## SECTION E: PLANIMETERING PROCEDURE

The procedure outlined below will be followed when planimetering an area to determine the extent of a practice.

(1) Follow instructions for the particular planimeter used. Adjust the tracer point of planimeter so that it will be near but not touching the surface of the paper or photograph. The area planimetered should be on one sheet of paper and on a smooth surface.

(2) Place the tracer point near the center of area to be planimetered. Position pole arm at approximately a right angle to tracer arm. An approximate run of the tracer point around the boundary will show if the setting is one which permits ease of operation.

(3) Select starting point on boundary of area to be measured. Place tracer point on this starting point.

(4) Take and record initial reading. The planimeter should be read to the nearest one-hundredth of a square inch. If preferred, the dial and measuring wheel scale may be set at zero for this initial reading. In making this zero setting, lift carriage slightly and rotate the measuring wheel, touching only the plastic drum.

(5) Follow center of area boundary line with tracer point, moving clockwise. Stop on starting point. Take and record second reading to the nearest one-hundredth square inch.

(6) Subtract first reading from second reading. This difference is the check area to be used in checking the accuracy of the planimetering.

(7) Follow boundary line for two additional turns before stopping. Take and record the third reading. Subtract first reading from the third reading and divide by 3. This is the average area for three times around the boundary.

(8) Determine whether the average area is within allowable tolerance of check area determined in step 6 above. The difference between the check area and average area should be within tolerance listed in Table FL1--2 for Planimetering Tolerance of Certifying Amounts. If the tolerance is exceeded, the entire planimetering operation should be repeated. If within tolerance, the average area to the nearest one-hundredth square inch should be used as the area planimetered. This area should be converted to acres or other appropriate units. Certification of extent of practices on an acreage basis should be made to nearest 0.1 acre.

*Example*

First reading = 1.24 square inches

Second reading = 3.40 square inches

Check area = 3.40- 1.24 = 2.16 square inches

Tolerance, = $\pm$ 0.03 or 2.13 to 2.19
from Table FL1-2

Third reading = 7.75 square inches

Average area = $\frac{7.75 - 1.24}{3} = \frac{6.51}{3}$ = 2.17 sq in.

The 2.17 square inches is within allowable tolerance and would be used to convert to acres or other units.

NOTE: *Recordings of planimetering should be made and kept to substantiate certifications.*

(9) When spot-checking an outlined area which has been measured by a planimeter, the spot-checker should follow the above procedure . However, in comparing the results with the certified amounts, the planimetering tolerances for spot checking listed in Table FL1-2 should be used. Using the 2.17 square inches determined above as the certified amount, the spot-check tolerance would be $\pm$ .06 or 2.11 to 2.23 square inches. When the planimeter measures in acres, the measurement must be converted to square inches in order to use the tolerances in Table FL1-2.

**Table FL1E-1** Planimetering Tolerances

| Area Planimetered in square inches. | Planimetering Tolerance for Certifying Amounts | Planimetering Tolerance for Spot Checking |
|---|---|---|
| 0.01 - 0.99 | ± 0.01 square inches | ± 0.02 square inches |
| 1.00 - 1.99 | ± 0.02 square inches | ± 0.04 square inches |
| 2.00 - 2.99 | ± 0 .03 square inches | ± 0.06 square inches |
| 3.00 - 3.99 | ± 0 .04 square inches | ± 0.08 square inches |
| 4.00 - 4.99 | ± 0 .05 square inches | ± 0.10 square inches |
| 5.00 - 5.99 | ± 0.06 square inches | ± 0.12 square inches |
| 6.00 - 6.99 | ± 0.07 square inches | ± 0.14 square inches |
| 7.00 - 7.99 | ± 0.08 square inches | ± 0.16 square inches |
| 8.00 - 9.99 | ± 0.09 square inches | ± 0.18 square inches |
| 10.00 and above | ± 1.00 percent | ± 2.00 percent |

**Table FL1E-2** - Stadia Reduction Tables

| Degrees | 0 | | 1 | | 2 | | 3 | | Degrees |
|---|---|---|---|---|---|---|---|---|---|
| Minutes | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Minutes |
| 0 | 100.00 | 0.00 | 99.97 | 1.74 | 99.88 | 3.49 | 99.73 | 5.23 | 0 |
| 2 | 100.00 | 0.06 | 99.97 | 1.80 | 99.87 | 3.55 | 99.72 | 5.28 | 2 |
| 4 | 100.00 | 0.12 | 99.97 | 1.86 | 99.87 | 3.60 | 99.71 | 5.34 | 4 |
| 6 | 100.00 | 0.17 | 99.96 | 1.92 | 99.87 | 3.66 | 99.71 | 5.40 | 6 |
| 8 | 100.00 | 0.23 | 99.96 | 1.98 | 99.86 | 3.72 | 99.70 | 5.46 | 8 |
| **10** | **100.00** | **0.29** | **99.96** | **2.04** | **99.86** | **3.78** | **99.69** | **5.52** | **10** |
| 12 | 100.00 | 0.35 | 99.96 | 2.09 | 99.85 | 3.84 | 99.69 | 5.57 | 12 |
| 14 | 100.00 | 0.41 | 99.95 | 2.15 | 99.85 | 3.89 | 99.68 | 5.63 | 14 |
| 16 | 100.00 | 0.47 | 99.95 | 2.21 | 99.84 | 3.95 | 99.68 | 5.69 | 16 |
| 18 | 100.00 | 0.52 | 99.95 | 2.27 | 99.84 | 4.01 | 99.67 | 5.75 | 18 |
| **20** | **100.00** | **0.58** | **99.95** | **2.33** | **99.83** | **4.07** | **99.66** | **5.80** | **20** |
| 22 | 100.00 | 0.64 | 99.94 | 2.38 | 99.83 | 4.13 | 99.66 | 5.86 | 22 |
| 24 | 100.00 | 0.70 | 99.94 | 2.44 | 99.82 | 4.18 | 99.65 | 5.92 | 24 |
| 26 | 99.99 | 0.76 | 99.94 | 2.50 | 99.82 | 4.24 | 99.64 | 5.98 | 26 |
| 28 | 99.99 | 0.81 | 99.93 | 2.56 | 99.81 | 4.30 | 99.63 | 6.04 | 28 |
| **30** | **99.99** | **0.87** | **99.93** | **2.62** | **99.81** | **4.36** | **99.63** | **6.09** | **30** |
| 32 | 99.99 | 0.93 | 99.93 | 2.67 | 99.80 | 4.42 | 99.62 | 6.15 | 32 |
| 34 | 99.99 | 0.99 | 99.93 | 2.73 | 99.80 | 4.47 | 99.61 | 6.21 | 34 |
| 36 | 99.99 | 1.05 | 99.92 | 2.79 | 99.79 | 4.53 | 99.61 | 6.27 | 36 |
| 38 | 99.99 | 1.11 | 99.92 | 2.85 | 99.79 | 4.59 | 99.60 | 6.32 | 38 |
| **40** | **99.99** | **1.16** | **99.92** | **2.91** | **99.78** | **4.65** | **99.59** | **6.38** | **40** |
| 42 | 99.99 | 1.22 | 99.91 | 2.97 | 99.78 | 4.71 | 99.58 | 6.44 | 42 |
| 44 | 99.98 | 1.28 | 99.91 | 3.02 | 99.77 | 4.76 | 99.58 | 6.50 | 44 |
| 46 | 99.98 | 1.34 | 99.90 | 3.08 | 99.77 | 4.82 | 99.57 | 6.56 | 46 |
| 48 | 99.98 | 1.40 | 99.90 | 3.14 | 99.76 | 4.88 | 99.56 | 6.61 | 48 |
| **50** | **99.98** | **1.45** | **99.90** | **3.20** | **99.76** | **4.94** | **99.55** | **6.67** | **50** |
| 52 | 99.98 | 1.51 | 99.89 | 3.26 | 99.75 | 4.99 | 99.55 | 6.73 | 52 |
| 54 | 99.98 | 1.57 | 99.89 | 3.31 | 99.74 | 5.05 | 99.54 | 6.79 | 54 |
| 56 | 99.97 | 1.63 | 99.89 | 3.37 | 99.74 | 5.11 | 99.53 | 6.84 | 56 |
| 58 | 99.97 | 1.69 | 99.88 | 3.43 | 99.73 | 5.17 | 99.52 | 6.90 | 58 |
| **60** | **99.97** | **1.74** | **99.88** | **3.49** | **99.73** | **5.23** | **99.51** | **6.96** | **60** |

**Table FL1E-2 -** Stadia Reduction Tables

| Degrees | 4 | | 5 | | 6 | | 7 | | Degrees |
|---|---|---|---|---|---|---|---|---|---|
| **Minutes** | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | **Minutes** |
| 0 | 99.51 | 6.96 | 99.24 | 8.68 | 98.91 | 10.40 | 98.51 | 12.10 | 0 |
| 2 | 99.51 | 7.02 | 99.23 | 8.74 | 98.90 | 10.45 | 98.50 | 12.15 | 2 |
| 4 | 99.50 | 7.07 | 99.22 | 8.80 | 98.88 | 10.51 | 98.49 | 12.21 | 4 |
| 6 | 99.49 | 7.13 | 99.21 | 8.85 | 98.87 | 10.57 | 98.47 | 12.27 | 6 |
| 8 | 99.48 | 7.19 | 99.20 | 8.91 | 98.86 | 10.62 | 98.46 | 12.32 | 8 |
| **10** | **99.47** | **7.25** | **99.19** | **8.97** | **98.85** | **10.68** | **98.44** | **12.38** | **10** |
| 12 | 99.46 | 7.30 | 99.18 | 9.03 | 98.83 | 10.74 | 98.43 | 12.43 | 12 |
| 14 | 99.46 | 7.36 | 99.17 | 9.08 | 98.82 | 10.79 | 98.41 | 12.49 | 14 |
| 16 | 99.45 | 7.42 | 99.16 | 9.14 | 98.81 | 10.85 | 98.40 | 12.55 | 16 |
| 18 | 99.44 | 7.48 | 99.15 | 9.20 | 98.80 | 10.91 | 98.39 | 12.60 | 18 |
| **20** | **99.43** | **7.53** | **99.14** | **9.25** | **98.78** | **10.96** | **98.37** | **12.66** | **20** |
| 22 | 99.42 | 7.59 | 99.13 | 9.31 | 98.77 | 11.02 | 98.36 | 12.72 | 22 |
| 24 | 99.41 | 7.65 | 99.11 | 9.37 | 98.76 | 11.08 | 98.34 | 12.77 | 24 |
| 26 | 99.40 | 7.71 | 99.10 | 9.43 | 98.74 | 11.13 | 98.33 | 12.83 | 26 |
| 28 | 99.39 | 7.76 | 99.09 | 9.48 | 98.73 | 11.19 | 98.31 | 12.88 | 28 |
| **30** | **99.38** | **7.82** | **99.08** | **9.54** | **98.72** | **11.25** | **98.30** | **12.94** | **30** |
| 32 | 99.38 | 7.88 | 99.07 | 9.60 | 98.71 | 11.30 | 98.28 | 13.00 | 32 |
| 34 | 99.37 | 7.94 | 99.06 | 9.65 | 98.69 | 11.36 | 98.27 | 13.05 | 34 |
| 36 | 99.36 | 7.99 | 99.05 | 9.71 | 98.68 | 11.42 | 98.25 | 13.11 | 36 |
| 38 | 99.35 | 8.05 | 99.04 | 9.77 | 98.67 | 11.47 | 98.24 | 13.17 | 38 |
| **40** | **99.34** | **8.11** | **99.03** | **9.83** | **98.65** | **11.53** | **98.22** | **13.22** | **40** |
| 42 | 99.33 | 8.17 | 99.01 | 9.88 | 98.64 | 11.59 | 98.20 | 13.28 | 42 |
| 44 | 99.32 | 8.22 | 99.00 | 9.94 | 98.63 | 11.64 | 98.19 | 13.33 | 44 |
| 46 | 99.31 | 8.28 | 98.99 | 10.00 | 98.61 | 11.70 | 98.17 | 13.39 | 46 |
| 48 | 99.30 | 8.34 | 98.98 | 10.05 | 98.60 | 11.76 | 98.16 | 13.45 | 48 |
| **50** | **99.29** | **8.40** | **98.97** | **10.11** | **98.58** | **11.81** | **98.14** | **13.50** | **50** |
| 52 | 99.28 | 8.45 | 98.96 | 10.17 | 98.57 | 11.87 | 98.13 | 13.56 | 52 |
| 54 | 99.27 | 8.51 | 98.94 | 10.22 | 98.56 | 11.93 | 98.11 | 13.61 | 54 |
| 56 | 99.26 | 8.57 | 98.93 | 10.28 | 98.54 | 11.98 | 98.10 | 13.67 | 56 |
| 58 | 99.25 | 8.63 | 98.92 | 10.34 | 98.53 | 12.04 | 98.08 | 13.73 | 58 |
| **60** | **99.24** | **8.68** | **98.91** | **10.40** | **98.51** | **12.10** | **98.06** | **13.78** | **60** |

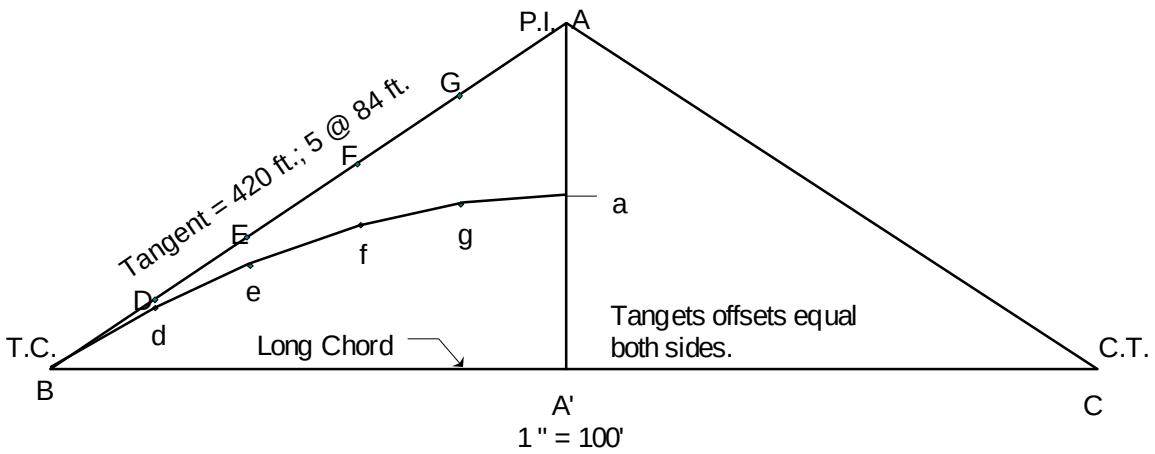
**Table FL1E-2** - Stadia Reduction Tables

| Degrees | 8 | | 9 | | 10 | | 11 | | Degrees |
|---|---|---|---|---|---|---|---|---|---|
| **Minutes** | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | Hor. Dist. | Elev. Diff. | **Minutes** |
| 0 | 98.06 | 13.78 | 97.55 | 15.45 | 96.98 | 17.10 | 96.36 | 18.73 | 0 |
| 2 | 98.05 | 13.84 | 97.53 | 15.51 | 96.96 | 17.16 | 96.34 | 18.78 | 2 |
| 4 | 98.03 | 13.89 | 97.52 | 15.56 | 96.94 | 17.21 | 96.32 | 18.84 | 4 |
| 6 | 98.01 | 13.95 | 97.50 | 15.62 | 96.92 | 17.26 | 96.29 | 18.89 | 6 |
| 8 | 98.00 | 14.01 | 97.48 | 15.67 | 96.90 | 17.32 | 96.27 | 18.95 | 8 |
| **10** | **97.98** | **14.06** | **97.46** | **15.73** | **96.88** | **17.37** | **96.25** | **19.00** | **10** |
| 12 | 97.97 | 14.12 | 97.44 | 15.78 | 96.86 | 17.43 | 96.23 | 19.05 | 12 |
| 14 | 97.95 | 14.17 | 97.43 | 15.84 | 96.84 | 17.48 | 96.21 | 19.11 | 14 |
| 16 | 97.93 | 14.23 | 97.41 | 15.89 | 96.82 | 17.54 | 96.18 | 19.16 | 16 |
| 18 | 97.92 | 14.28 | 97.39 | 15.95 | 96.80 | 17.59 | 96.16 | 19.21 | 18 |
| **20** | **97.90** | **14.34** | **97.37** | **16.00** | **96.78** | **17.65** | **96.14** | **19.27** | **20** |
| 22 | 97.88 | 14.40 | 97.35 | 16.06 | 96.76 | 17.70 | 96.12 | 19.32 | 22 |
| 24 | 97.87 | 14.45 | 97.33 | 16.11 | 96.74 | 17.76 | 96.09 | 19.38 | 24 |
| 26 | 97.85 | 14.51 | 97.31 | 16.17 | 96.72 | 17.81 | 96.07 | 19.43 | 26 |
| 28 | 97.83 | 14.56 | 97.29 | 16.22 | 96.70 | 17.86 | 96.05 | 19.48 | 28 |
| **30** | **97.82** | **14.62** | **97.28** | **16.28** | **96.68** | **17.92** | **96.03** | **19.54** | **30** |
| 32 | 97.80 | 14.67 | 97.26 | 16.33 | 96.66 | 17.97 | 96.00 | 19.59 | 32 |
| 34 | 97.78 | 14.73 | 97.24 | 16.39 | 96.64 | 18.03 | 95.98 | 19.64 | 34 |
| 36 | 97.76 | 14.79 | 97.22 | 16.44 | 96.62 | 18.08 | 95.96 | 19.70 | 36 |
| 38 | 97.75 | 14.84 | 97.20 | 16.50 | 96.60 | 18.14 | 95.93 | 19.75 | 38 |
| **40** | **97.73** | **14.90** | **97.18** | **16.55** | **96.57** | **18.19** | **95.91** | **19.80** | **40** |
| 42 | 97.71 | 14.95 | 97.16 | 16.61 | 96.55 | 18.24 | 95.89 | 19.86 | 42 |
| 44 | 97.69 | 15.01 | 97.14 | 16.66 | 96.53 | 18.30 | 95.86 | 19.91 | 44 |
| 46 | 97.68 | 15.06 | 97.12 | 16.72 | 96.51 | 18.35 | 95.84 | 19.96 | 46 |
| 48 | 97.66 | 15.12 | 97.10 | 16.77 | 96.49 | 18.41 | 95.82 | 20.02 | 48 |
| **50** | **97.64** | **15.17** | **97.08** | **16.83** | **96.47** | **18.46** | **95.79** | **20.07** | **50** |
| 52 | 97.62 | 15.23 | 97.06 | 16.88 | 96.45 | 18.51 | 95.77 | 20.12 | 52 |
| 54 | 97.61 | 15.28 | 97.04 | 16.94 | 96.42 | 18.57 | 95.75 | 20.18 | 54 |
| 56 | 97.59 | 15.34 | 97.02 | 16.99 | 96.40 | 18.62 | 95.72 | 20.23 | 56 |
| 58 | 97.57 | 15.40 | 97.00 | 17.05 | 96.38 | 18.68 | 95.70 | 20.28 | 58 |
| **60** | **97.55** | **15.45** | **96.98** | **17.10** | **96.36** | **18.73** | **95.68** | **20.34** | **60** |

**Table FL1E-2 -** Stadia Reduction Tables

| **Degrees** | **12** | | **13** | | **14** | | **15** | | **Degrees** |
|---|---|---|---|---|---|---|---|---|---|
| **Minutes** | Hor. Dist. | Elev. Diff. | Hor. Dist | Elev. Diff. | Hor. Dist | Elev. Diff. | Hor. Dist | Elev. Diff. | **Minutes** |
| 0 | 95.68 | 20.34 | 94.94 | 21.92 | 94.15 | 23.47 | 93.30 | 25.00 | 0 |
| 2 | 95.65 | 20.39 | 94.91 | 21.97 | 94.12 | 23.52 | 93.27 | 25.05 | 2 |
| 4 | 95.63 | 20.44 | 94.89 | 22.02 | 94.09 | 23.58 | 93.24 | 25.10 | 4 |
| 6 | 95.61 | 20.50 | 94.86 | 22.08 | 94.07 | 23.63 | 93.21 | 25.15 | 6 |
| 8 | 95.58 | 20.55 | 94.84 | 22.13 | 94.04 | 23.68 | 93.18 | 25.20 | 8 |
| **10** | **95.56** | **20.60** | **94.81** | **22.18** | **94.01** | **23.73** | **93.16** | **25.25** | **10** |
| 12 | 95.53 | 20.66 | 94.79 | 22.23 | 93.98 | 23.78 | 93.13 | 25.30 | 12 |
| 14 | 95.51 | 20.71 | 94.76 | 22.28 | 93.95 | 23.83 | 93.10 | 25.35 | 14 |
| 16 | 95.49 | 20.76 | 94.73 | 22.34 | 93.93 | 23.88 | 93.07 | 25.40 | 16 |
| 18 | 95.46 | 20.81 | 94.71 | 22.39 | 93.90 | 23.93 | 93.04 | 25.45 | 18 |
| **20** | **95.44** | **20.87** | **94.68** | **22.44** | **93.87** | **23.99** | **93.01** | **25.50** | **20** |
| 22 | 95.41 | 20.92 | 94.66 | 22.49 | 93.84 | 24.04 | 92.98 | 25.55 | 22 |
| 24 | 95.39 | 20.97 | 94.63 | 22.54 | 93.82 | 24.09 | 92.95 | 25.60 | 24 |
| 26 | 95.36 | 21.03 | 94.60 | 22.60 | 93.79 | 24.14 | 92.92 | 25.65 | 26 |
| 28 | 95.34 | 21.08 | 94.58 | 22.65 | 93.76 | 24.19 | 92.89 | 25.70 | 28 |
| **30** | **95.32** | **21.13** | **94.55** | **22.70** | **93.73** | **24.24** | **92.86** | **25.75** | **30** |
| 32 | 95.29 | 21.18 | 94.52 | 22.75 | 93.70 | 24.29 | 92.83 | 25.80 | 32 |
| 34 | 95.27 | 21.24 | 94.50 | 22.80 | 93.67 | 24.34 | 92.80 | 25.85 | 34 |
| 36 | 95.24 | 21.29 | 94.47 | 22.85 | 93.65 | 24.39 | 92.77 | 25.90 | 36 |
| 38 | 95.22 | 21.34 | 94.44 | 22.91 | 93.62 | 24.44 | 92.74 | 25.95 | 38 |
| **40** | **95.19** | **21.39** | **94.42** | **22.96** | **93.59** | **24.49** | **92.71** | **26.00** | **40** |
| 42 | 95.17 | 21.45 | 94.39 | 23.01 | 93.56 | 24.55 | 92.68 | 26.05 | 42 |
| 44 | 95.14 | 21.50 | 94.36 | 23.06 | 93.53 | 24.60 | 92.65 | 26.10 | 44 |
| 46 | 95.12 | 21.55 | 94.34 | 23.11 | 93.50 | 24.65 | 92.62 | 26.15 | 46 |
| 48 | 95.09 | 21.60 | 94.31 | 23.16 | 93.47 | 24.70 | 92.59 | 26.20 | 48 |
| **50** | **95.07** | **21.66** | **94.28** | **23.22** | **93.45** | **24.75** | **92.56** | **26.25** | **50** |
| 52 | 95.04 | 21.71 | 94.26 | 23.27 | 93.42 | 24.80 | 92.53 | 26.30 | 52 |
| 54 | 95.02 | 21.76 | 94.23 | 23.32 | 93.39 | 24.85 | 92.49 | 26.35 | 54 |
| 56 | 94.99 | 21.81 | 94.20 | 23.37 | 93.36 | 24.90 | 92.46 | 26.40 | 56 |
| 58 | 94.97 | 21.87 | 94.17 | 23.42 | 93.33 | 24.95 | 92.43 | 26.45 | 58 |
| **60** | **94.94** | **21.92** | **94.15** | **23.47** | **93.30** | **25.00** | **92.40** | **26.50** | **60** |

**Exhibit FL1E-1** - Laying Out a Curve Without A Transit




1. Select tangent points and stake.
2. Sight P.I. and stake tangent.
segments of the tangent
3. Determine tangent length e.g. 420 ft.
4. Divide tangent length into equal increments
and stake. e.g., 84 ft. lengths with n = 5
5. Stake long chord (any interval)
6. Measure distance from long chord to P.I. = 238 ft.
Divide by 2 and stake point a. @ 119 ft.
7. $Dd = Aa/n^2$ =119/25 = 4.76
distances are
Ee = 4Dd = 4(4.76) = 19.0
long chord.
Ff = 9Dd = 9(4.76) = 42.8
Gg = 16Dd = 16(4.76) = 76.2

Definitions:
n = number of equal

Dd, Ee, etc., = tangent offset
$Dd = Aa/n^2$
$Ee = 2^2$ Dd
$Ff = 3^2$ Dd
$Gg = 4^2$ Dd and so on

NOTE: Tangent offset

perpendicular to the

**Table FL1E-3** Map Scales and Equivalents

| MAP SCALES AND EQUIVALENTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FRACTIONAL SCALE | FEET PER INCH | IN. PER 1000 FT. | INCHES PER MILE | MILES PER INCH | METERS PER IN. | ACRES PER SQ. INCH | SQ. IN. PER ACRE | SQ. MII. PER SQ. INCH |
| 1:500 | 41.667 | 24.000 | 126.720 | 0.008 | 12.700 | 0.0399 | 25.091 | 0.00006 |
| 1:600 | 50.000 | 20.000 | 105.600 | 0.009 | 15.240 | 0.0574 | 17.424 | 0.00009 |
| 1:1000 | 83.333 | 12.000 | 63.360 | 0.016 | 25.400 | 0.1594 | 6.273 | 0.00025 |
| 1:1200 | 100.000 | 10.000 | 52.800 | 0.019 | 30.480 | 0.2296 | 4.356 | 0.00036 |
| 1:1500 | 125.000 | 8.000 | 42.240 | 0.024 | 38.100 | 0.3587 | 2.788 | 0.00056 |
| 1:2000 | 166.667 | 6.000 | 31.680 | 0.032 | 50.800 | 0.6377 | 1.568 | 0.00100 |
| 1:2400 | 200.000 | 5.000 | 26.400 | 0.038 | 60.960 | 0.9183 | 1.089 | 0.00143 |
| 1:2500 | 208.333 | 4.800 | 25.344 | 0.039 | 63.500 | 0.9964 | 1.004 | 0.00156 |
| 1:3000 | 250.000 | 4.000 | 21.120 | 0.047 | 76.200 | 1.4348 | 0.697 | 0.00224 |
| 1:3600 | 300.000 | 3.333 | 17.600 | 0.057 | 91.440 | 2.0661 | 0.484 | 0.00323 |
| 1:4000 | 333.333 | 3.000 | 15.840 | 0.063 | 101.600 | 2.5508 | 0.392 | 0.00399 |
| 1:4800 | 400.000 | 2.500 | 13.200 | 0.076 | 121.920 | 3.6731 | 0.272 | 0.00574 |
| 1:5000 | 416.667 | 2.400 | 12.672 | 0.079 | 127.000 | 3.9856 | 0.251 | 0.00623 |
| 1:6000 | 500.000 | 2.000 | 10.560 | 0.095 | 152.400 | 5.7392 | 0.174 | 0.00897 |
| 1:7000 | 583.333 | 1.714 | 9.051 | 0.110 | 177.800 | 7.8117 | 0.128 | 0.01221 |
| 1:7200 | 600.000 | 1.667 | 8.800 | 0.114 | 182.880 | 8.2645 | 0.121 | 0.01291 |
| 1:7920 | 660.000 | 1.515 | 8.000 | 0.125 | 201.168 | 10.0000 | 0.100 | 0.01563 |
| 1:8000 | 666.667 | 1.500 | 7.920 | 0.126 | 203.200 | 10.2030 | 0.098 | 0.01594 |
| 1:8400 | 700.000 | 1.429 | 7.543 | 0.133 | 213.360 | 11.2489 | 0.089 | 0.01758 |
| 1:9000 | 750.000 | 1.333 | 7.040 | 0.142 | 228.600 | 12.9132 | 0.077 | 0.02018 |
| 1:9600 | 800.000 | 1.250 | 6.600 | 0.152 | 243.840 | 14.6924 | 0.068 | 0.02296 |
| 1:10000 | 833.333 | 1.200 | 6.336 | 0.158 | 254.001 | 15.9423 | 0.063 | 0.02491 |
| 1:10800 | 900.000 | 1.111 | 5.867 | 0.170 | 274.321 | 18.5950 | 0.054 | 0.02905 |
| 1:12000 | 1000.000 | 1.000 | 5.280 | 0.189 | 304.801 | 22.9568 | 0.044 | 0.03587 |
| 1:13200 | 1100.000 | 0.909 | 4.800 | 0.208 | 335.281 | 27.7778 | 0.036 | 0.04340 |
| 1:14400 | 1200.000 | 0.833 | 4.400 | 0.227 | 365.761 | 33.0579 | 0.030 | 0.05165 |
| 1:15000 | 1250.000 | 0.800 | 4.224 | 0.237 | 381.001 | 35.8701 | 0.028 | 0.05605 |
| 1:15600 | 1300.000 | 0.769 | 4.062 | 0.246 | 396.241 | 38.7971 | 0.026 | 0.06062 |
| 1:15840 | 1320.000 | 0.758 | 4.000 | 0.250 | 402.337 | 40.0000 | 0.025 | 0.06250 |
| 1:16000 | 1333.333 | 0.750 | 3.960 | 0.253 | 406.401 | 40.8122 | 0.025 | 0.06377 |
| 1:16800 | 1400.000 | 0.714 | 3.771 | 0.265 | 426.721 | 44.9954 | 0.022 | 0.07031 |
| 1:18000 | 1500.000 | 0.667 | 3.520 | 0.284 | 457.201 | 51.6529 | 0.019 | 0.08071 |
| 1:19200 | 1600.000 | 0.625 | 3.300 | 0.303 | 487.681 | 58.7695 | 0.017 | 0.09183 |
| 1:20000 | 1666.667 | 0.600 | 3.168 | 0.316 | 508.001 | 63.7690 | 0.016 | 0.09964 |
| 1:20400 | 1700.000 | 0.588 | 3.106 | 0.322 | 518.161 | 66.3453 | 0.015 | 0.10366 |
| 1:21120 | 1760.000 | 0.568 | 3.000 | 0.333 | 536.449 | 71.1111 | 0.014 | 0.11111 |
| 1:21600 | 1800.000 | 0.556 | 2.933 | 0.341 | 548.641 | 74.3802 | 0.013 | 0.11622 |
| 1:22800 | 1900.000 | 0.526 | 2.779 | 0.360 | 579.121 | 82.8742 | 0.012 | 0.12949 |
| 1:24000 | 2000.000 | 0.500 | 2.640 | 0.379 | 609.601 | 91.8274 | 0.011 | 0.14348 |
| 1:25000 | 2083.333 | 0.480 | 2.534 | 0.395 | 635.001 | 99.6391 | 0.010 | 0.15569 |
| 1:31680 | 2640.000 | 0.379 | 2.000 | 0.500 | 804.674 | 160.0000 | 0.006 | 0.25000 |
| 1:48000 | 4000.000 | 0.250 | 1.320 | 0.758 | 1219.202 | 367.3095 | 0.003 | 0.57392 |
| 1:62500 | 5208.333 | 0.192 | 1.014 | 0.986 | 1587.503 | 622.7442 | 0.002 | 0.97304 |
| 1:63360 | 5280.000 | 0.189 | 1.000 | 1.000 | 1609.347 | 640.0000 | 0.002 | 1.00000 |
| 1:96000 | 8000.000 | 0.125 | 0.660 | 1.515 | 2438.405 | 1469.2378 | 0.001 | 2.29568 |
| 1:1:125000 | 10416.667 | 0.096 | 0.507 | 1.973 | 3175.006 | 2490.9767 | 0.000 | 3.89215 |
| 1:126720 | 10560.000 | 0.095 | 0.500 | 2.000 | 3218.694 | 2560.0000 | 0.000 | 4.00000 |
| 1:250000 | 20833.333 | 0.048 | 0.253 | 3.946 | 6350.013 | 9963.9067 | 0.000 | 15.56860 |
| 1:253440 | 21120.000 | 0.047 | 0.250 | 4.000 | 6437.389 | 10240.0000 | 0.000 | 16.00000 |
| 1:500000 | 41666.667 | 0.024 | 0.127 | 7.891 | 12700.025 | 39855.6270 | 0.000 | 62.27442 |
| 1:1000000 | 83333.333 | 0.012 | 0.063 | 15.783 | 25400.050 | 159422.5079 | 0.000 | 249.09767 |
| FORMULAS | $\frac{\text{SCALE}}{12}$ | $\frac{12000}{\text{SCALE}}$ | $\frac{63360}{\text{SCALE}}$ | $\frac{\text{SCALE}}{63360}$ | Ft. per in. x 0.3048006 | $\frac{\text{SCALE}^2}{43560 \times 144}$ | $\frac{43560 \times 144}{\text{SCALE}^2}$ | $\frac{(\text{Ft. per in.})^2}{(5280)^2}$ |