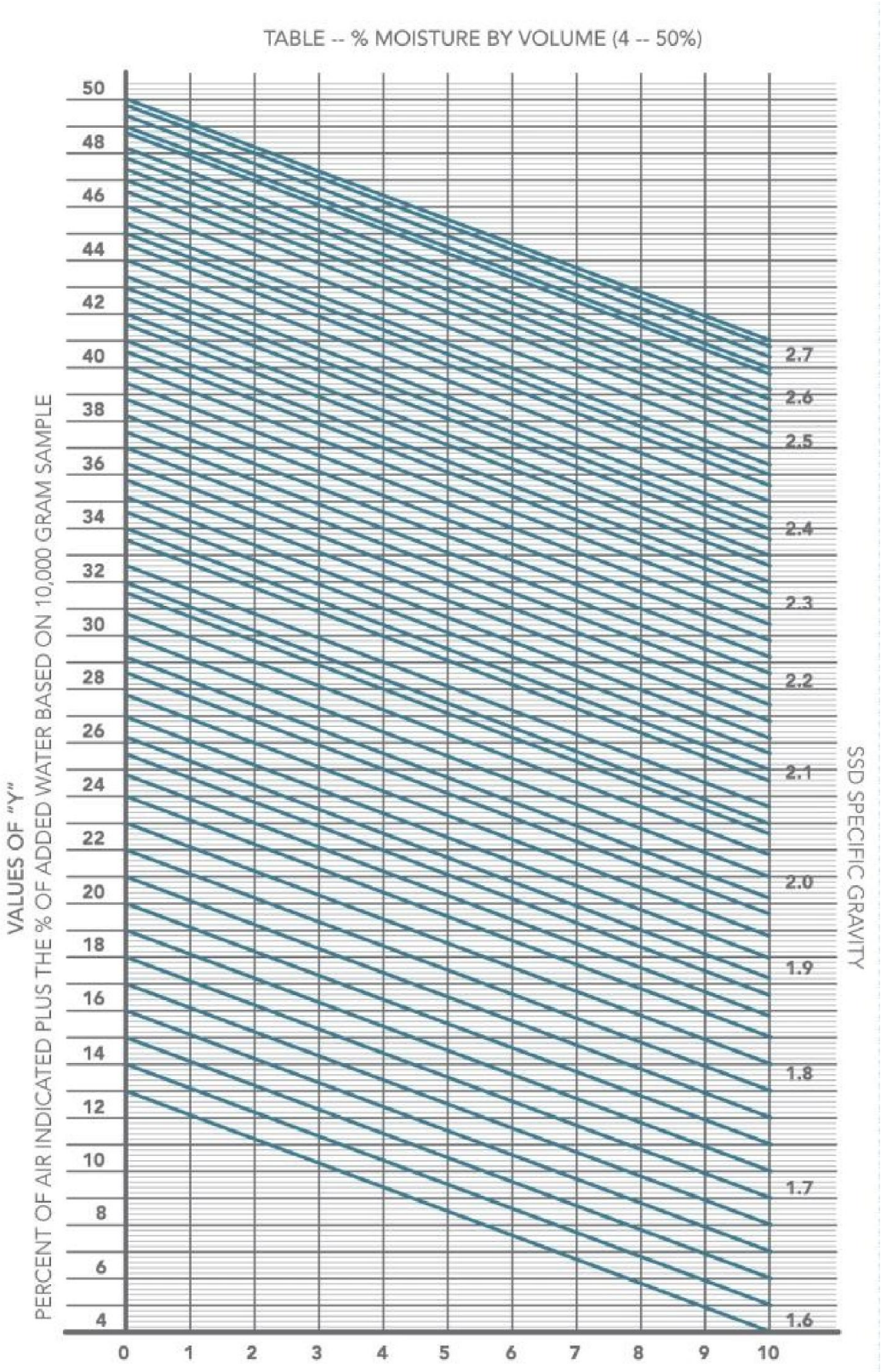
TABLE -- % MOISTURE BY VOLUME (4 -- 50%)
VALUES OF "Y"
PERCENT OF AIR INDICATED PLUS THE % OF ADDED WATER BASED ON 10,000 GRAM SAMPLE
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
0
1
2
3
4
5
6
7
8
9
10
SSD SPECIFIC GRAVITY
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6

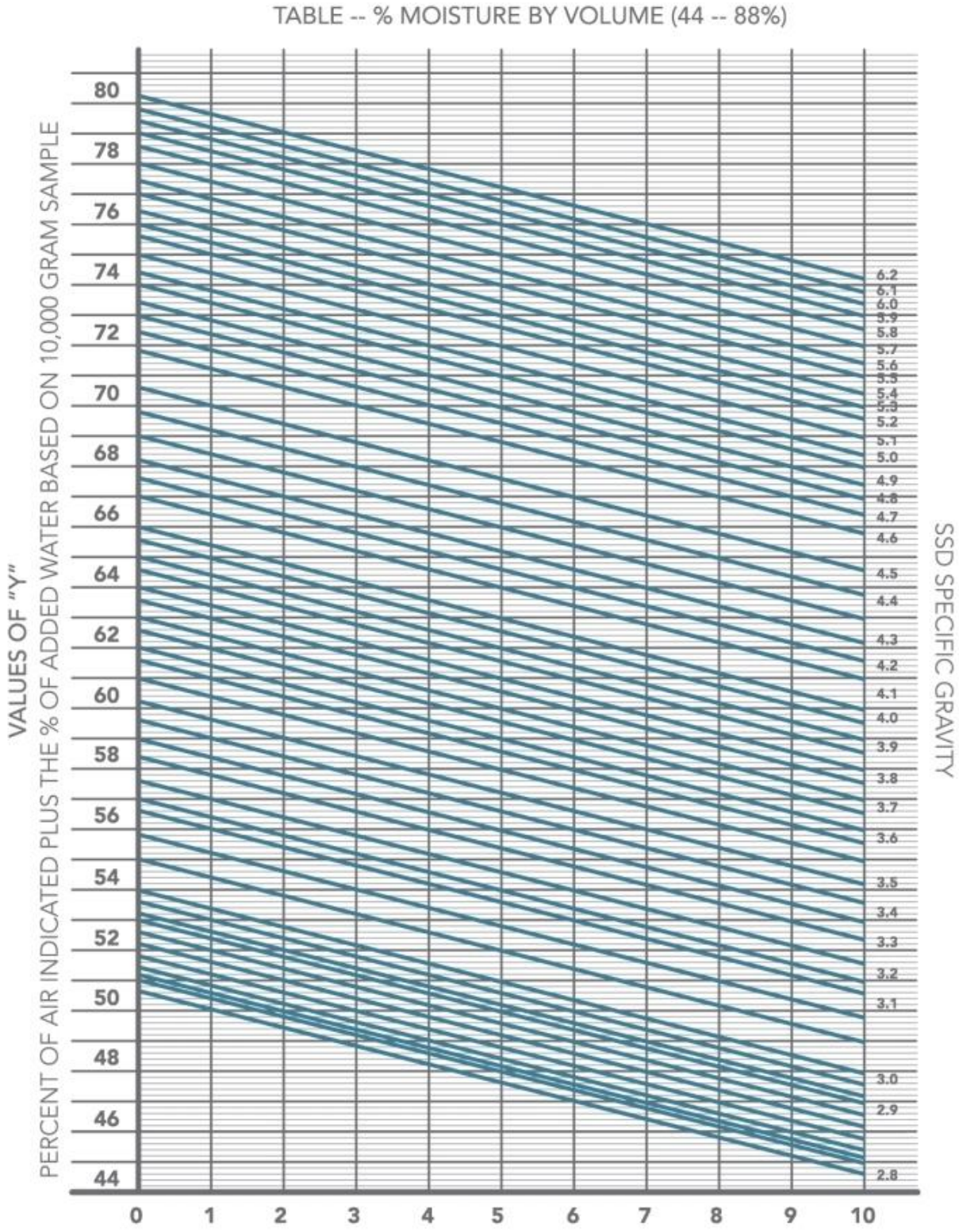
TABLE -- % MOISTURE BY VOLUME (44 -- 88%)
VALUES OF "Y"
PERCENT OF AIR INDICATED PLUS THE % OF ADDED WATER BASED ON 10,000 GRAM SAMPLE
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
0
1
2
3
4
5
6
7
8
9
10
SSD SPECIFIC GRAVITY
6.2
6.1
6.0
5.9
5.8
5.7
5.6
5.5
5.4
5.3
5.2
5.1
5.0
4.9
4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
4.0
3.9
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
2.9
2.8