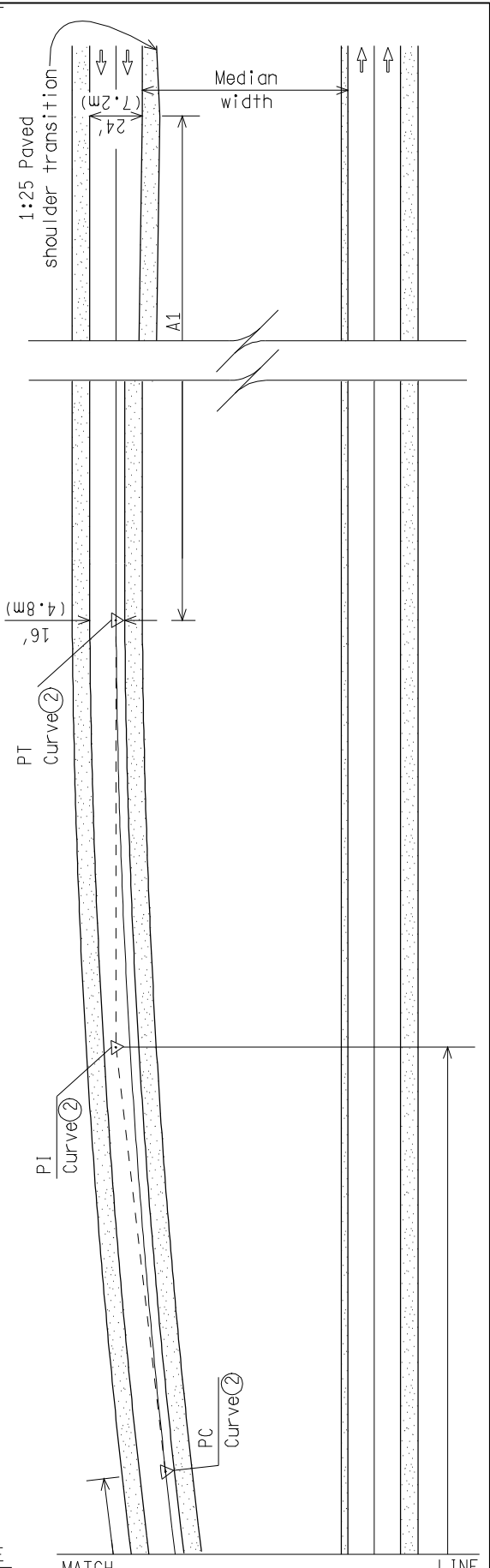
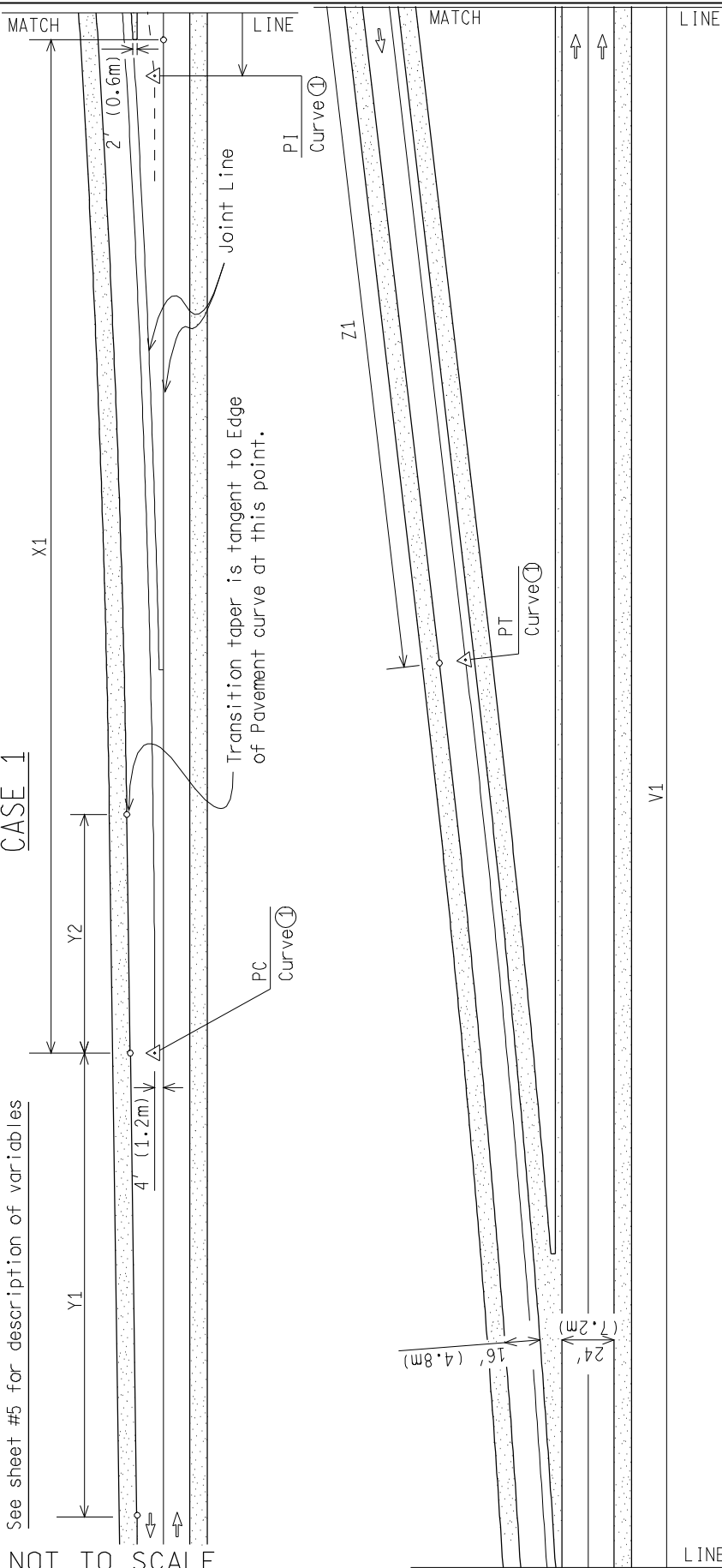


CASE 1

See sheet #5 for description of variables

NOT TO SCALE



TRAFFIC AND SAFETY
 DRAWN BY: ECH
 CHECKED BY: IRG/JAT
 FILE: PW RD TS Geo/mdot traf GEO-610-C.dgn

BY: *John C. Friend*
 ENGINEER OF DELIVERY
 BY: *Mark A. Van Pelt*
 ENGINEER OF DEVELOPMENT
 REV. 01/20/2010

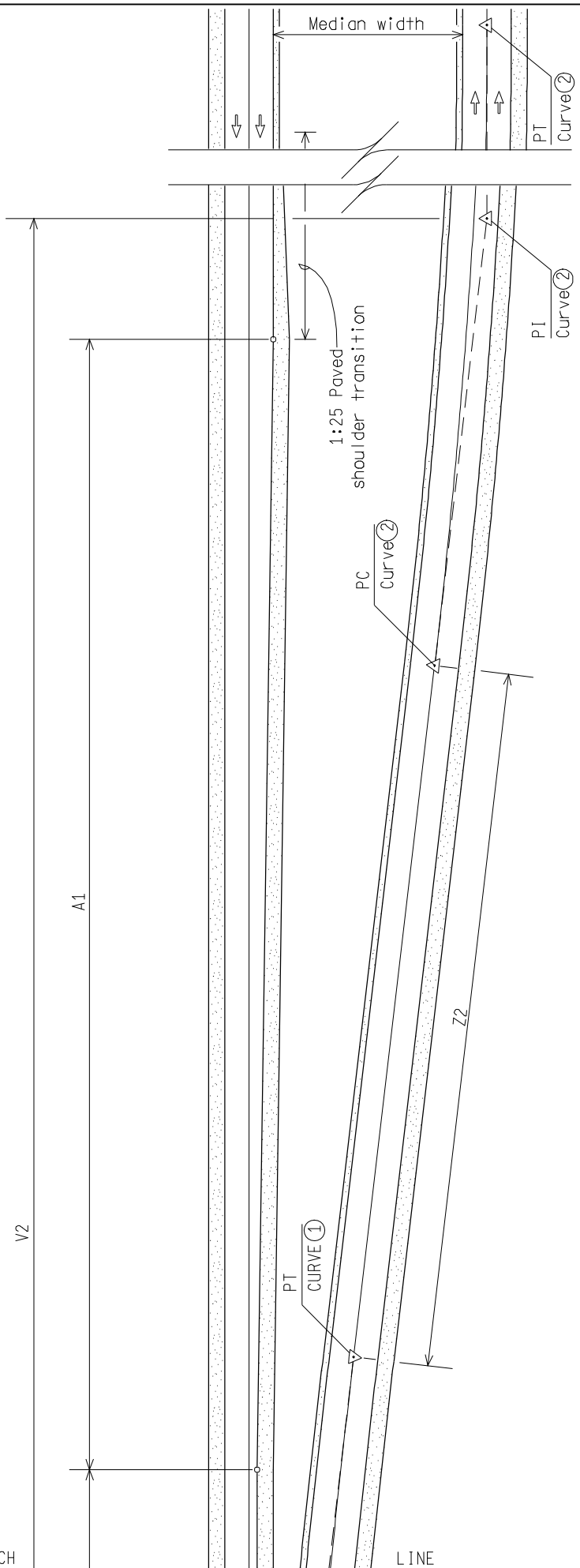
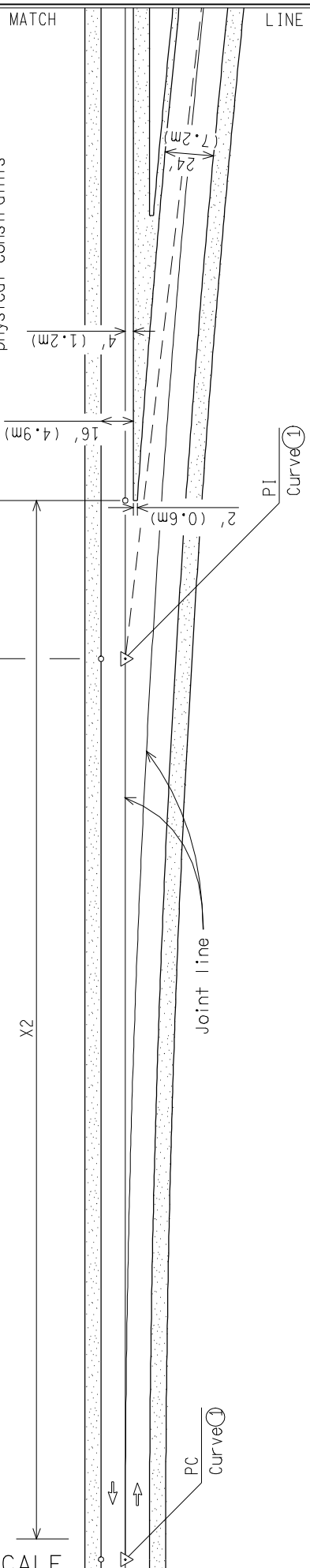
GEOMETRIC DESIGN GUIDE FOR
 TWO LANE TO FOUR LANE
 DIVIDED TRANSITION

06/03/2010
 PLAN DATE: GEO-610-C SHEET 1 OF 5

See sheet #5 for description of variables

CASE 2

3 sec x 1.47 Design Speed (mph) desirable
3 sec x 0.278 Design Speed (kph) desirable
other distances may be required based on physical constraints



NOT TO SCALE

| DESIGN SPEED | MEDIAN WIDTHS | DELTA | CURVE 1 DATA | | | | CURVE 2 DATA | | | | CASE 1 DATA | | | | | | CASE 2 DATA | | | | |
|--------------|---------------|--------|--------------|---------|--------|--------|--------------|---------|---------|--------|-------------|--------|--------|--------|--------|--------|-------------|---------|--------|--------|-----|
| | | | D1 | R1 | T1 | L1 | E1 | D2 | R2 | T2 | L2 | E2 | V1 | Z1 | X1 | Y1 | Y2 | V2 | Z2 | X2 | A1 |
| 70 | 94 | 6°41' | 0°45' | 7639.44 | 446.06 | 891.11 | 13.01 | 1°30' | 3819.72 | 223.03 | 445.56 | 6.51 | 972.88 | 310.44 | 462.41 | 225.52 | 108.96 | 1007.01 | 344.81 | 524.53 | 840 |
| | 84 | 6°19' | 0°45' | 7639.44 | 421.54 | 842.22 | 11.62 | 1°30' | 3819.72 | 210.77 | 421.11 | 5.81 | 939.51 | 312.95 | 462.41 | 225.52 | 108.96 | 975.65 | 349.30 | 524.53 | 840 |
| | 70 | 5°48' | 0°45' | 7639.44 | 387.00 | 773.33 | 9.80 | 1°30' | 3819.72 | 193.50 | 386.67 | 4.90 | 886.03 | 310.10 | 462.41 | 225.52 | 108.96 | 925.41 | 349.68 | 524.53 | 840 |
| | 60 | 5°23' | 0°45' | 7639.44 | 359.15 | 717.78 | 8.44 | 1°30' | 3819.72 | 179.58 | 358.89 | 4.22 | 848.95 | 313.98 | 462.41 | 225.52 | 108.96 | 891.39 | 356.61 | 524.53 | 840 |
| | 46 | 4°48' | 0°45' | 7639.44 | 320.19 | 640.00 | 6.71 | 1°30' | 3819.72 | 160.09 | 320.00 | 3.35 | 785.97 | 308.46 | 462.41 | 225.52 | 108.96 | 833.61 | 356.26 | 524.53 | 840 |
| | 36 | 4°19' | 0°45' | 7639.44 | 287.91 | 575.56 | 5.42 | 1°30' | 3819.72 | 143.96 | 287.78 | 2.71 | 741.89 | 312.13 | 462.41 | 225.52 | 108.96 | 794.88 | 365.27 | 524.53 | 840 |
| | 26 | 3°49' | 0°45' | 7639.44 | 254.54 | 508.89 | 4.24 | 1°30' | 3819.72 | 127.27 | 254.44 | 2.12 | 689.53 | 309.25 | 462.41 | 225.52 | 108.96 | 749.49 | 369.35 | 524.75 | 840 |
| | 60 | 7°38' | 1°10' | 4911.07 | 327.63 | 654.29 | 10.92 | 3°30' | 1637.02 | 109.21 | 218.10 | 3.64 | 850.62 | 421.38 | 370.71 | 199.18 | 81.64 | 880.46 | 451.50 | 420.60 | 720 |
| | 84 | 7°11' | 1°10' | 4911.07 | 308.26 | 615.71 | 9.67 | 3°30' | 1637.02 | 102.75 | 205.24 | 3.22 | 825.18 | 420.69 | 370.71 | 199.18 | 81.64 | 856.91 | 452.68 | 420.60 | 720 |
| | 70 | 6°31' | 1°10' | 4911.07 | 279.59 | 558.57 | 7.95 | 3°30' | 1637.02 | 93.20 | 186.19 | 2.65 | 787.88 | 420.22 | 370.71 | 199.18 | 81.64 | 822.90 | 455.47 | 420.60 | 720 |
| 60 | 6°00' | 1°10' | 4911.07 | 257.38 | 514.29 | 6.74 | 3°30' | 1637.02 | 85.79 | 171.43 | 2.25 | 761.15 | 422.17 | 370.71 | 199.18 | 81.64 | 799.21 | 460.44 | 420.60 | 720 | |
| 46 | 5°15' | 1°10' | 4911.07 | 225.16 | 450.00 | 5.16 | 3°30' | 1637.02 | 75.05 | 150.00 | 1.72 | 718.27 | 421.09 | 370.71 | 199.18 | 81.64 | 761.80 | 464.80 | 420.60 | 720 | |
| 36 | 4°40' | 1°10' | 4911.07 | 200.11 | 400.00 | 4.08 | 3°30' | 1637.02 | 66.70 | 133.33 | 1.36 | 686.03 | 421.50 | 370.71 | 199.18 | 81.64 | 735.03 | 470.66 | 421.11 | 720 | |
| 26 | 4°02' | 1°10' | 4911.07 | 172.93 | 345.71 | 3.04 | 3°30' | 1637.02 | 57.64 | 115.24 | 1.01 | 652.38 | 423.42 | 371.62 | 199.18 | 81.64 | 709.10 | 480.29 | 428.63 | 720 | |
| 50 | 94 | 8°50' | 1°30' | 3819.72 | 295.03 | 588.89 | 11.38 | 5°30' | 1041.74 | 80.46 | 160.61 | 3.10 | 733.57 | 366.89 | 326.91 | 161.93 | 76.14 | 759.31 | 392.93 | 370.97 | 600 |
| 84 | 8°19' | 1°30' | 3819.72 | 277.71 | 554.44 | 10.08 | 5°30' | 1041.74 | 75.74 | 151.21 | 2.75 | 711.45 | 365.56 | 326.91 | 161.93 | 76.14 | 738.81 | 393.21 | 370.97 | 600 | |
| 70 | 7°32' | 1°30' | 3819.72 | 251.47 | 502.22 | 8.27 | 5°30' | 1041.74 | 68.58 | 136.97 | 2.26 | 680.56 | 366.43 | 326.91 | 161.93 | 76.14 | 710.81 | 396.94 | 370.97 | 600 | |
| 60 | 6°57' | 1°30' | 3819.72 | 231.95 | 463.33 | 7.04 | 5°30' | 1041.74 | 63.26 | 126.36 | 1.92 | 656.28 | 365.93 | 326.91 | 161.93 | 76.14 | 689.10 | 398.99 | 370.97 | 600 | |
| 46 | 6°04' | 1°30' | 3819.72 | 202.41 | 404.44 | 5.36 | 5°30' | 1041.74 | 55.20 | 110.30 | 1.46 | 621.00 | 366.88 | 326.91 | 161.93 | 76.14 | 658.63 | 404.73 | 370.97 | 600 | |
| 36 | 5°24' | 1°30' | 3819.72 | 180.13 | 360.00 | 4.25 | 5°30' | 1041.74 | 49.13 | 98.18 | 1.16 | 592.42 | 365.80 | 326.91 | 161.93 | 76.14 | 634.73 | 408.30 | 371.12 | 600 | |
| 26 | 4°40' | 1°30' | 3819.72 | 155.64 | 311.11 | 3.17 | 5°30' | 1041.74 | 42.45 | 84.85 | 0.86 | 563.52 | 367.31 | 327.31 | 161.93 | 76.14 | 612.53 | 416.47 | 376.64 | 600 | |
| 40 | 94 | 10°21' | 2°00' | 2864.79 | 259.46 | 517.50 | 11.73 | 7°30' | 763.94 | 69.19 | 138.00 | 3.13 | 624.20 | 305.88 | 283.07 | 124.35 | 71.30 | 646.11 | 328.15 | 321.31 | 320 |
| 84 | 9°44' | 2°00' | 2864.79 | 243.92 | 486.67 | 10.37 | 7°30' | 763.94 | 65.05 | 129.78 | 2.76 | 606.30 | 306.19 | 283.07 | 124.35 | 71.30 | 629.62 | 329.85 | 321.31 | 320 | |
| 70 | 8°50' | 2°00' | 2864.79 | 221.47 | 441.67 | 8.53 | 7°30' | 763.94 | 59.01 | 117.78 | 2.28 | 579.14 | 305.81 | 283.07 | 124.35 | 71.30 | 604.88 | 331.86 | 321.31 | 320 | |
| 60 | 8°09' | 2°00' | 2864.79 | 204.09 | 407.50 | 7.26 | 7°30' | 763.94 | 54.43 | 108.67 | 1.94 | 558.61 | 305.79 | 283.07 | 124.35 | 71.30 | 586.54 | 334.01 | 321.31 | 320 | |
| 46 | 7°08' | 2°00' | 2864.79 | 178.56 | 356.67 | 5.56 | 7°30' | 763.94 | 47.62 | 95.11 | 1.48 | 527.38 | 305.31 | 283.07 | 124.35 | 71.30 | 559.34 | 337.52 | 321.31 | 320 | |
| 36 | 6°21' | 2°00' | 2864.79 | 158.91 | 317.50 | 4.40 | 7°30' | 763.94 | 42.38 | 84.67 | 1.17 | 503.22 | 305.03 | 283.07 | 124.35 | 71.30 | 539.16 | 341.20 | 321.33 | 320 | |
| 26 | 5°30' | 2°00' | 2864.79 | 137.61 | 275.00 | 3.30 | 7°30' | 763.94 | 36.69 | 73.33 | 0.88 | 477.73 | 305.64 | 283.19 | 124.35 | 71.30 | 519.27 | 347.37 | 325.12 | 320 | |

*Note all distances are in feet and speeds in mph. Values are based on a 12' lane width.

| DESIGN SPEED | MEDIAN WIDTHS | CURVE 1 DATA | | | | CURVE 2 DATA | | | | CASE 1 DATA | | | | | | CASE 2 DATA | | | |
|--------------|---------------|--------------|--------|--------|------|--------------|-------|--------|------|-------------|--------|--------|-------|-------|--------|-------------|--------|-----|--|
| | | R1 | T1 | L1 | E1 | R2 | T2 | L2 | E2 | V1 | Z1 | X1 | Y1 | Y2 | V2 | Z2 | X2 | A1 | |
| 120 | | 2400 | 137.33 | 274.37 | 3.93 | 1200 | 68.67 | 137.18 | 1.96 | 304.83 | 100.83 | 141.96 | 73.41 | 32.14 | 315.28 | 111.35 | 161.03 | 270 | |
| | | 2400 | 130.33 | 260.40 | 3.54 | 1200 | 65.16 | 130.20 | 1.77 | 293.77 | 100.01 | 141.96 | 73.41 | 32.14 | 304.79 | 111.09 | 161.03 | 270 | |
| | | 2400 | 117.38 | 234.57 | 2.87 | 1200 | 58.69 | 117.29 | 1.43 | 275.37 | 100.62 | 141.96 | 73.41 | 32.14 | 287.61 | 112.92 | 161.03 | 270 | |
| | | 2400 | 108.98 | 217.82 | 2.47 | 1200 | 54.49 | 108.91 | 1.24 | 263.72 | 101.33 | 141.96 | 73.41 | 32.14 | 276.90 | 114.57 | 161.03 | 270 | |
| | | 2400 | 97.44 | 194.78 | 1.98 | 1200 | 48.72 | 97.39 | 0.99 | 245.89 | 100.54 | 141.96 | 73.41 | 32.14 | 260.65 | 115.34 | 161.03 | 270 | |
| | | 2400 | 88.00 | 175.93 | 1.61 | 1200 | 44.00 | 87.96 | 0.81 | 231.50 | 100.11 | 141.96 | 73.41 | 32.14 | 247.84 | 116.50 | 161.03 | 270 | |
| | | 2400 | 77.52 | 154.99 | 1.25 | 1200 | 38.76 | 77.49 | 0.63 | 216.49 | 100.67 | 141.96 | 73.41 | 32.14 | 235.05 | 119.26 | 161.14 | 270 | |
| | | 1500 | 98.75 | 197.22 | 3.25 | 500 | 32.92 | 65.74 | 1.08 | 264.66 | 135.29 | 112.22 | 62.52 | 24.08 | 273.74 | 144.45 | 127.32 | 225 | |
| 100 | | 1500 | 92.84 | 185.44 | 2.87 | 500 | 30.95 | 61.81 | 0.96 | 257.52 | 135.72 | 112.22 | 62.52 | 24.08 | 267.18 | 145.45 | 127.32 | 225 | |
| | | 1500 | 82.77 | 165.37 | 2.28 | 500 | 27.59 | 55.12 | 0.76 | 243.91 | 135.04 | 112.22 | 62.52 | 24.08 | 254.75 | 145.95 | 127.32 | 225 | |
| | | 1500 | 76.21 | 152.28 | 1.93 | 500 | 25.40 | 50.76 | 0.64 | 235.59 | 135.21 | 112.22 | 62.52 | 24.08 | 247.37 | 147.05 | 127.32 | 225 | |
| | | 1500 | 66.80 | 133.52 | 1.49 | 500 | 22.27 | 44.51 | 0.50 | 224.10 | 135.92 | 112.22 | 62.52 | 24.08 | 237.54 | 149.41 | 127.32 | 225 | |
| | | 1500 | 59.37 | 118.68 | 1.17 | 500 | 19.79 | 39.56 | 0.39 | 214.41 | 135.92 | 112.22 | 62.52 | 24.08 | 229.55 | 151.10 | 127.62 | 225 | |
| | | 1500 | 51.51 | 102.97 | 0.88 | 500 | 17.17 | 34.32 | 0.29 | 203.61 | 135.42 | 112.22 | 62.52 | 24.08 | 221.07 | 152.91 | 130.17 | 225 | |
| | | 1200 | 92.86 | 185.35 | 3.59 | 350 | 27.08 | 54.06 | 1.05 | 224.79 | 107.55 | 100.36 | 47.62 | 24.06 | 232.50 | 115.35 | 113.88 | 180 | |
| | | 1200 | 87.60 | 174.88 | 3.19 | 350 | 25.55 | 51.01 | 0.93 | 218.02 | 107.21 | 100.36 | 47.62 | 24.06 | 226.20 | 115.47 | 113.88 | 180 | |
| 80 | | 1200 | 78.13 | 156.03 | 2.54 | 350 | 22.79 | 45.51 | 0.74 | 206.48 | 107.32 | 100.36 | 47.62 | 24.06 | 215.65 | 116.58 | 113.88 | 180 | |
| | | 1200 | 72.17 | 144.16 | 2.17 | 350 | 21.05 | 42.05 | 0.63 | 198.81 | 107.04 | 100.36 | 47.62 | 24.06 | 208.75 | 117.05 | 113.88 | 180 | |
| | | 1200 | 63.59 | 127.06 | 1.68 | 350 | 18.55 | 37.06 | 0.49 | 188.18 | 107.10 | 100.36 | 47.62 | 24.06 | 199.47 | 118.46 | 113.88 | 180 | |
| | | 1200 | 56.59 | 113.10 | 1.33 | 350 | 16.51 | 32.99 | 0.39 | 179.84 | 107.55 | 100.36 | 47.62 | 24.06 | 192.54 | 120.30 | 113.89 | 180 | |
| | | 1200 | 49.25 | 98.44 | 1.01 | 350 | 14.36 | 28.71 | 0.29 | 170.29 | 107.25 | 100.36 | 47.62 | 24.06 | 184.88 | 121.90 | 115.08 | 180 | |
| | | 900 | 84.41 | 168.34 | 3.95 | 250 | 23.45 | 46.76 | 1.10 | 184.94 | 80.36 | 86.90 | 32.72 | 24.04 | 191.28 | 86.81 | 98.64 | 85 | |
| | | 900 | 79.66 | 158.91 | 3.52 | 250 | 22.13 | 44.14 | 0.98 | 179.34 | 80.39 | 86.90 | 32.72 | 24.04 | 186.07 | 87.22 | 98.64 | 85 | |
| | | 900 | 71.36 | 142.42 | 2.82 | 250 | 19.82 | 39.56 | 0.78 | 169.20 | 80.16 | 86.90 | 32.72 | 24.04 | 176.72 | 87.77 | 98.64 | 85 | |
| 60 | | 900 | 65.96 | 131.69 | 2.41 | 250 | 18.32 | 36.58 | 0.67 | 162.86 | 80.33 | 86.90 | 32.72 | 24.04 | 171.00 | 88.56 | 98.64 | 85 | |
| | | 900 | 58.33 | 116.50 | 1.89 | 250 | 16.20 | 32.36 | 0.52 | 153.64 | 80.40 | 86.90 | 32.72 | 24.04 | 162.86 | 89.70 | 98.64 | 85 | |
| | | 900 | 52.16 | 104.20 | 1.51 | 250 | 14.49 | 28.94 | 0.42 | 146.18 | 80.52 | 86.90 | 32.72 | 24.04 | 156.50 | 90.91 | 98.64 | 85 | |
| | | 900 | 45.59 | 91.11 | 1.15 | 250 | 12.66 | 25.31 | 0.32 | 137.83 | 80.28 | 86.90 | 32.72 | 24.04 | 149.64 | 92.15 | 98.94 | 85 | |
| | | 900 | 45.59 | 91.11 | 1.15 | 250 | 12.66 | 25.31 | 0.32 | 137.83 | 80.28 | 86.90 | 32.72 | 24.04 | 149.64 | 92.15 | 98.94 | 85 | |

*Note all distances are in meters and speeds in kph. Values are based on a 3.6m lane width.

NOT TO SCALE

DESCRIPTION OF VARIABLES

A1 = length of 2 to 1 transition
V1 = distance from PI of curve 1 to PI of curve 2 (case 1)
V2 = distance from PI of curve 1 to PI of curve 2 (case 2)
X1 = tangent distance along the curve to the 2' (0.6m) point (case 1)
X2 = tangent distance along the curve to the 2' (0.6m) point (case 2)
Y1 = distance from transitioning pavement widths
Y2 = distance into curve 1 from PC that is required such that
transition taper is tangent to the curve
Z1 = distance between curve 1 and curve 2 (case 1)
Z2 = distance between curve 1 and curve 2 (case 2)

NOTES:

1. Provide the driver with sight distance along the full length of the 2 to 4 lane transition.
2. Full paved shoulders should be used along lane drop tapers. Use a 1:25 taper transition where it joins the normal median shoulder width.
3. The data provided in the tables are examples of typical situations. For combinations of design speeds, lane widths, median widths, and curve data not given in the table, the designer should interpolate a delta value (Δ) using median widths and calculate the remaining values.
4. If the lane drop is on a curve, plot offsets for taper and connect with appropriate curve. Design lane drops on tangent alignment if possible.
5. Spirals should be used on new alignments based on the design speed of the curve and the radius as shown in the table of the Road Standard Plan R-107-Series.
6. The cross slope in the gore area between the 2' (0.6m) point and the 22' (6.6m) point should not exceed 8%, with a 6% maximum algebraic difference in grades between the gore and the adjacent paved shoulder.
7. The design speed of the vertical alignment should meet or exceed the design speed of the horizontal alignment.
8. Each transition should be designed to provide decision sight distance at its merge points. See Geometric Design Guide GEO-300-Series.
9. Current AASHTO "A Policy on Geometric Design of Highways and Streets" and MDOT Guidelines should be used for sight distance requirements.
10. These design concepts are for new construction. Where modification may be needed for retrofitting to existing road features, consult the Geometric Review and Congestion Analysis Unit of the Division of Operations.

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