



FIELD TECHNICIAN REVIEW

(8:00 to 2:15)

Intro

- ATTI
- Safety
- Rounding Procedure

Thursday

ARIZ 225	Calibration of Proctor Molds (Appendix A) (Hand Out)
ARIZ 229	Calibration of Standard Sand and Sand Cone (Hand Out)
ARIZ 232	One Point Proctor (Method A) (Hand Out)
ARIZ 246	One Point Proctor (Method D) (Hand Out)
ARIZ 227	Rock Correction Procedure (Hand Out)
ARIZ 230	Field Density by the Sand Cone Method (Hand Out)
AASHTO T 217	Moisture Content by Calcium Carbide Method
ARIZ 103	Sampling Bituminous Materials
<i>Hand Out Practice Calculations</i>	
Lunch 11:30 — 12:30	
Hands On Practice	? — 2:15

Friday

<i>Check Practice Calculations</i>	
ARIZ 104	Sampling Bituminous Mixtures
AASHTO R76	Reducing Field Samples of Aggregate to Testing Size
ARIZ 105	Sampling Soils and Aggregates
ARIZ 235	Density of Soil and Soil-Aggregate by the Nuclear Method
ARIZ 412	Density of Compacted Bituminous Mixtures Nuclear Method
Lunch 11:30 — 12:30	
Hands On Practice	? — 2:15

ADOT Materials Testing Manual

<http://www.azdot.gov/business/engineering-and-construction/construction-and-materials/materials-manuals>



Field Technician Review Class

Practice Calculations

Calibration of Proctor Mold

_____ Four Inch Mold

_____ Six Inch Mold

Mold I. D. #: _____

Temperature of Water used for Calibration: _____

Unit Weight of Water: _____ lb. / cu. Ft.

Weight of Baseplate, Empty Mold, and Glass Plate (grams)	Weight of Baseplate, Mold Filled With Water, and Glass Plate (grams)	Weight of Water to fill Mold (grams)

$$\left[\begin{array}{c} \text{Volume of} \\ \text{Mold} \\ \text{(cu. ft.)} \end{array} \right] = \frac{\text{Weight of Water to Fill Mold (grams)}}{\left[\begin{array}{c} \text{Unit Weight} \\ \text{of Water} \\ \text{(lb. / cu. ft.)} \end{array} \right] \times [453.6 \text{ (grams / lb.)}]}$$

$$= \frac{(\quad)}{(\quad) \times (453.6)} = \quad \text{cu. Ft.}$$

Remarks: _____

Calibration Date: _____

Test Operator: _____

Supervisor and Date: _____

Calibration Expiration Date: _____

APPENDIX A - (Continued)

Temperature		Unit Weight of Water	
Temp °F		lbs/cu. Ft.	
68		62.315	
69		62.308	
70		62.301	
71		62.293	
72		62.285	
73		62.277	
74		62.269	
75		62.261	
76		62.252	
77		62.243	
78		62.234	
79		62.225	
80		62.216	
81		62.206	
82		62.196	
83		62.186	
84		62.176	
85		62.166	
86		62.155	

Calibration of Proctor Mold

_____ Four Inch Mold

_____ Six Inch Mold

Mold I. D. #: _____

Temperature of Water used for Calibration: _____

Unit Weight of Water: _____ lb. / cu. Ft.

Weight of Baseplate, Empty Mold, and Glass Plate (grams)	Weight of Baseplate, Mold Filled With Water, and Glass Plate (grams)	Weight of Water to fill Mold (grams)

$$\left[\begin{array}{c} \text{Volume of} \\ \text{Mold} \\ \text{(cu. ft.)} \end{array} \right] = \frac{\text{Weight of Water to Fill Mold (grams)}}{\left[\begin{array}{c} \text{Unit Weight} \\ \text{of Water} \\ \text{(lb. / cu. ft.)} \end{array} \right] \times [453.6 \text{ (grams / lb.)}]}$$

$$= \frac{(\quad)}{(\quad) \times (453.6)} = \quad \text{cu. Ft.}$$

Remarks: _____

Calibration Date: _____

Test Operator: _____

Supervisor and Date: _____

Calibration Expiration Date: _____

CALIBRATION OF DENSITY SAND AND SAND CONE APPARATUS

ARIZ 229

(A Modification of AASHTO T 191)

Date of Calibration: _____ Test Operator: _____
I. D. No. of Mold used in calibration: _____
Volume of Mold used in calibration: _____
Identification of Sand: _____
Identification of Sand Cone Apparatus: _____

Trial No.	Wt. of Baseplate And Empty Mold (grams)	Wt. of Baseplate and Mold Filled with Sand (grams)	Wt. of Sand to Fill Mold (grams)
1			
2			
3			

Average Weight of Sand to Fill Mold = _____ grams

$$\text{Density of Sand, } D_s = \frac{\text{Average Weight of Sand to Fill Mold}}{(453.6 \text{ grams / lb.}) \times (\text{Volume of Mold})}$$

$$= \frac{\text{_____}}{(453.6) \times (\text{_____})} = \text{_____} = \text{lb./ft.}^3$$

Trial No.	Initial Wt. of Apparatus (grams)	Final Wt. of Apparatus (grams)	Wt. of Sand to Fill Funnel and Baseplate (grams)
1			
2			
3			

Average Weight of Sand to Fill Funnel and Baseplate = _____ grams

$$\text{Volume of Funnel and Baseplate, } V_{fb} = \frac{\text{Average Weight of Sand to Fill Funnel and Baseplate}}{(453.6 \text{ grams / lb.}) \times (\text{Density of Sand})}$$

$$= \frac{\text{_____}}{(453.6) \times (\text{_____})} = \text{_____} = \text{ft.}^3$$

Remarks: _____ I = D_s x V_{fb} _____ _____ Supervisor and Date: _____ Calibration Expiration Date: _____

ARIZONA DEPARTMENT OF TRANSPORTATION SAND CONE DENSITY (ARIZ 230)

USE CAPITAL LETTERS

LAB NUMBER						ORG NUMBER				MATL		TYPE			PUR-POSE		TEST LAB		SIZE		SIZE %										
TEST NO.				LOT OR SUFFIX		SAMPLED BY										MO DAY YEAR			TIME				MILITARY TIME								
SAMPLED FROM																		LIFT NO.				RDWY				STATION					
																										+ IF MILEPOST, INPUT DECIMAL					
ORIGINAL SOURCE										PROJECT ENGINEER / SUPERVISOR										PROJECT NUMBER						TRACS NUMBER					
REMARKS																															

A. TOTAL WET WEIGHT OF MATERIAL FROM THE HOLE						LB.
B. WET WEIGHT OF MATERIAL RETAINED ON THE #4 SIEVE						LB.
C. WET WEIGHT OF MATERIAL PASSING THE #4 SIEVE (A-B)						LB.
D. MOISTURE OF THE MATERIAL PASSING THE #4 SIEVE						%
E. MOIST. CORRECTED FOR MATERIAL RETAINED ON THE #4 SIEVE						%
F. WEIGHT OF SAND & APPARATUS BEFORE FILLING HOLE						LB.
G. WEIGHT OF SAND & APPARATUS AFTER FILLING HOLE						LB.
H. WEIGHT OF SAND TO FILL HOLE AND CONE (F-G)						LB.
I. WEIGHT OF SAND TO FILL CONE AND BASE PLATE						LB.
J. WEIGHT OF SAND TO FILL HOLE (H-I)						LB.
K. DENSITY OF SAND						PCF
L. VOLUME OF HOLE $\left(\frac{J}{K}\right)$						CF
M. WET DENSITY = $\left(\frac{A}{L}\right)$						PCF
N. DRY DENSITY = $\left(\frac{M}{100 + E}\right) \times 100$						PCF
COMPACTION = $\left(\frac{N}{R}\right) \times 100$ OR $\left(\frac{N}{T}\right) \times 100$						%
COMPACTION SPECIFICATION						%

PROCTOR DENSITY

PROCTOR NUMBER					
PROCTOR METHOD (A, C, D, OR 1)					
O. SPECIFIC GRAVITY OF RETAINED #4					
P. ABSORPTION OF RETAINED #4					%
Q. OPTIMUM MOISTURE					%
R. MAXIMUM DRY DENSITY					PCF

CORRECTION FOR RETAINED #4 (METHOD A OR ONE-POINT ONLY)

S. CORRECTED OPTIMUM MOISTURE					%
T. CORRECTED MAXIMUM DRY DENSITY					PCF

$$a. \text{ RETAINED ON \#4} = \left(\frac{B}{A}\right) \times 100$$

IF RET. ON #4 IS MORE THAN 50% (60% IF AB), GO NO FURTHER.

FOR METHOD A OR ONE POINT ONLY

$$E = \frac{[D (100 - a)] + a}{100}$$

ONE POINT PROCTOR (ARIZ 232)

b. WEIGHT OF MOLD & SOIL					LB.
c. WEIGHT OF MOLD					LB.
d. WEIGHT OF COMPACTED SOIL (b-c)					LB.
e. VOLUME OF MOLD					CF
f. WET DENSITY (d / e)					PCF
g. MOISTURE CONTENT					%
FAMILY OF CURVES IDENTIFICATION					&
Q. OPTIMUM MOISTURE					%
R. MAXIMUM DRY DENSITY					PCF

TEST OPERATOR AND DATE

RESIDENT ENGINEER, PROJECT SUPERVISOR, OR LABMAN AND DATE

FOR METHOD A OR ONE POINT ONLY

$$S = \frac{[Q (100 - a)] + a}{100}$$

$$T = \frac{[R (100 - a)] + [(56.2) (a)(O)]}{100}$$



Curve	Max Dry Wt. lbs/cu.ft.	Optimum Moisture
A	141.8	6.6
B	139.1	7.2
C	136.3	7.9
D	134.1	8.5
E	132.	9.0
F	129.3	9.7
G	126.6	10.5
H	124.2	11.2
I	121.7	11.9
J	119.3	12.7
K	117.0	13.5
L	114.6	14.6
M	112.0	15.8
N	109.6	16.9
O	107.1	18.1
P	104.7	19.2
Q	102.4	20.3
R	99.9	21.5
S	97.4	22.7
T	94.6	24.4
U	92.1	25.8
V	89.9	27.4
W	87.5	29.5
X	85.0	30.5
Y	83.0	31.5
Z	81.1	32.5

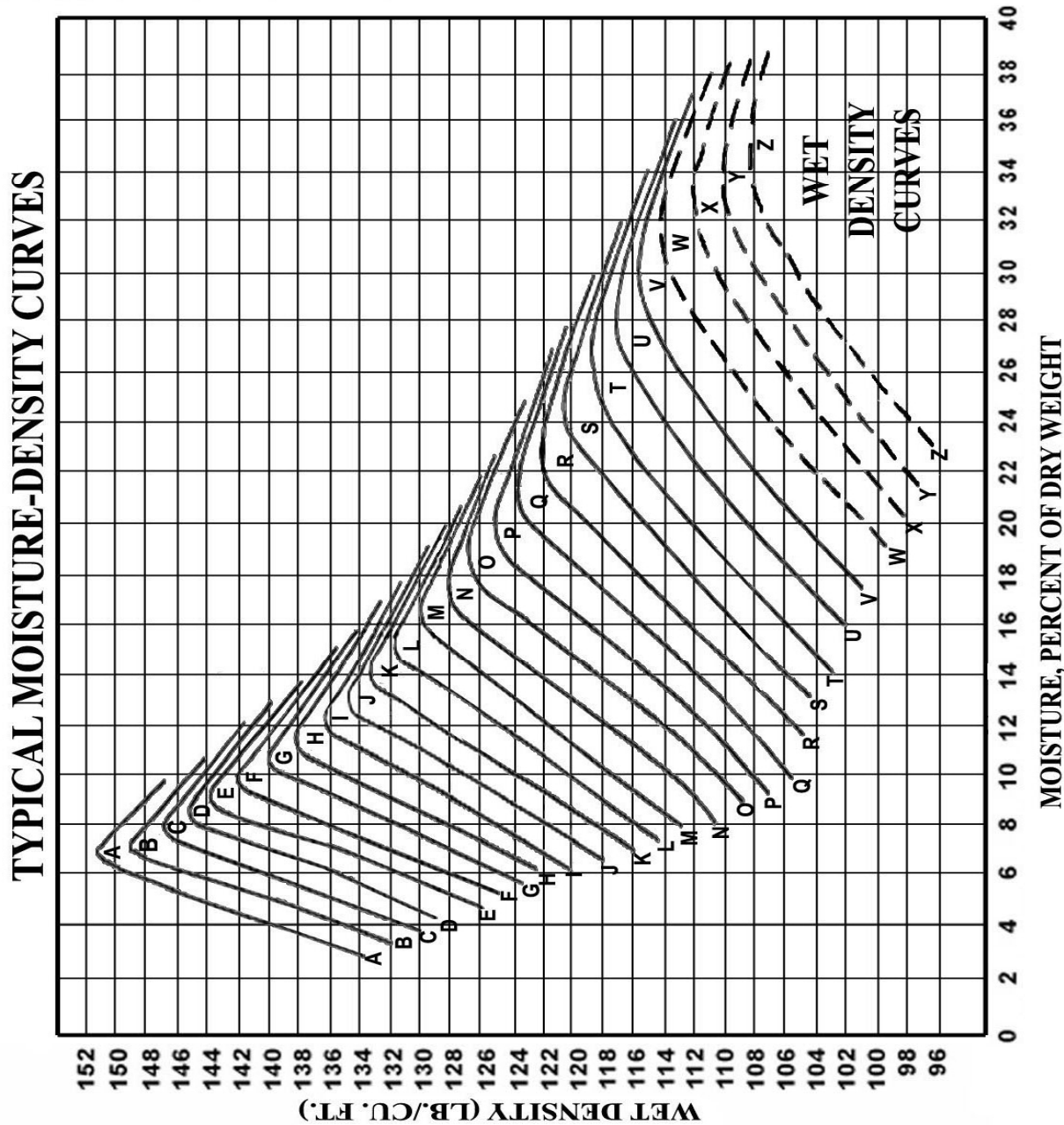


FIGURE 2

A	141.8	6.6	F	129.3	9.7	K	117.0	13.5	P	104.7	19.2	U	92.1	25.8
10%	141.5	6.7	10%	129.0	9.8	10%	116.8	13.6	10%	104.5	19.3	10%	91.9	26.0
20%	141.3	6.7	20%	128.8	9.9	20%	116.5	13.7	20%	104.2	19.4	20%	91.7	26.1
30%	141.0	6.8	30%	128.5	9.9	30%	116.3	13.8	30%	104.0	19.5	30%	91.4	26.3
40%	140.7	6.8	40%	128.2	10.0	40%	116.0	13.9	40%	103.8	19.6	40%	91.2	26.4
50%	140.5	6.9	50%	128.0	10.1	50%	115.8	14.1	50%	103.6	19.8	50%	91.0	26.6
60%	140.2	7.0	60%	127.7	10.2	60%	115.6	14.2	60%	103.3	19.9	60%	90.8	26.8
70%	139.9	7.0	70%	127.4	10.3	70%	115.3	14.3	70%	103.1	20.0	70%	90.6	26.9
80%	139.6	7.1	80%	127.1	10.3	80%	115.1	14.4	80%	102.9	20.1	80%	90.3	27.1
90%	139.4	7.1	90%	126.9	10.4	90%	114.8	14.5	90%	102.6	20.2	90%	90.1	27.2
B	139.1	7.2	G	126.6	10.5	L	114.6	14.6	Q	102.4	20.3	V	89.9	27.4
10%	138.8	7.3	10%	126.4	10.6	10%	114.3	14.7	10%	102.2	20.4	10%	89.7	27.6
20%	138.5	7.3	20%	126.1	10.6	20%	114.1	14.8	20%	101.9	20.5	20%	89.4	27.8
30%	138.3	7.4	30%	125.9	10.7	30%	113.8	15.0	30%	101.7	20.7	30%	89.2	28.0
40%	138.0	7.5	40%	125.6	10.8	40%	113.6	15.1	40%	101.4	20.8	40%	88.9	28.2
50%	137.7	7.6	50%	125.4	10.9	50%	113.3	15.2	50%	101.2	20.9	50%	88.7	28.5
60%	137.4	7.6	60%	125.2	10.9	60%	113.0	15.3	60%	100.9	21.0	60%	88.5	28.7
70%	137.1	7.7	70%	124.9	11.0	70%	112.8	15.4	70%	100.7	21.1	70%	88.2	28.9
80%	136.9	7.8	80%	124.7	11.1	80%	112.5	15.6	80%	100.4	21.3	80%	88.0	29.1
90%	136.6	7.8	90%	124.4	11.1	90%	112.3	15.7	90%	100.2	21.4	90%	87.7	29.3
C	136.3	7.9	H	124.2	11.2	M	112.0	15.8	R	99.9	21.5	W	87.5	29.5
10%	136.1	8.0	10%	124.0	11.3	10%	111.8	15.9	10%	99.7	21.6	10%	87.3	29.6
20%	135.9	8.0	20%	123.7	11.3	20%	111.5	16.0	20%	99.4	21.7	20%	87.0	29.7
30%	135.6	8.1	30%	123.5	11.4	30%	111.3	16.1	30%	99.2	21.9	30%	86.8	29.8
40%	135.4	8.1	40%	123.2	11.5	40%	111.0	16.2	40%	98.9	22.0	40%	86.5	29.9
50%	135.2	8.2	50%	123.0	11.6	50%	110.8	16.4	50%	98.7	22.1	50%	86.3	30.0
60%	135.0	8.3	60%	122.7	11.6	60%	110.6	16.5	60%	98.4	22.2	60%	86.0	30.1
70%	134.8	8.3	70%	122.5	11.7	70%	110.3	16.6	70%	98.2	22.3	70%	85.8	30.2
80%	134.5	8.4	80%	122.2	11.8	80%	110.1	16.7	80%	97.9	22.5	80%	85.5	30.3
90%	134.3	8.4	90%	122.0	11.8	90%	109.8	16.8	90%	97.7	22.6	90%	85.3	30.4
D	134.1	8.5	I	121.7	11.9	N	109.6	16.9	S	97.4	22.7	X	85.0	30.5
10%	133.9	8.6	10%	121.5	12.0	10%	109.4	17.0	10%	97.1	22.9	10%	84.8	30.6
20%	133.7	8.6	20%	121.2	12.1	20%	109.1	17.1	20%	96.8	23.0	20%	84.6	30.7
30%	133.5	8.7	30%	121.0	12.1	30%	108.9	17.3	30%	96.6	23.2	30%	84.4	30.8
40%	133.3	8.7	40%	120.7	12.2	40%	108.6	17.4	40%	96.3	23.4	40%	84.2	30.9
50%	133.1	8.8	50%	120.5	12.3	50%	108.4	17.5	50%	96.0	23.6	50%	84.0	31.0
60%	132.8	8.8	60%	120.3	12.4	60%	108.1	17.6	60%	95.7	23.7	60%	83.8	31.1
70%	132.6	8.9	70%	120.0	12.5	70%	107.9	17.7	70%	95.4	23.9	70%	83.6	31.2
80%	132.4	8.9	80%	119.8	12.5	80%	107.6	17.9	80%	95.2	24.1	80%	83.4	31.3
90%	132.2	9.0	90%	119.5	12.6	90%	107.4	18.0	90%	94.9	24.2	90%	83.2	31.4
E	132.0	9.0	J	119.3	12.7	O	107.1	18.1	T	94.6	24.4	Y	83.0	31.5
10%	131.7	9.1	10%	119.1	12.8	10%	106.9	18.2	10%	94.4	24.5	10%	82.8	31.6
20%	131.5	9.1	20%	118.8	12.9	20%	106.6	18.3	20%	94.1	24.7	20%	82.6	31.7
30%	131.2	9.2	30%	118.6	12.9	30%	106.4	18.4	30%	93.9	24.8	30%	82.4	31.8
40%	130.9	9.3	40%	118.4	13.0	40%	106.1	18.5	40%	93.6	25.0	40%	82.2	31.9
50%	130.7	9.4	50%	118.2	13.1	50%	105.9	18.7	50%	93.4	25.1	50%	82.1	32.0
60%	130.4	9.4	60%	117.9	13.2	60%	105.7	18.8	60%	93.1	25.2	60%	81.9	32.1
70%	130.1	9.5	70%	117.7	13.3	70%	105.4	18.9	70%	92.9	25.4	70%	81.7	32.2
80%	129.8	9.6	80%	117.5	13.3	80%	105.2	19.0	80%	92.6	25.5	80%	81.5	32.3
90%	129.6	9.6	90%	117.2	13.4	90%	104.9	19.1	90%	92.4	25.7	90%	81.3	32.4
F	129.3	9.7	K	117.0	13.5	P	104.7	19.2	U	92.1	25.8	Z	81.1	32.5

TABLE 1

Calibration of Proctor Mold

_____ Four Inch Mold

_____ Six Inch Mold

Mold I. D. #: _____

Temperature of Water used for Calibration: _____

Unit Weight of Water: _____ lb. / cu. Ft.

Weight of Baseplate, Empty Mold, and Glass Plate (grams)	Weight of Baseplate, Mold Filled With Water, and Glass Plate (grams)	Weight of Water to fill Mold (grams)
		941.1

$$\left[\begin{array}{c} \text{Volume of} \\ \text{Mold} \\ \text{(cu. ft.)} \end{array} \right] = \frac{\text{Weight of Water to Fill Mold (grams)}}{\left[\begin{array}{c} \text{Unit Weight} \\ \text{of Water} \\ \text{(lb. / cu. ft.)} \end{array} \right] \times [453.6 \text{ (grams / lb.)}]}$$

$$= \frac{\left(\frac{941.1}{62.225} \right)}{28225.26} = \frac{.0333}{.033342474} \text{ cu. Ft.}$$

Remarks: _____

Calibration Date: _____

Test Operator: _____

Supervisor and Date: _____

Calibration Expiration Date: _____

APPENDIX A - (Continued)

Temperature		Unit Weight of Water	
Temp °F		lbs/cu. Ft.	
68		62.315	
69		62.308	
70		62.301	
71		62.293	
72		62.285	
73		62.277	
74		62.269	
75		62.261	
76		62.252	
77		62.243	
78		62.234	
79		62.225	
80		62.216	
81		62.206	
82		62.196	
83		62.186	
84		62.176	
85		62.166	
86		62.155	

Calibration of Proctor Mold

_____ Four Inch Mold

_____ Six Inch Mold

Mold I. D. #: _____

Temperature of Water used for Calibration: _____

Unit Weight of Water: _____ lb. / cu. Ft.

Weight of Baseplate, Empty Mold, and Glass Plate (grams)	Weight of Baseplate, Mold Filled With Water, and Glass Plate (grams)	Weight of Water to fill Mold (grams)
		2126.1

$$\left[\begin{array}{c} \text{Volume of} \\ \text{Mold} \\ \text{(cu. ft.)} \end{array} \right] = \frac{\text{Weight of Water to Fill Mold (grams)}}{\left[\begin{array}{c} \text{Unit Weight} \\ \text{of Water} \\ \text{(lb. / cu. ft.)} \end{array} \right] \times [453.6 \text{ (grams / lb.)}]}$$

$$= \frac{\left(\frac{2126.1}{62.186} \right)}{28207.5696} = \frac{.0754}{.075373385} \text{ cu. Ft.}$$

Remarks: _____

Calibration Date: _____

Test Operator: _____

Supervisor and Date: _____

Calibration Expiration Date: _____

CALIBRATION OF DENSITY SAND AND SAND CONE APPARATUS

ARIZ 229

(A Modification of AASHTO T 191)

Date of Calibration: _____ Test Operator: _____
I. D. No. of Mold used in calibration: _____
Volume of Mold used in calibration: _____
Identification of Sand: _____
Identification of Sand Cone Apparatus: _____

Trial No.	Wt. of Baseplate And Empty Mold (grams)	Wt. of Baseplate and Mold Filled with Sand (grams)	Wt. of Sand to Fill Mold (grams)
1			2774
2			2772
3			2775

Average Weight of Sand to Fill Mold = 2774 grams

$$\text{Density of Sand, } D_s = \frac{\text{Average Weight of Sand to Fill Mold}}{(453.6 \text{ grams / lb.}) \times (\text{Volume of Mold})}$$

$$= \frac{2774}{(453.6) \times (.0754)} = \frac{81.1}{34.20144} = \text{lb./ft.}^3$$

Trial No.	Initial Wt. of Apparatus (grams)	Final Wt. of Apparatus (grams)	Wt. of Sand to Fill Funnel and Baseplate (grams)
1			1479
2			1484
3			1477

Average Weight of Sand to Fill Funnel and Baseplate = 1480 grams

$$\text{Volume of Funnel and Baseplate, } V_{fb} = \frac{\text{Average Weight of Sand to Fill Funnel and Baseplate}}{(453.6 \text{ grams / lb.}) \times (\text{Density of Sand})}$$

$$= \frac{1480}{(453.6) \times (.81)} = \frac{.0402}{36786.96} = \text{ft.}^3$$

Remarks: <u> </u> $I = D_s \times V_{fb}$ <u>81.1 x .0402 = 3.26022</u> <u>3.26</u>
Supervisor and Date: _____
Calibration Expiration Date: _____

ARIZONA DEPARTMENT OF TRANSPORTATION SAND CONE DENSITY (ARIZ 230)

USE CAPITAL LETTERS

LAB NUMBER						ORG NUMBER				MATL		TYPE			PUR-POSE		TEST LAB		SIZE		SIZE %			
TEST NO.				LOT OR SUFFIX		SAMPLED BY										MO DAY YEAR			TIME			MILITARY TIME		
SAMPLED FROM														LIFT NO.			RDWY			STATION				
																				+ IF MILEPOST, INPUT DECIMAL				
ORIGINAL SOURCE						PROJECT ENGINEER / SUPERVISOR						PROJECT NUMBER						TRACS NUMBER						
REMARKS																								

A. TOTAL WET WEIGHT OF MATERIAL FROM THE HOLE					LB.
B. WET WEIGHT OF MATERIAL RETAINED ON THE #4 SIEVE					LB.
C. WET WEIGHT OF MATERIAL PASSING THE #4 SIEVE (A-B)	4	7	5		LB.
D. MOISTURE OF THE MATERIAL PASSING THE #4 SIEVE					%
E. MOIST. CORRECTED FOR MATERIAL RETAINED ON THE #4 SIEVE	6	2			%
F. WEIGHT OF SAND & APPARATUS BEFORE FILLING HOLE					LB.
G. WEIGHT OF SAND & APPARATUS AFTER FILLING HOLE					LB.
H. WEIGHT OF SAND TO FILL HOLE AND CONE (F-G)	8	2	4		LB.
I. WEIGHT OF SAND TO FILL CONE AND BASE PLATE	3	2	6		LB.
J. WEIGHT OF SAND TO FILL HOLE (H-I)	4	9	8		LB.
K. DENSITY OF SAND	8	1	1		PCF
L. VOLUME OF HOLE $\left(\frac{J}{K}\right)$	0	6	1	4	CF
M. WET DENSITY = $\left(\frac{A}{L}\right)$	1	2	9	5	PCF
N. DRY DENSITY = $\left(\frac{M}{100 + E}\right) \times 100$	1	2	1	9	PCF
COMPACTION = $\left(\frac{N}{R}\right) \times 100$ OR $\left(\frac{N}{T}\right) \times 100$	9	2			%
COMPACTION SPECIFICATION					%

PROCTOR DENSITY

PROCTOR NUMBER					
PROCTOR METHOD (A, C, D, OR 1)					
O. SPECIFIC GRAVITY OF RETAINED #4					
P. ABSORPTION OF RETAINED #4					%
Q. OPTIMUM MOISTURE					%
R. MAXIMUM DRY DENSITY					PCF

CORRECTION FOR RETAINED #4 (METHOD A OR ONE-POINT ONLY)

S. CORRECTED OPTIMUM MOISTURE			7	7	%
T. CORRECTED MAXIMUM DRY DENSITY	1	3	2	4	PCF

$$a. \text{ RETAINED ON \#4} = \left(\frac{B}{A}\right) \times 100$$

IF RET. ON #4 IS MORE THAN 50% (60% IF AB), GO NO FURTHER.

FOR METHOD A OR ONE POINT ONLY

$$E = \frac{[D (100 - a)] + a}{100}$$

ONE POINT PROCTOR (ARIZ 232)

b. WEIGHT OF MOLD & SOIL					LB.
c. WEIGHT OF MOLD					LB.
d. WEIGHT OF COMPACTED SOIL (b-c)	4	3	8		LB.
e. VOLUME OF MOLD	0	3	3	3	CF
f. WET DENSITY (d / e)	1	3	1	5	PCF
g. MOISTURE CONTENT					%
FAMILY OF CURVES IDENTIFICATION	I	&	J		
Q. OPTIMUM MOISTURE	1	2	1		%
R. MAXIMUM DRY DENSITY	1	2	1	0	PCF

TEST OPERATOR AND DATE

RESIDENT ENGINEER, PROJECT SUPERVISOR, OR LABMAN AND DATE

FOR METHOD A OR ONE POINT ONLY

$$S = \frac{[Q (100 - a)] + a}{100}$$

$$T = \frac{[R (100 - a)] + [(56.2) (a)(O)]}{100}$$



Curve	Max Dry Wt. lbs/cu.ft.	Optimum Moisture
A	141.8	6.6
B	139.1	7.2
C	136.3	7.9
D	134.1	8.5
E	132.	9.0
F	129.3	9.7
G	126.6	10.5
H	124.2	11.2
I	121.7	11.9
J	119.3	12.7
K	117.0	13.5
L	114.6	14.6
M	112.0	15.8
N	109.6	16.9
O	107.1	18.1
P	104.7	19.2
Q	102.4	20.3
R	99.9	21.5
S	97.4	22.7
T	94.6	24.4
U	92.1	25.8
V	89.9	27.4
W	87.5	29.5
X	85.0	30.5
Y	83.0	31.5
Z	81.1	32.5

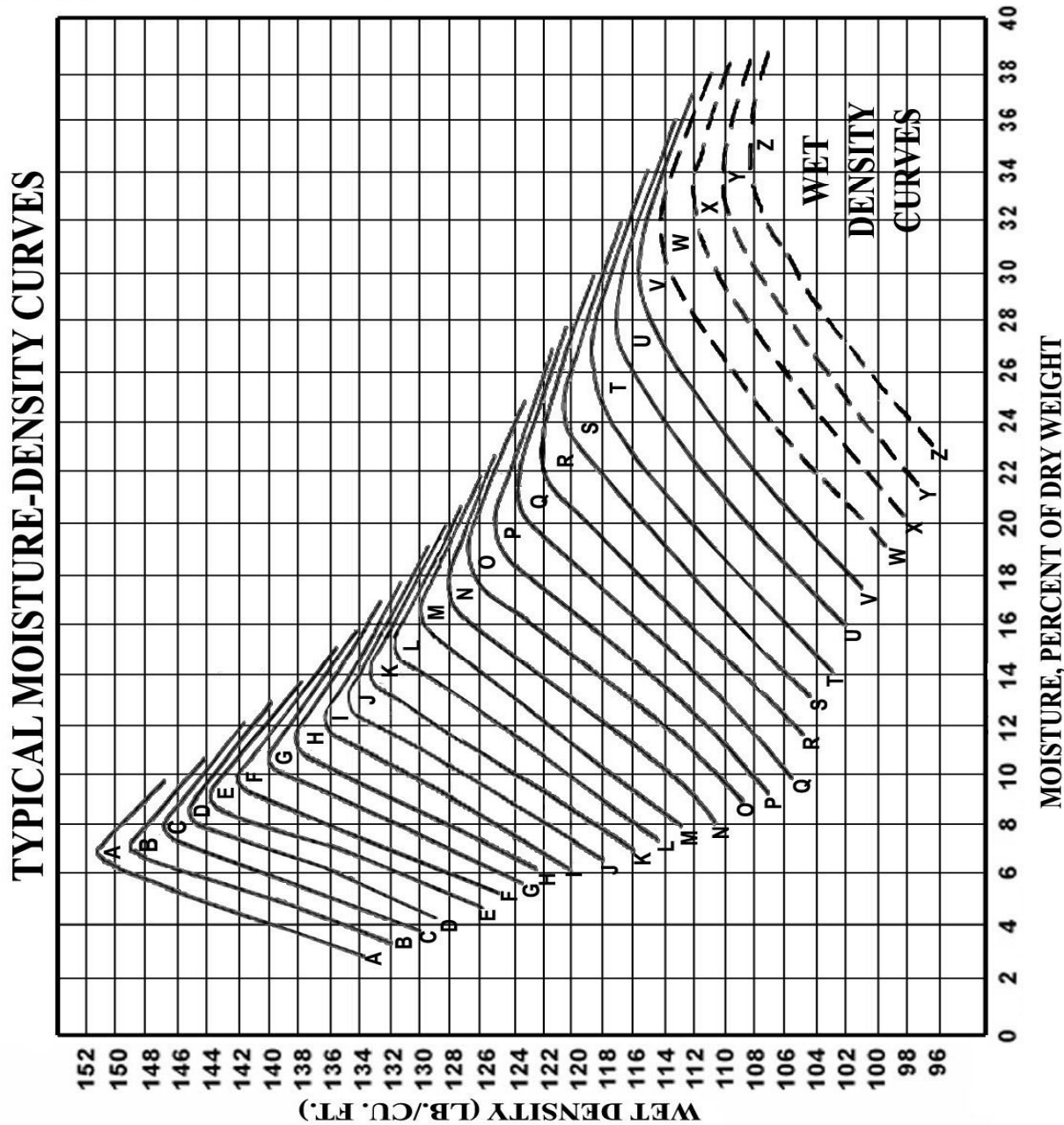


FIGURE 2

A	141.8	6.6	F	129.3	9.7	K	117.0	13.5	P	104.7	19.2	U	92.1	25.8
10%	141.5	6.7	10%	129.0	9.8	10%	116.8	13.6	10%	104.5	19.3	10%	91.9	26.0
20%	141.3	6.7	20%	128.8	9.9	20%	116.5	13.7	20%	104.2	19.4	20%	91.7	26.1
30%	141.0	6.8	30%	128.5	9.9	30%	116.3	13.8	30%	104.0	19.5	30%	91.4	26.3
40%	140.7	6.8	40%	128.2	10.0	40%	116.0	13.9	40%	103.8	19.6	40%	91.2	26.4
50%	140.5	6.9	50%	128.0	10.1	50%	115.8	14.1	50%	103.6	19.8	50%	91.0	26.6
60%	140.2	7.0	60%	127.7	10.2	60%	115.6	14.2	60%	103.3	19.9	60%	90.8	26.8
70%	139.9	7.0	70%	127.4	10.3	70%	115.3	14.3	70%	103.1	20.0	70%	90.6	26.9
80%	139.6	7.1	80%	127.1	10.3	80%	115.1	14.4	80%	102.9	20.1	80%	90.3	27.1
90%	139.4	7.1	90%	126.9	10.4	90%	114.8	14.5	90%	102.6	20.2	90%	90.1	27.2
B	139.1	7.2	G	126.6	10.5	L	114.6	14.6	Q	102.4	20.3	V	89.9	27.4
10%	138.8	7.3	10%	126.4	10.6	10%	114.3	14.7	10%	102.2	20.4	10%	89.7	27.6
20%	138.5	7.3	20%	126.1	10.6	20%	114.1	14.8	20%	101.9	20.5	20%	89.4	27.8
30%	138.3	7.4	30%	125.9	10.7	30%	113.8	15.0	30%	101.7	20.7	30%	89.2	28.0
40%	138.0	7.5	40%	125.6	10.8	40%	113.6	15.1	40%	101.4	20.8	40%	88.9	28.2
50%	137.7	7.6	50%	125.4	10.9	50%	113.3	15.2	50%	101.2	20.9	50%	88.7	28.5
60%	137.4	7.6	60%	125.2	10.9	60%	113.0	15.3	60%	100.9	21.0	60%	88.5	28.7
70%	137.1	7.7	70%	124.9	11.0	70%	112.8	15.4	70%	100.7	21.1	70%	88.2	28.9
80%	136.9	7.8	80%	124.7	11.1	80%	112.5	15.6	80%	100.4	21.3	80%	88.0	29.1
90%	136.6	7.8	90%	124.4	11.1	90%	112.3	15.7	90%	100.2	21.4	90%	87.7	29.3
C	136.3	7.9	H	124.2	11.2	M	112.0	15.8	R	99.9	21.5	W	87.5	29.5
10%	136.1	8.0	10%	124.0	11.3	10%	111.8	15.9	10%	99.7	21.6	10%	87.3	29.6
20%	135.9	8.0	20%	123.7	11.3	20%	111.5	16.0	20%	99.4	21.7	20%	87.0	29.7
30%	135.6	8.1	30%	123.5	11.4	30%	111.3	16.1	30%	99.2	21.9	30%	86.8	29.8
40%	135.4	8.1	40%	123.2	11.5	40%	111.0	16.2	40%	98.9	22.0	40%	86.5	29.9
50%	135.2	8.2	50%	123.0	11.6	50%	110.8	16.4	50%	98.7	22.1	50%	86.3	30.0
60%	135.0	8.3	60%	122.7	11.6	60%	110.6	16.5	60%	98.4	22.2	60%	86.0	30.1
70%	134.8	8.3	70%	122.5	11.7	70%	110.3	16.6	70%	98.2	22.3	70%	85.8	30.2
80%	134.5	8.4	80%	122.2	11.8	80%	110.1	16.7	80%	97.9	22.5	80%	85.5	30.3
90%	134.3	8.4	90%	122.0	11.8	90%	109.8	16.8	90%	97.7	22.6	90%	85.3	30.4
D	134.1	8.5	I	121.7	11.9	N	109.6	16.9	S	97.4	22.7	X	85.0	30.5
10%	133.9	8.6	10%	121.5	12.0	10%	109.4	17.0	10%	97.1	22.9	10%	84.8	30.6
20%	133.7	8.6	20%	121.2	12.1	20%	109.1	17.1	20%	96.8	23.0	20%	84.6	30.7
30%	133.5	8.7	30%	121.0	12.1	30%	108.9	17.3	30%	96.6	23.2	30%	84.4	30.8
40%	133.3	8.7	40%	120.7	12.2	40%	108.6	17.4	40%	96.3	23.4	40%	84.2	30.9
50%	133.1	8.8	50%	120.5	12.3	50%	108.4	17.5	50%	96.0	23.6	50%	84.0	31.0
60%	132.8	8.8	60%	120.3	12.4	60%	108.1	17.6	60%	95.7	23.7	60%	83.8	31.1
70%	132.6	8.9	70%	120.0	12.5	70%	107.9	17.7	70%	95.4	23.9	70%	83.6	31.2
80%	132.4	8.9	80%	119.8	12.5	80%	107.6	17.9	80%	95.2	24.1	80%	83.4	31.3
90%	132.2	9.0	90%	119.5	12.6	90%	107.4	18.0	90%	94.9	24.2	90%	83.2	31.4
E	132.0	9.0	J	119.3	12.7	O	107.1	18.1	T	94.6	24.4	Y	83.0	31.5
10%	131.7	9.1	10%	119.1	12.8	10%	106.9	18.2	10%	94.4	24.5	10%	82.8	31.6
20%	131.5	9.1	20%	118.8	12.9	20%	106.6	18.3	20%	94.1	24.7	20%	82.6	31.7
30%	131.2	9.2	30%	118.6	12.9	30%	106.4	18.4	30%	93.9	24.8	30%	82.4	31.8
40%	130.9	9.3	40%	118.4	13.0	40%	106.1	18.5	40%	93.6	25.0	40%	82.2	31.9
50%	130.7	9.4	50%	118.2	13.1	50%	105.9	18.7	50%	93.4	25.1	50%	82.1	32.0
60%	130.4	9.4	60%	117.9	13.2	60%	105.7	18.8	60%	93.1	25.2	60%	81.9	32.1
70%	130.1	9.5	70%	117.7	13.3	70%	105.4	18.9	70%	92.9	25.4	70%	81.7	32.2
80%	129.8	9.6	80%	117.5	13.3	80%	105.2	19.0	80%	92.6	25.5	80%	81.5	32.3
90%	129.6	9.6	90%	117.2	13.4	90%	104.9	19.1	90%	92.4	25.7	90%	81.3	32.4
F	129.3	9.7	K	117.0	13.5	P	104.7	19.2	U	92.1	25.8	Z	81.1	32.5

TABLE 1