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# ภาคผนวก ก

## ผลการ Calibrate Vibrating Table

ตาราง ก.1 สรุปผลการทดสอบค่า Minimum Density และ Maximum Density เมื่อแปรเปลี่ยน ความถี่ (Frequency) และเวลา (Time)

| ***MINIMUM DENSITY DETERMINATION*** (Frequency = 40 Hz,Time = 15 Min.) | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Wt. soil + mold (kg.) | 7.749 | 7.747 | 7.722 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.086 | 4.084 | 4.059 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1444 | 1443 | 1434 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Left gage read (cm.) | 4.314 | 4.389 | 4.359 |
| Right gage read (cm.) | 4.324 | 4.422 | 4.328 |
| Avg. gage read , Rf | 2.696 | 2.638 | 2.604 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.137 | 1.217 | 1.155 |
| Initial gage read , Ri | 4.452 | 4.459 | 4.459 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2805.7 | 2820.3 | 2809.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2485.4 | 2488.3 | 2470.7 |
| Wt. dry soil + mold (kg.) | 7.749 | 7.747 | 7.722 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.086 | 4.084 | 4.059 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1644 | 1641 | 1643 |

| ***MINIMUM DENSITY DETERMINATION*** (Frequency = 50 Hz,Time = 10 Min.) | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Wt. soil + mold (kg.) | 7.695 | 7.705 | 7.689 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.032 | 4.042 | 4.026 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1425 | 1428 | 1423 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Left gage read (cm.) | 4.317 | 4.315 | 4.271 |
| Right gage read (cm.) | 4.284 | 4.296 | 4.318 |
| Avg. gage read , Rf | 2.496 | 2.512 | 2.493 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.120 | 1.120 | 1.135 |
| Initial gage read , Ri | 4.451 | 4.456 | 4.430 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2802.6 | 2802.6 | 2805.4 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2446.1 | 2448.1 | 2452.1 |
| Wt. dry soil + mold (kg.) | 7.695 | 7.705 | 7.689 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.032 | 4.042 | 4.026 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1648 | 1651 | 1642 |

ตาราง ก.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (Frequency = 50 Hz,Time = 15 Min.) | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Wt. soil + mold (kg.) | 7.666 | 7.715 | 7.657 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.003 | 4.052 | 3.994 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1414 | 1432 | 1411 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Left gage read (cm.) | 4.336 | 4.332 | 4.293 |
| Right gage read (cm.) | 4.323 | 4.280 | 4.317 |
| Avg. gage read , Rf | 2.390 | 2.511 | 2.328 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.151 | 1.120 | 1.134 |
| Initial gage read , Ri | 4.449 | 4.456 | 4.441 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2808.3 | 2802.6 | 2805.2 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2432.8 | 2447.9 | 2419.8 |
| Wt. dry soil + mold (kg.) | 7.666 | 7.715 | 7.657 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.003 | 4.052 | 3.994 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1645 | 1655 | 1651 |

| ***MINIMUM DENSITY DETERMINATION*** (Frequency = 60 Hz,Time = 5 Min.) | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Wt. soil + mold (kg.) | 7.668 | 7.664 | 7.671 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.005 | 4.001 | 4.008 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1415 | 1414 | 1416 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Left gage read (cm.) | 4.318 | 4.275 | 4.288 |
| Right gage read (cm.) | 4.276 | 4.214 | 4.230 |
| Avg. gage read , Rf | 2.431 | 2.405 | 2.393 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.122 | 1.077 | 1.085 |
| Initial gage read , Ri | 4.445 | 4.438 | 4.444 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2803.0 | 2794.8 | 2796.3 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2435.6 | 2424.0 | 2422.1 |
| Wt. dry soil + mold (kg.) | 7.668 | 7.664 | 7.671 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.005 | 4.001 | 4.008 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1644 | 1651 | 1655 |

ตาราง ก.1 (ต่อ)

**MINIMUM DENSITY DETERMINATION**
(Frequency = 60 Hz,Time = 10 Min.)

| Test No. | | A | B | C |
|---|---|---|---|---|
| Wt. soil + mold | (kg.) | 7.703 | 7.712 | 7.721 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) | (kg.) | 4.040 | 4.049 | 4.058 |
| Volume of mold (Vc) | (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) | (kg/cu.m.) | 1428 | 1431 | 1434 |

**MAXIMUM DENSITY DETERMINATION**

| Test No. | | A | B | C |
|---|---|---|---|---|
| Left gage read | (cm.) | 4.317 | 4.314 | 4.295 |
| Right gage read | (cm.) | 4.311 | 4.321 | 4.288 |
| Avg. gage read , Rf | | 2.399 | 2.400 | 2.494 |
| Surcharge base pl. thick | (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness | (cm.) | 1.136 | 1.143 | 1.119 |
| Initial gage read , Ri | | 4.448 | 4.445 | 4.443 |
| Area of sample surface , A | (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc | (cu.cm.) | 2805.6 | 2806.8 | 2802.5 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A | (cu.cm.) | 2431.8 | 2433.9 | 2447.0 |
| Wt. dry soil + mold | (kg.) | 7.703 | 7.712 | 7.721 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws | (kg.) | 4.040 | 4.049 | 4.058 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) | (kg/cu.m.) | 1661 | 1664 | 1658 |

**MINIMUM DENSITY DETERMINATION**
(Frequency = 60 Hz,Time = 15 Min.)

| Test No. | | A | B | C |
|---|---|---|---|---|
| Wt. soil + mold | (kg.) | 7.720 | 7.695 | 7.713 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) | (kg.) | 4.057 | 4.032 | 4.050 |
| Volume of mold (Vc) | (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) | (kg/cu.m.) | 1434 | 1425 | 1431 |

**MAXIMUM DENSITY DETERMINATION**

| Test No. | | A | B | C |
|---|---|---|---|---|
| Left gage read | (cm.) | 4.285 | 4.309 | 4.280 |
| Right gage read | (cm.) | 4.310 | 4.352 | 4.281 |
| Avg. gage read , Rf | | 2.501 | 2.387 | 2.454 |
| Surcharge base pl. thick | (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness | (cm.) | 1.118 | 1.154 | 1.120 |
| Initial gage read , Ri | | 4.450 | 4.447 | 4.431 |
| Area of sample surface , A | (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc | (cu.cm.) | 2802.3 | 2808.8 | 2802.6 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A | (cu.cm.) | 2446.8 | 2433.2 | 2442.1 |
| Wt. dry soil + mold | (kg.) | 7.720 | 7.695 | 7.713 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws | (kg.) | 4.057 | 4.032 | 4.050 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) | (kg/cu.m.) | 1658 | 1657 | 1658 |

ตาราง ก.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (Frequency = 70 Hz,Time = 10 Min.) | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Wt. soil + mold (kg.) | 7.680 | 7.719 | 7.707 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.017 | 4.056 | 4.044 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1419 | 1433 | 1429 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | A | B | C |
| Left gage read (cm.) | 4.271 | 4.343 | 4.328 |
| Right gage read (cm.) | 4.289 | 4.328 | 4.306 |
| Avg. gage read , Rf | 2.306 | 2.495 | 2.499 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.111 | 1.143 | 1.116 |
| Initial gage read , Ri | 4.439 | 4.463 | 4.471 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2801.0 | 2806.8 | 2801.9 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2411.9 | 2447.9 | 2442.2 |
| Wt. dry soil + mold (kg.) | 7.680 | 7.719 | 7.707 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.017 | 4.056 | 4.044 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1665 | 1657 | 1656 |

# ภาคผนวก ข

## ผลการทดสอบค่า Minimum Density และ Maximum Density

ตาราง ข.1 สรุปผลการทดสอบค่า Minimum Density และ Maximum Density เมื่อแปรเปลี่ยนอัตราส่วนผสมของ Coarse Sand, Medium Sand และ Fine Sand

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 10 : 80) | | | |
|---|---|---|---|
| Test No. | 1A | 1B | 1C |
| Wt. soil + mold (kg.) | 8.174 | 8.230 | 8.215 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.511 | 4.567 | 4.552 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1594 | 1614 | 1608 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 1A | 1B | 1C |
| Left gage read (cm.) | 4.232 | 4.297 | 4.180 |
| Right gage read (cm.) | 4.246 | 4.272 | 4.199 |
| Avg. gage read , Rf | 1.966 | 2.044 | 1.933 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.060 | 1.104 | 0.998 |
| Initial gage read , Ri | 4.450 | 4.451 | 4.462 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2791.6 | 2799.7 | 2780.3 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2338.5 | 2360.7 | 2319.0 |
| Wt. dry soil + mold (kg.) | 8.174 | 8.230 | 8.215 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.511 | 4.567 | 4.552 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1929 | 1935 | 1963 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 20 : 70) | | | |
|---|---|---|---|
| Test No. | 2A | 2B | 2C |
| Wt. soil + mold (kg.) | 8.178 | 8.240 | 8.251 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.515 | 4.577 | 4.588 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1595 | 1617 | 1621 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 2A | 2B | 2C |
| Left gage read (cm.) | 4.270 | 4.285 | 4.286 |
| Right gage read (cm.) | 4.288 | 4.269 | 4.275 |
| Avg. gage read , Rf | 1.882 | 2.002 | 2.024 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.105 | 1.103 | 1.098 |
| Initial gage read , Ri | 4.444 | 4.444 | 4.452 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2799.8 | 2799.4 | 2798.6 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2332.5 | 2354.0 | 2355.7 |
| Wt. dry soil + mold (kg.) | 8.178 | 8.240 | 8.251 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.515 | 4.577 | 4.588 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1936 | 1944 | 1948 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 30 : 60) | | | |
|---|---|---|---|
| Test No. | 3A | 3B | 3C |
| Wt. soil + mold (kg.) | 8.228 | 8.273 | 8.280 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.565 | 4.610 | 4.617 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1613 | 1629 | 1631 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 3A | 3B | 3C |
| Left gage read (cm.) | 4.328 | 4.261 | 4.297 |
| Right gage read (cm.) | 4.280 | 4.258 | 4.255 |
| Avg. gage read , Rf | 1.894 | 1.982 | 1.994 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.117 | 1.070 | 1.097 |
| Initial gage read , Ri | 4.458 | 4.460 | 4.450 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2802.0 | 2793.5 | 2798.4 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2334.4 | 2341.5 | 2350.4 |
| Wt. dry soil + mold (kg.) | 8.228 | 8.273 | 8.280 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.565 | 4.610 | 4.617 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1956 | 1969 | 1964 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 40 : 50) | | | |
|---|---|---|---|
| Test No. | 4A | 4B | 4C |
| Wt. soil + mold (kg.) | 8.290 | 8.305 | 8.315 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.627 | 4.642 | 4.652 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1635 | 1640 | 1644 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 4A | 4B | 4C |
| Left gage read (cm.) | 4.268 | 4.245 | 4.228 |
| Right gage read (cm.) | 4.286 | 4.249 | 4.249 |
| Avg. gage read , Rf | 1.946 | 1.922 | 1.977 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.098 | 1.070 | 1.064 |
| Initial gage read , Ri | 4.449 | 4.447 | 4.444 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2798.5 | 2793.5 | 2792.4 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2341.8 | 2333.0 | 2342.3 |
| Wt. dry soil + mold (kg.) | 8.290 | 8.305 | 8.315 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.627 | 4.642 | 4.652 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1976 | 1990 | 1986 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 50 : 40) | | | |
|---|---|---|---|
| Test No. | 5A | 5B | 5C |
| Wt. soil + mold (kg.) | 8.230 | 8.256 | 8.272 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.567 | 4.593 | 4.609 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1614 | 1623 | 1629 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 5A | 5B | 5C |
| Left gage read (cm.) | 4.310 | 4.262 | 4.268 |
| Right gage read (cm.) | 4.259 | 4.282 | 4.231 |
| Avg. gage read , Rf | 1.990 | 1.905 | 2.074 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.105 | 1.095 | 1.075 |
| Initial gage read , Ri | 4.450 | 4.447 | 4.444 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2799.8 | 2798.0 | 2794.4 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2351.2 | 2334.2 | 2362.0 |
| Wt. dry soil + mold (kg.) | 8.230 | 8.256 | 8.272 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.567 | 4.593 | 4.609 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1942 | 1968 | 1951 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 60 : 30) | | | |
|---|---|---|---|
| Test No. | 6A | 6B | 6C |
| Wt. soil + mold (kg.) | 8.141 | 8.178 | 8.212 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.478 | 4.515 | 4.549 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1582 | 1595 | 1607 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 6A | 6B | 6C |
| Left gage read (cm.) | 4.324 | 4.344 | 4.350 |
| Right gage read (cm.) | 4.357 | 4.333 | 4.337 |
| Avg. gage read , Rf | 1.912 | 1.977 | 2.039 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.165 | 1.154 | 1.169 |
| Initial gage read , Ri | 4.446 | 4.455 | 4.445 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2810.8 | 2808.7 | 2811.5 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2348.5 | 2356.8 | 2372.5 |
| Wt. dry soil + mold (kg.) | 8.141 | 8.178 | 8.212 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.478 | 4.515 | 4.549 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1907 | 1916 | 1917 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 70 : 20) | | | |
|---|---|---|---|
| Test No. | 7A | 7B | 7C |
| Wt. soil + mold (kg.) | 8.118 | 8.151 | 8.164 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.455 | 4.488 | 4.501 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1574 | 1586 | 1590 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 7A | 7B | 7C |
| Left gage read (cm.) | 4.393 | 4.344 | 4.354 |
| Right gage read (cm.) | 4.321 | 4.327 | 4.343 |
| Avg. gage read , Rf | 1.994 | 2.048 | 1.988 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.192 | 1.160 | 1.177 |
| Initial gage read , Ri | 4.435 | 4.446 | 4.442 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2815.8 | 2809.9 | 2813.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2370.7 | 2372.5 | 2365.5 |
| Wt. dry soil + mold (kg.) | 8.118 | 8.151 | 8.164 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.455 | 4.488 | 4.501 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1879 | 1892 | 1903 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 10 : 80 : 10) | | | |
|---|---|---|---|
| Test No. | 8A | 8B | 8C |
| Wt. soil + mold (kg.) | 8.048 | 8.092 | 8.084 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.385 | 4.429 | 4.421 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1549 | 1565 | 1562 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 8A | 8B | 8C |
| Left gage read (cm.) | 4.351 | 4.376 | 4.363 |
| Right gage read (cm.) | 4.292 | 4.300 | 4.319 |
| Avg. gage read , Rf | 1.825 | 1.944 | 1.987 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.150 | 1.173 | 1.182 |
| Initial gage read , Ri | 4.441 | 4.436 | 4.429 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2808.1 | 2812.2 | 2813.9 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2330.9 | 2357.7 | 2368.5 |
| Wt. dry soil + mold (kg.) | 8.048 | 8.092 | 8.084 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.385 | 4.429 | 4.421 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1881 | 1878 | 1867 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 10 : 70) | | | |
|---|---|---|---|
| Test No. | 9A | 9B | 9C |
| Wt. soil + mold (kg.) | 8.363 | 8.394 | 8.416 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.700 | 4.731 | 4.753 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1661 | 1672 | 1680 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 9A | 9B | 9C |
| Left gage read (cm.) | 4.238 | 4.271 | 4.302 |
| Right gage read (cm.) | 4.289 | 4.229 | 4.314 |
| Avg. gage read , Rf | 2.175 | 2.134 | 2.189 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.078 | 1.070 | 1.131 |
| Initial gage read , Ri | 4.456 | 4.450 | 4.447 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2795.0 | 2793.5 | 2804.6 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2378.9 | 2371.0 | 2392.6 |
| Wt. dry soil + mold (kg.) | 8.363 | 8.394 | 8.416 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.700 | 4.731 | 4.753 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1976 | 1995 | 1987 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 20 : 60) | | | |
|---|---|---|---|
| Test No. | 10A | 10B | 10C |
| Wt. soil + mold (kg.) | 8.410 | 8.437 | 8.473 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.747 | 4.774 | 4.810 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1677 | 1687 | 1700 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 10A | 10B | 10C |
| Left gage read (cm.) | 4.305 | 4.227 | 4.293 |
| Right gage read (cm.) | 4.282 | 4.258 | 4.243 |
| Avg. gage read , Rf | 2.061 | 2.049 | 2.179 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.120 | 1.060 | 1.083 |
| Initial gage read , Ri | 4.444 | 4.452 | 4.456 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2802.6 | 2791.7 | 2795.8 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2368.0 | 2353.2 | 2380.5 |
| Wt. dry soil + mold (kg.) | 8.410 | 8.437 | 8.473 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.747 | 4.774 | 4.810 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2005 | 2029 | 2021 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 30 : 50) | | | |
|---|---|---|---|
| Test No. | 11A | 11B | 11C |
| Wt. soil + mold (kg.) | 8.461 | 8.465 | 8.467 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.798 | 4.802 | 4.804 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1695 | 1697 | 1698 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 11A | 11B | 11C |
| Left gage read (cm.) | 4.222 | 4.216 | 4.194 |
| Right gage read (cm.) | 4.175 | 4.152 | 4.161 |
| Avg. gage read , Rf | 1.902 | 1.944 | 1.934 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.028 | 1.013 | 1.004 |
| Initial gage read , Ri | 4.441 | 4.442 | 4.444 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2785.9 | 2783.0 | 2781.4 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2322.7 | 2327.5 | 2323.5 |
| Wt. dry soil + mold (kg.) | 8.461 | 8.465 | 8.467 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.798 | 4.802 | 4.804 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2066 | 2063 | 2068 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 40 : 40) | | | |
|---|---|---|---|
| Test No. | 12A | 12B | 12C |
| Wt. soil + mold (kg.) | 8.443 | 8.450 | 8.438 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.780 | 4.787 | 4.775 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1689 | 1692 | 1687 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 12A | 12B | 12C |
| Left gage read (cm.) | 4.250 | 4.216 | 4.223 |
| Right gage read (cm.) | 4.207 | 4.238 | 4.209 |
| Avg. gage read , Rf | 1.936 | 2.008 | 1.888 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.056 | 1.056 | 1.045 |
| Initial gage read , Ri | 4.443 | 4.441 | 4.441 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2791.0 | 2790.9 | 2789.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2333.7 | 2347.0 | 2323.2 |
| Wt. dry soil + mold (kg.) | 8.443 | 8.450 | 8.438 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.780 | 4.787 | 4.775 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2048 | 2040 | 2055 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 50 : 30) | | | |
|---|---|---|---|
| Test No. | 13A | 13B | 13C |
| Wt. soil + mold (kg.) | 8.342 | 8.365 | 8.391 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.679 | 4.702 | 4.728 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1653 | 1661 | 1671 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 13A | 13B | 13C |
| Left gage read (cm.) | 4.270 | 4.290 | 4.260 |
| Right gage read (cm.) | 4.233 | 4.255 | 4.227 |
| Avg. gage read , Rf | 2.136 | 2.101 | 2.161 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.082 | 1.105 | 1.078 |
| Initial gage read , Ri | 4.440 | 4.438 | 4.436 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2795.7 | 2799.8 | 2795.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2375.5 | 2373.5 | 2380.0 |
| Wt. dry soil + mold (kg.) | 8.342 | 8.365 | 8.391 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.679 | 4.702 | 4.728 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1970 | 1981 | 1987 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 60 : 20) | | | |
|---|---|---|---|
| Test No. | 14A | 14B | 14C |
| Wt. soil + mold (kg.) | 8.268 | 8.285 | 8.288 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.605 | 4.622 | 4.625 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1627 | 1633 | 1634 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 14A | 14B | 14C |
| Left gage read (cm.) | 4.320 | 4.282 | 4.283 |
| Right gage read (cm.) | 4.232 | 4.238 | 4.282 |
| Avg. gage read , Rf | 1.904 | 1.954 | 1.922 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.093 | 1.095 | 1.112 |
| Initial gage read , Ri | 4.453 | 4.436 | 4.441 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2797.6 | 2798.0 | 2801.2 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2332.6 | 2345.3 | 2341.6 |
| Wt. dry soil + mold (kg.) | 8.268 | 8.285 | 8.288 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.605 | 4.622 | 4.625 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1974 | 1971 | 1975 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 20 : 70 : 10) | | | |
|---|---|---|---|
| Test No. | 15A | 15B | 15C |
| Wt. soil + mold (kg.) | 8.203 | 8.201 | 8.205 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.540 | 4.538 | 4.542 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1604 | 1604 | 1605 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 15A | 15B | 15C |
| Left gage read (cm.) | 4.283 | 4.225 | 4.289 |
| Right gage read (cm.) | 4.229 | 4.199 | 4.199 |
| Avg. gage read , Rf | 1.946 | 1.877 | 1.808 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.105 | 1.049 | 1.079 |
| Initial gage read , Ri | 4.421 | 4.433 | 4.436 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2799.9 | 2789.7 | 2795.1 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2348.5 | 2323.6 | 2315.7 |
| Wt. dry soil + mold (kg.) | 8.203 | 8.201 | 8.205 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.540 | 4.538 | 4.542 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1933 | 1953 | 1961 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 30 : 10 : 60) | | | |
|---|---|---|---|
| Test No. | 16A | 16B | 16C |
| Wt. soil + mold (kg.) | 8.620 | 8.618 | 8.644 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.957 | 4.955 | 4.981 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1752 | 1751 | 1760 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 16A | 16B | 16C |
| Left gage read (cm.) | 4.279 | 4.266 | 4.192 |
| Right gage read (cm.) | 4.223 | 4.196 | 4.200 |
| Avg. gage read , Rf | 2.357 | 2.153 | 2.227 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.084 | 1.064 | 1.033 |
| Initial gage read , Ri | 4.437 | 4.437 | 4.433 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2796.1 | 2792.3 | 2786.8 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2416.7 | 2375.7 | 2384.3 |
| Wt. dry soil + mold (kg.) | 8.620 | 8.618 | 8.644 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.957 | 4.955 | 4.981 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2051 | 2086 | 2089 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 30 : 20 : 50) | | | |
|---|---|---|---|
| Test No. | 17A | 17B | 17C |
| Wt. soil + mold (kg.) | 8.600 | 8.596 | 8.598 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.937 | 4.933 | 4.935 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1745 | 1743 | 1744 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 17A | 17B | 17C |
| Left gage read (cm.) | 4.304 | 4.266 | 4.256 |
| Right gage read (cm.) | 4.282 | 4.242 | 4.247 |
| Avg. gage read , Rf | 2.277 | 2.151 | 2.195 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.125 | 1.097 | 1.090 |
| Initial gage read , Ri | 4.439 | 4.428 | 4.432 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2803.5 | 2798.4 | 2797.2 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2409.1 | 2383.0 | 2389.3 |
| Wt. dry soil + mold (kg.) | 8.600 | 8.596 | 8.598 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.937 | 4.933 | 4.935 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2049 | 2070 | 2065 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 30 : 30 : 40) | | | |
|---|---|---|---|
| Test No. | 18A | 18B | 18C |
| Wt. soil + mold (kg.) | 8.565 | 8.560 | 8.585 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.902 | 4.897 | 4.922 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1732 | 1730 | 1739 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 18A | 18B | 18C |
| Left gage read (cm.) | 4.242 | 4.260 | 4.233 |
| Right gage read (cm.) | 4.293 | 4.215 | 4.194 |
| Avg. gage read , Rf | 2.172 | 2.061 | 2.200 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.066 | 1.074 | 1.047 |
| Initial gage read , Ri | 4.472 | 4.434 | 4.437 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2792.7 | 2794.2 | 2789.3 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2373.2 | 2361.5 | 2381.4 |
| Wt. dry soil + mold (kg.) | 8.565 | 8.560 | 8.585 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.902 | 4.897 | 4.922 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2066 | 2074 | 2067 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 30 : 40 : 30) | | | |
|---|---|---|---|
| Test No. | 19A | 19B | 19C |
| Wt. soil + mold (kg.) | 8.409 | 8.435 | 8.444 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.746 | 4.772 | 4.781 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1677 | 1686 | 1689 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 19A | 19B | 19C |
| Left gage read (cm.) | 4.257 | 4.246 | 4.245 |
| Right gage read (cm.) | 4.227 | 4.199 | 4.193 |
| Avg. gage read , Rf | 2.287 | 2.329 | 2.173 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.073 | 1.057 | 1.050 |
| Initial gage read , Ri | 4.439 | 4.436 | 4.439 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2794.1 | 2791.1 | 2789.9 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2401.5 | 2406.8 | 2376.6 |
| Wt. dry soil + mold (kg.) | 8.409 | 8.435 | 8.444 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.746 | 4.772 | 4.781 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1976 | 1983 | 2012 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 30 : 50 : 20) | | | |
|---|---|---|---|
| Test No. | 20A | 20B | 20C |
| Wt. soil + mold (kg.) | 8.398 | 8.409 | 8.400 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.735 | 4.746 | 4.737 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1673 | 1677 | 1674 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 20A | 20B | 20C |
| Left gage read (cm.) | 4.217 | 4.246 | 4.254 |
| Right gage read (cm.) | 4.178 | 4.192 | 4.210 |
| Avg. gage read , Rf | 2.098 | 2.020 | 2.048 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.030 | 1.049 | 1.066 |
| Initial gage read , Ri | 4.438 | 4.440 | 4.436 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2786.1 | 2789.7 | 2792.8 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2359.2 | 2348.2 | 2357.1 |
| Wt. dry soil + mold (kg.) | 8.398 | 8.409 | 8.400 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.735 | 4.746 | 4.737 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2007 | 2021 | 2010 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| MINIMUM DENSITY DETERMINATION (C : M : F = 30 : 60 : 10) | | | | |
|---|---|---|---|---|
| Test No. | | 21A | 21B | 21C |
| Wt. soil + mold | (kg.) | 8.311 | 8.291 | 8.293 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) | (kg.) | 4.648 | 4.628 | 4.630 |
| Volume of mold (Vc) | (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) | (kg/cu.m.) | 1642 | 1635 | 1636 |

| MAXIMUM DENSITY DETERMINATION | | | | |
|---|---|---|---|---|
| Test No. | | 21A | 21B | 21C |
| Left gage read | (cm.) | 4.295 | 4.291 | 4.260 |
| Right gage read | (cm.) | 4.268 | 4.232 | 4.247 |
| Avg. gage read , Rf | | 1.975 | 1.967 | 1.922 |
| Surcharge base pl. thick | (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness | (cm.) | 1.112 | 1.101 | 1.091 |
| Initial gage read , Ri | | 4.440 | 4.431 | 4.433 |
| Area of sample surface , A | (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc | (cu.cm.) | 2801.1 | 2799.2 | 2797.3 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A | (cu.cm.) | 2351.4 | 2349.7 | 2339.1 |
| Wt. dry soil + mold | (kg.) | 8.311 | 8.291 | 8.293 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws | (kg.) | 4.648 | 4.628 | 4.630 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) | (kg/cu.m.) | 1977 | 1970 | 1979 |

| MINIMUM DENSITY DETERMINATION (C : M : F = 40 : 10 : 50) | | | | |
|---|---|---|---|---|
| Test No. | | 22A | 22B | 22C |
| Wt. soil + mold | (kg.) | 8.645 | 8.624 | 8.630 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) | (kg.) | 4.982 | 4.961 | 4.967 |
| Volume of mold (Vc) | (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) | (kg/cu.m.) | 1760 | 1753 | 1755 |

| MAXIMUM DENSITY DETERMINATION | | | | |
|---|---|---|---|---|
| Test No. | | 22A | 22B | 22C |
| Left gage read | (cm.) | 4.279 | 4.289 | 4.267 |
| Right gage read | (cm.) | 4.163 | 4.218 | 4.221 |
| Avg. gage read , Rf | | 2.597 | 2.395 | 2.488 |
| Surcharge base pl. thick | (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness | (cm.) | 1.074 | 1.090 | 1.077 |
| Initial gage read , Ri | | 4.418 | 4.434 | 4.438 |
| Area of sample surface , A | (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc | (cu.cm.) | 2794.2 | 2797.2 | 2794.7 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A | (cu.cm.) | 2462.0 | 2425.3 | 2439.0 |
| Wt. dry soil + mold | (kg.) | 8.645 | 8.624 | 8.630 |
| Wt. mold | (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws | (kg.) | 4.982 | 4.961 | 4.967 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) | (kg/cu.m.) | 2024 | 2046 | 2036 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 40 : 20 : 40) | | | |
|---|---|---|---|
| Test No. | 23A | 23B | 23C |
| Wt. soil + mold (kg.) | 8.575 | 8.560 | 8.584 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.912 | 4.897 | 4.921 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1736 | 1730 | 1739 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 23A | 23B | 23C |
| Left gage read (cm.) | 4.266 | 4.294 | 4.222 |
| Right gage read (cm.) | 4.256 | 4.224 | 4.171 |
| Avg. gage read , Rf | 2.573 | 2.489 | 2.455 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.089 | 1.099 | 1.044 |
| Initial gage read , Ri | 4.443 | 4.430 | 4.423 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2796.9 | 2798.8 | 2788.8 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2455.8 | 2444.7 | 2429.9 |
| Wt. dry soil + mold (kg.) | 8.575 | 8.560 | 8.584 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.912 | 4.897 | 4.921 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 2000 | 2003 | 2025 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 40 : 30 : 30) | | | |
|---|---|---|---|
| Test No. | 24A | 24B | 24C |
| Wt. soil + mold (kg.) | 8.450 | 8.456 | 8.465 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.787 | 4.793 | 4.802 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1692 | 1694 | 1697 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 24A | 24B | 24C |
| Left gage read (cm.) | 4.242 | 4.257 | 4.243 |
| Right gage read (cm.) | 4.232 | 4.225 | 4.228 |
| Avg. gage read , Rf | 2.427 | 2.330 | 2.332 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.071 | 1.072 | 1.061 |
| Initial gage read , Ri | 4.436 | 4.439 | 4.445 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2793.6 | 2793.8 | 2791.8 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2427.1 | 2409.0 | 2406.2 |
| Wt. dry soil + mold (kg.) | 8.450 | 8.456 | 8.465 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.787 | 4.793 | 4.802 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1972 | 1990 | 1996 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 40 : 40 : 20) | | | |
|---|---|---|---|
| Test No. | 25A | 25B | 25C |
| Wt. soil + mold (kg.) | 8.397 | 8.414 | 8.428 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.734 | 4.751 | 4.765 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1673 | 1679 | 1684 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 25A | 25B | 25C |
| Left gage read (cm.) | 4.211 | 4.282 | 4.267 |
| Right gage read (cm.) | 4.200 | 4.227 | 4.231 |
| Avg. gage read , Rf | 2.325 | 2.272 | 2.302 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.029 | 1.082 | 1.093 |
| Initial gage read , Ri | 4.447 | 4.443 | 4.426 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2785.9 | 2795.7 | 2797.7 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2398.9 | 2399.7 | 2410.2 |
| Wt. dry soil + mold (kg.) | 8.397 | 8.414 | 8.428 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.734 | 4.751 | 4.765 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1973 | 1980 | 1977 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 40 : 50 : 10) | | | |
|---|---|---|---|
| Test No. | 26A | 26B | 26C |
| Wt. soil + mold (kg.) | 8.245 | 8.230 | 8.233 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.582 | 4.567 | 4.570 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1619 | 1614 | 1615 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 26A | 26B | 26C |
| Left gage read (cm.) | 4.304 | 4.291 | 4.253 |
| Right gage read (cm.) | 4.271 | 4.266 | 4.259 |
| Avg. gage read , Rf | 2.468 | 2.307 | 2.370 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.118 | 1.114 | 1.095 |
| Initial gage read , Ri | 4.440 | 4.435 | 4.431 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2802.2 | 2801.5 | 2798.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2442.4 | 2413.4 | 2422.0 |
| Wt. dry soil + mold (kg.) | 8.245 | 8.230 | 8.233 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.582 | 4.567 | 4.570 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1876 | 1892 | 1887 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 50 : 10 : 40) | | | |
|---|---|---|---|
| Test No. | 27A | 27B | 27C |
| Wt. soil + mold (kg.) | 8.485 | 8.497 | 8.495 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.822 | 4.834 | 4.832 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1704 | 1708 | 1707 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 27A | 27B | 27C |
| Left gage read (cm.) | 4.254 | 4.257 | 4.242 |
| Right gage read (cm.) | 4.269 | 4.277 | 4.222 |
| Avg. gage read , Rf | 2.668 | 2.608 | 2.606 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.086 | 1.096 | 1.062 |
| Initial gage read , Ri | 4.446 | 4.442 | 4.440 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2796.3 | 2798.2 | 2792.1 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2472.1 | 2463.6 | 2457.5 |
| Wt. dry soil + mold (kg.) | 8.485 | 8.497 | 8.495 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.822 | 4.834 | 4.832 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1951 | 1962 | 1966 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 50 : 20 : 30) | | | |
|---|---|---|---|
| Test No. | 28A | 28B | 28C |
| Wt. soil + mold (kg.) | 8.434 | 8.439 | 8.440 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.771 | 4.776 | 4.777 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1686 | 1688 | 1688 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 28A | 28B | 28C |
| Left gage read (cm.) | 4.207 | 4.258 | 4.262 |
| Right gage read (cm.) | 4.226 | 4.233 | 4.245 |
| Avg. gage read , Rf | 2.524 | 2.499 | 2.451 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.040 | 1.080 | 1.076 |
| Initial gage read , Ri | 4.446 | 4.436 | 4.448 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2788.0 | 2795.3 | 2794.5 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2437.4 | 2442.2 | 2430.2 |
| Wt. dry soil + mold (kg.) | 8.434 | 8.439 | 8.440 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.771 | 4.776 | 4.777 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1957 | 1956 | 1966 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 50 : 30 : 20) | | | |
|---|---|---|---|
| Test No. | 29A | 29B | 29C |
| Wt. soil + mold (kg.) | 8.294 | 8.318 | 8.320 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.631 | 4.655 | 4.657 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1636 | 1645 | 1646 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 29A | 29B | 29C |
| Left gage read (cm.) | 4.282 | 4.202 | 4.249 |
| Right gage read (cm.) | 4.279 | 4.209 | 4.218 |
| Avg. gage read , Rf | 2.430 | 2.504 | 2.506 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.098 | 1.039 | 1.067 |
| Initial gage read , Ri | 4.453 | 4.437 | 4.436 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2798.5 | 2787.8 | 2793.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2429.5 | 2435.2 | 2440.8 |
| Wt. dry soil + mold (kg.) | 8.294 | 8.318 | 8.320 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.631 | 4.655 | 4.657 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1906 | 1912 | 1908 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 50 : 10 : 40) | | | |
|---|---|---|---|
| Test No. | 30A | 30B | 30C |
| Wt. soil + mold (kg.) | 8.159 | 8.149 | 8.154 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.496 | 4.486 | 4.491 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1589 | 1585 | 1587 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 30A | 30B | 30C |
| Left gage read (cm.) | 4.303 | 4.255 | 4.317 |
| Right gage read (cm.) | 4.292 | 4.228 | 4.271 |
| Avg. gage read , Rf | 2.463 | 2.333 | 2.366 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.094 | 1.071 | 1.128 |
| Initial gage read , Ri | 4.474 | 4.441 | 4.437 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2797.8 | 2793.7 | 2804.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2431.1 | 2409.3 | 2426.2 |
| Wt. dry soil + mold (kg.) | 8.159 | 8.149 | 8.154 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.496 | 4.486 | 4.491 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1849 | 1862 | 1851 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 60 : 10 : 30) | | | |
|---|---|---|---|
| Test No. | 31A | 31B | 31C |
| Wt. soil + mold (kg.) | 8.334 | 8.332 | 8.337 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.671 | 4.669 | 4.674 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1651 | 1650 | 1652 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 31A | 31B | 31C |
| Left gage read (cm.) | 4.343 | 4.326 | 4.351 |
| Right gage read (cm.) | 4.335 | 4.315 | 4.330 |
| Avg. gage read , Rf | 2.551 | 2.550 | 2.556 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.162 | 1.135 | 1.165 |
| Initial gage read , Ri | 4.447 | 4.456 | 4.445 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2810.3 | 2805.4 | 2810.8 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2464.4 | 2457.8 | 2466.1 |
| Wt. dry soil + mold (kg.) | 8.334 | 8.332 | 8.337 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.671 | 4.669 | 4.674 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1895 | 1900 | 1895 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 60 : 20 : 20) | | | |
|---|---|---|---|
| Test No. | 32A | 32B | 32C |
| Wt. soil + mold (kg.) | 8.278 | 8.260 | 8.270 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.615 | 4.597 | 4.607 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1631 | 1624 | 1628 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 32A | 32B | 32C |
| Left gage read (cm.) | 4.341 | 4.339 | 4.355 |
| Right gage read (cm.) | 4.331 | 4.337 | 4.382 |
| Avg. gage read , Rf | 2.540 | 2.453 | 2.460 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.168 | 1.155 | 1.186 |
| Initial gage read , Ri | 4.438 | 4.453 | 4.453 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2811.3 | 2809.0 | 2814.6 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2465.0 | 2444.2 | 2450.9 |
| Wt. dry soil + mold (kg.) | 8.278 | 8.260 | 8.270 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.615 | 4.597 | 4.607 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1872 | 1881 | 1880 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 60 : 10 : 30) | | | |
|---|---|---|---|
| Test No. | 33A | 33B | 33C |
| Wt. soil + mold (kg.) | 8.045 | 8.066 | 8.075 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.382 | 4.403 | 4.412 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1548 | 1556 | 1559 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 33A | 33B | 33C |
| Left gage read (cm.) | 4.348 | 4.283 | 4.336 |
| Right gage read (cm.) | 4.293 | 4.309 | 4.297 |
| Avg. gage read , Rf | 2.338 | 2.507 | 2.579 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.155 | 1.118 | 1.138 |
| Initial gage read , Ri | 4.436 | 4.448 | 4.448 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2808.9 | 2802.2 | 2805.9 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2426.2 | 2448.0 | 2464.9 |
| Wt. dry soil + mold (kg.) | 8.045 | 8.066 | 8.075 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.382 | 4.403 | 4.412 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1806 | 1799 | 1790 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 70 : 10 : 20) | | | |
|---|---|---|---|
| Test No. | 34A | 34B | 34C |
| Wt. soil + mold (kg.) | 8.117 | 8.136 | 8.127 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.454 | 4.473 | 4.464 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1574 | 1581 | 1577 |
| ***MAXIMUM DENSITY DETERMINATION*** | | | |
| Test No. | 34A | 34B | 34C |
| Left gage read (cm.) | 4.362 | 4.314 | 4.315 |
| Right gage read (cm.) | 4.398 | 4.315 | 4.314 |
| Avg. gage read , Rf | 2.292 | 2.402 | 2.323 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.199 | 1.141 | 1.137 |
| Initial gage read , Ri | 4.452 | 4.443 | 4.448 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2817.0 | 2806.5 | 2805.6 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2423.0 | 2434.1 | 2418.1 |
| Wt. dry soil + mold (kg.) | 8.117 | 8.136 | 8.127 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.454 | 4.473 | 4.464 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1838 | 1838 | 1846 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

ตาราง ข.1 (ต่อ)

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 70 : 20 : 10) | | | |
|---|---|---|---|
| Test No. | 35A | 35B | 35C |
| Wt. soil + mold (kg.) | 7.979 | 8.006 | 8.008 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.316 | 4.343 | 4.345 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1525 | 1535 | 1535 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 35A | 35B | 35C |
| Left gage read (cm.) | 4.335 | 4.334 | 4.320 |
| Right gage read (cm.) | 4.330 | 4.280 | 4.326 |
| Avg. gage read , Rf | 2.145 | 2.189 | 2.153 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.158 | 1.129 | 1.139 |
| Initial gage read , Ri | 4.445 | 4.448 | 4.455 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2809.5 | 2804.3 | 2806.0 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2390.0 | 2392.2 | 2386.3 |
| Wt. dry soil + mold (kg.) | 7.979 | 8.006 | 8.008 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.316 | 4.343 | 4.345 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1806 | 1816 | 1821 |

| ***MINIMUM DENSITY DETERMINATION*** (C : M : F = 80 : 10 : 10) | | | |
|---|---|---|---|
| Test No. | 36A | 36B | 36C |
| Wt. soil + mold (kg.) | 7.777 | 7.796 | 7.818 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. soil (Ws) (kg.) | 4.114 | 4.133 | 4.155 |
| Volume of mold (Vc) (cu.m.) | 2830 | 2830 | 2830 |
| Minimum Dry Density = (Ws)/(Vc) (kg/cu.m.) | 1454 | 1460 | 1468 |

| ***MAXIMUM DENSITY DETERMINATION*** | | | |
|---|---|---|---|
| Test No. | 36A | 36B | 36C |
| Left gage read (cm.) | 4.305 | 4.336 | 4.378 |
| Right gage read (cm.) | 4.326 | 4.316 | 4.360 |
| Avg. gage read , Rf | 1.861 | 1.897 | 1.961 |
| Surcharge base pl. thick (cm.) | 1.270 | 1.270 | 1.270 |
| Straightedge thickness (cm.) | 1.139 | 1.142 | 1.171 |
| Initial gage read , Ri | 4.447 | 4.454 | 4.468 |
| Area of sample surface , A (sq.cm.) | 182.4 | 182.4 | 182.4 |
| Calib. vol. of mold , Vc (cu.cm.) | 2806.0 | 2806.7 | 2811.9 |
| Soil vol. (Vs) = Vc - (Rf - Ri) x A (cu.cm.) | 2334.4 | 2340.1 | 2354.7 |
| Wt. dry soil + mold (kg.) | 7.777 | 7.796 | 7.818 |
| Wt. mold (kg.) | 3.663 | 3.663 | 3.663 |
| Wt. dry soil , Ws (kg.) | 4.114 | 4.133 | 4.155 |
| Maximum Dry Density = (Ws)x1,000,000/(Vs) (kg/cu.m.) | 1762 | 1766 | 1765 |

NOTE : C = % Coarse Sand , M = % Medium Sand , F = % Fine Sand

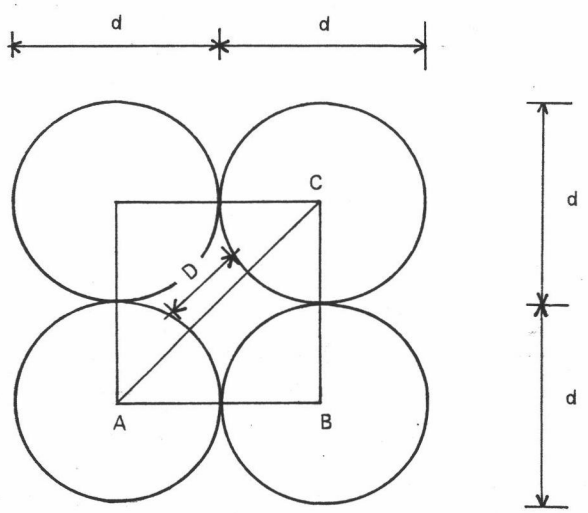
ภาคผนวก ค

การหาขนาดช่องว่างระหว่างเม็ดดิน

<u>การหาขนาดช่องว่างระหว่างเม็ดดิน</u>

กรณี Maximum Void Ratio

สมมุติให้เม็ดดินเป็นลักษณะทรงกลม และจัดเรียงตัวกันดังรูปที่ ค-1




รูปที่ ค-1 แสดงการจัดเรียงตัวของเม็ดดินในสภาพหลวมที่สุด

ให้เม็ดดินมีขนาดเส้นผ่าศูนย์กลาง = d และ D = เส้นผ่าศูนย์กลางที่ใหญ่ที่สุดของเม็ดดินที่สามารถเข้าไปแทรกระหว่างเม็ดดิน

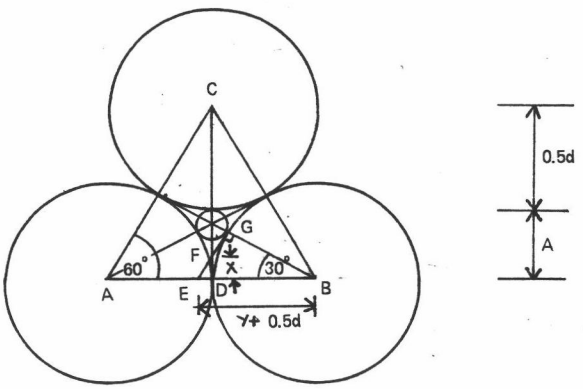
จาก $\Delta$ ABC ; $\sin 45^{\circ} = \dfrac{d}{(d+D)}$

$$\therefore \quad D = \frac{d\,(1-\sin 45^{\circ})}{\sin 45^{\circ}} \qquad \text{.....(ค-1)}$$

พ.ท. ระหว่างเม็ดดิน $= d^2 - 4\,\dfrac{\pi}{4}\,\dfrac{d^2}{4}$ .....(ค-2)

กรณี Minimum Void Ratio

สมมุติให้เม็ดดินเป็นลักษณะทรงกลม และจัดเรียงตัวกันดังรูปที่ ค-2




รูปที่ ค-2 แสดงการจัดเรียงตัวของเม็ดดินในสภาพแน่นที่สุด

ให้เม็ดดินมีขนาดเส้นผ่าศูนย์กลาง = d และ D = เส้นผ่าศูนย์กลางที่ใหญ่ที่สุดของเม็ดดินที่สามารถเข้าไปแทรกระหว่างเม็ดดิน

จาก $\Delta$ ADC ; $A + 0.5\,d = d \sin 60^{\circ}$

$\therefore \quad A = 0.366\,d$

จาก $\Delta$ BGE ; $0.5\,d = (y + 0.5\,d) \cos 30^{\circ}$

$\therefore \quad y = 0.0774\,d$

จาก $\Delta$ EDF ; $x = y \tan 60^{\circ}$

$\therefore \quad x = 0.134\,d$

จาก $A = x + 1.5\,D = 0.366\,d$

$\therefore \quad D = 0.155\,d$ .....(ค-3)

พ.ท. ระหว่างเม็ดดิน $= 0.5\,d\,(d \sin 60^{\circ}) - 3\left(\frac{\pi\,(0.5\,d)^2}{6}\right)$

$= 0.0403\,d^2$ .....(ค-4)

# ประวัติผู้เขียน

นายสุวิชัย เมธปรีชากุล เกิดเมื่อวันที่ 4 พฤศจิกายน พ.ศ. 2510 ที่จังหวัดนครราชสีมา สำเร็จการศึกษาวิศวกรรมศาสตรบัณฑิต สาขาวิศวกรรมโยธา จากมหาวิทยาลัยเชียงใหม่ เมื่อปีการศึกษา 2530 ได้ทำงานบริษัท ธำรงค์พัฒนาการ จำกัด ในตำแหน่งวิศวกรควบคุมงานก่อสร้างจนถึงปี พ.ศ. 2532 จากนั้นได้เข้าทำงานบริษัท ที.เอ.เค.ซี. จำกัด ในตำแหน่งวิศวกรควบคุมงานก่อสร้างจนถึงปี พ.ศ.2535