

ERRATA for *Guide for the Development of Bicycle Facilities*, 4th Edition (GBF-4)

February 2017

TO: AASHTO Members
FROM: Erin Grady, Director
AASHTO Publications Production

RE: February 2013 and 2017 Erratum to the *Guide for the Development of Bicycle Facilities*, 4th Edition

AASHTO has issued an errata that includes technical revisions to the *Guide for the Development of Bicycle Facilities*, 4th Edition.

To ensure that your editions are accurate and current, we are providing you with the attached summary of the errata changes, as well as the revised pages to which they apply. Those items with a **green** header are from the 2017 Errata, those items with a **red** header are from the 2013 Errata. Following the summary pages, you will find the replacement pages that include all revisions to be inserted into your book.

Should you need additional copies of the errata, you can download them free of charge on the AASHTO Online Bookstore at the following URL: <http://downloads.transportation.org/GBF-4-Errata.pdf>

We apologize for any inconvenience. Please feel free to contact us if you have questions or need any additional information.

Thank you.

Summary of Errata Changes, GBF-4
February 2017

| | | |
|------------|--------------------------------|---|
| 5-21, 5-22 | Shaded area represents $S > L$ | Revise to read: Shaded area represents $S < L$ |
|------------|--------------------------------|---|

**Summary of Errata Changes, GBF-4
February 2013**

| Page | Existing Text | Corrected Text | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--------------------------|-------|--|---------|----------------|--------|--|------------------------|----------------------|---|----------------------------|--------------------------|--|--|-------|--|---------|----------------|--------|--|------------------------|------------------------|---|-----------------------|--------------------------|--|-------|--|---------|----------------|--------|---|------|------|
| Chapter 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3-4 | <p>Table 3-2 in Row 1, Typical Upright Adult Cyclists, Feature column reads:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th colspan="2" style="text-align: center;">Value</th> </tr> <tr> <th style="text-align: center;">Feature</th> <th style="text-align: center;">U.S. Customary</th> <th style="text-align: center;">Metric</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Deceleration rate (dry level pavement)</td> <td style="text-align: center;">0.16 ft/s²</td> <td style="text-align: center;">4.8 m/s²</td> </tr> <tr> <td style="text-align: center;">Deceleration rate for wet conditions (50–80% reduction in efficiency)</td> <td style="text-align: center;">8.0–10.0 ft/s²</td> <td style="text-align: center;">2.4–3.0 m/s²</td> </tr> </tbody> </table> | | Value | | Feature | U.S. Customary | Metric | Deceleration rate (dry level pavement) | 0.16 ft/s ² | 4.8 m/s ² | Deceleration rate for wet conditions (50–80% reduction in efficiency) | 8.0–10.0 ft/s ² | 2.4–3.0 m/s ² | <p>Revise to read:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th colspan="2" style="text-align: center;">Value</th> </tr> <tr> <th style="text-align: center;">Feature</th> <th style="text-align: center;">U.S. Customary</th> <th style="text-align: center;">Metric</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Deceleration rate (dry level pavement)</td> <td style="text-align: center;">8–10 ft/s²</td> <td style="text-align: center;">2.4–3 m/s²</td> </tr> <tr> <td style="text-align: center;">Deceleration rate for wet conditions (50–80% reduction in efficiency)</td> <td style="text-align: center;">2–5 ft/s²</td> <td style="text-align: center;">0.6–1.5 m/s²</td> </tr> </tbody> </table> <p>Add new sixth row to read:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th colspan="2" style="text-align: center;">Value</th> </tr> <tr> <th style="text-align: center;">Feature</th> <th style="text-align: center;">U.S. Customary</th> <th style="text-align: center;">Metric</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Coefficient of friction for braking, wet level pavement</td> <td style="text-align: center;">0.16</td> <td style="text-align: center;">0.16</td> </tr> </tbody> </table> | | Value | | Feature | U.S. Customary | Metric | Deceleration rate (dry level pavement) | 8–10 ft/s ² | 2.4–3 m/s ² | Deceleration rate for wet conditions (50–80% reduction in efficiency) | 2–5 ft/s ² | 0.6–1.5 m/s ² | | Value | | Feature | U.S. Customary | Metric | Coefficient of friction for braking, wet level pavement | 0.16 | 0.16 |
| | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Feature | U.S. Customary | Metric | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deceleration rate (dry level pavement) | 0.16 ft/s ² | 4.8 m/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deceleration rate for wet conditions (50–80% reduction in efficiency) | 8.0–10.0 ft/s ² | 2.4–3.0 m/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Feature | U.S. Customary | Metric | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deceleration rate (dry level pavement) | 8–10 ft/s ² | 2.4–3 m/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deceleration rate for wet conditions (50–80% reduction in efficiency) | 2–5 ft/s ² | 0.6–1.5 m/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Feature | U.S. Customary | Metric | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coefficient of friction for braking, wet level pavement | 0.16 | 0.16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Summary of Errata Changes, GBF-4
February 2013**

| Page | Existing Text | Corrected Text |
|------------------|---|---|
| Chapter 5 | | |
| 5-7 | Figure 5-3 top illustration, the drop dimension reads: Drop is 6 ft 1(.8 m) | Revise to read: Drop is 6 ft (1.8 m) |
| 5-20 | Table 5-5 top formulas for U.S. Customary and Metric read: $S < L \quad L = 2S - \frac{200(\sqrt{h_1} + \sqrt{h_2})^2}{A}$ The bottom formulas for U.S. Customary and Metric read: $S < L \quad L = 2S - \frac{AS^2}{100(\sqrt{2h_1} + \sqrt{2h_2})^2}$ | Revise to read: $\text{when } S > L \quad L = 2S - \frac{200(\sqrt{h_1} + \sqrt{h_2})^2}{A}$ Revise to read: $\text{when } L = \frac{AS^2}{100(\sqrt{2h_1} + \sqrt{2h_2})^2}$ |
| 5-21, 5-22 | Figure 5-8, the notes at the bottom of the U.S. Customary and Metric tables read: Shaded area represents $S = L$ The Metric cell for $A = 5$ and $S = 55$ (i.e., value = 54) reads: <div style="border: 1px solid black; display: inline-block; padding: 2px;">54</div> | Revise to read: Shaded area represents $S > L$ Revise to read: <div style="border: 1px solid black; display: inline-block; padding: 2px;">54</div> [without shading] |
| 5-23 | Table 5-6, the bottom formulas for U.S. Customary and Metric read: $HSO = \frac{R}{28.65} \left[1 - \cos^{-1} \left(\frac{R - HSO}{R} \right) \right]$ | Revise to read: $S = \frac{R}{28.65} \left[\cos^{-1} \left(\frac{R - HSO}{R} \right) \right]$ |
| 5-36 | Table 5-8, the definition for term “ a_i ” for U.S. Customary and Metric reads: U.S. Customary a_i = motorist deceleration rate (ft/s ²) in intersection approach when braking to a stop is not initiated (assume -5.0 ft/s ²) Metric a_i = motorist deceleration rate (m/s ²) in intersection approach when braking to a stop is not initiated (assume -1.5 m/s ²) | Revise to read: U.S. Customary a_i = motorist deceleration rate (ft/s ²) on intersection approach when braking to a stop is not initiated (assume -5.0 ft/s ²) Metric a_i = motorist deceleration rate (m/s ²) on intersection approach when braking to a stop is not initiated (assume -1.5 m/s ²) |

Table 3-1. Key Dimensions (continued)

| User Type | Feature | Dimension | |
|------------------------------|-------------------------------------|----------------|--------|
| | | U.S. Customary | Metric |
| Recumbent bicyclist | Physical length | 82 in. | 2.2 m |
| | Eye height | 46 in. | 1.2 m |
| Tandem bicyclist | Physical length (typical dimension) | 96 in. | 2.4 m |
| Bicyclist with child trailer | Physical width | 30 in. | 0.75 m |
| | Physical length | 117 in. | 3.0 m |
| Hand bicyclist | Eye height | 34 in. | 0.9 m |
| Inline skater | Sweep width | 60 in. | 1.5 m |

As with bicycle dimensions, bicyclist performance can vary considerably based upon operator ability and vehicle design. Table 3-2 lists various performance criteria for typical upright adult bicyclists as well as key performance criteria for other types of bicyclists (1), (4), (11).

Bicyclist speeds vary based on age and ability and are a function of many factors, including bicyclist skill, bicyclist physical and cognitive abilities, bicycle design, traffic, lighting, wind conditions, transportation facility design, and terrain. Adults typically ride at 8–15 mph (13–24 km/h) on level terrain, while children ride more slowly. Experienced, physically fit riders can ride up to 30 mph (50 km/h); very fit riders can ride at speeds in excess of 30 mph (50 km/h) but will typically only ride at such speeds on roads.

Table 3-2. Key Performance Criteria

| Bicyclist Type | Feature | Value | |
|---------------------------------|---|-----------------------------|--------------------------|
| | | U.S. Customary | Metric |
| Typical upright adult bicyclist | Speed, paved level terrain | 8–15 mph | 13–24 km/h |
| | Speed, downhill | 20–30 plus mph | 32–50 plus km/h |
| | Speed, uphill | 5–12 mph | 8–19 km/h |
| | Perception reaction time | 1.0–2.5s | 1.0–2.5s |
| | Acceleration rate | 1.5–5.0 ft/s ² | 0.5–1.5 m/s ² |
| | Coefficient of friction for braking, wet level pavement | 0.16 | 0.16 |
| | Coefficient of friction for braking, dry level pavement | 0.32 | 0.32 |
| | Deceleration rate (dry level pavement) | 8–10 ft/s ² | 2.4–3 m/s ² |
| | Deceleration rate for wet conditions (50–80% reduction in efficiency) | 2–5 ft/s ² | 0.6–1.5 m/s ² |
| Recumbent bicyclist | Speed, level terrain | 11–18 mph | 18–29 km/h |
| | Acceleration rate | 3.0–6.0 ft/s ² | 1.0–1.8 m/s ² |
| | Deceleration rate | 10.0–13.0 ft/s ² | 3.0–4.0 m/s ² |

Note: The speeds reported are for bicyclists on shared use paths. Experience suggests that maximum speeds on roadways can be considerably higher.

Chapter 5: Design of Shared Use Paths

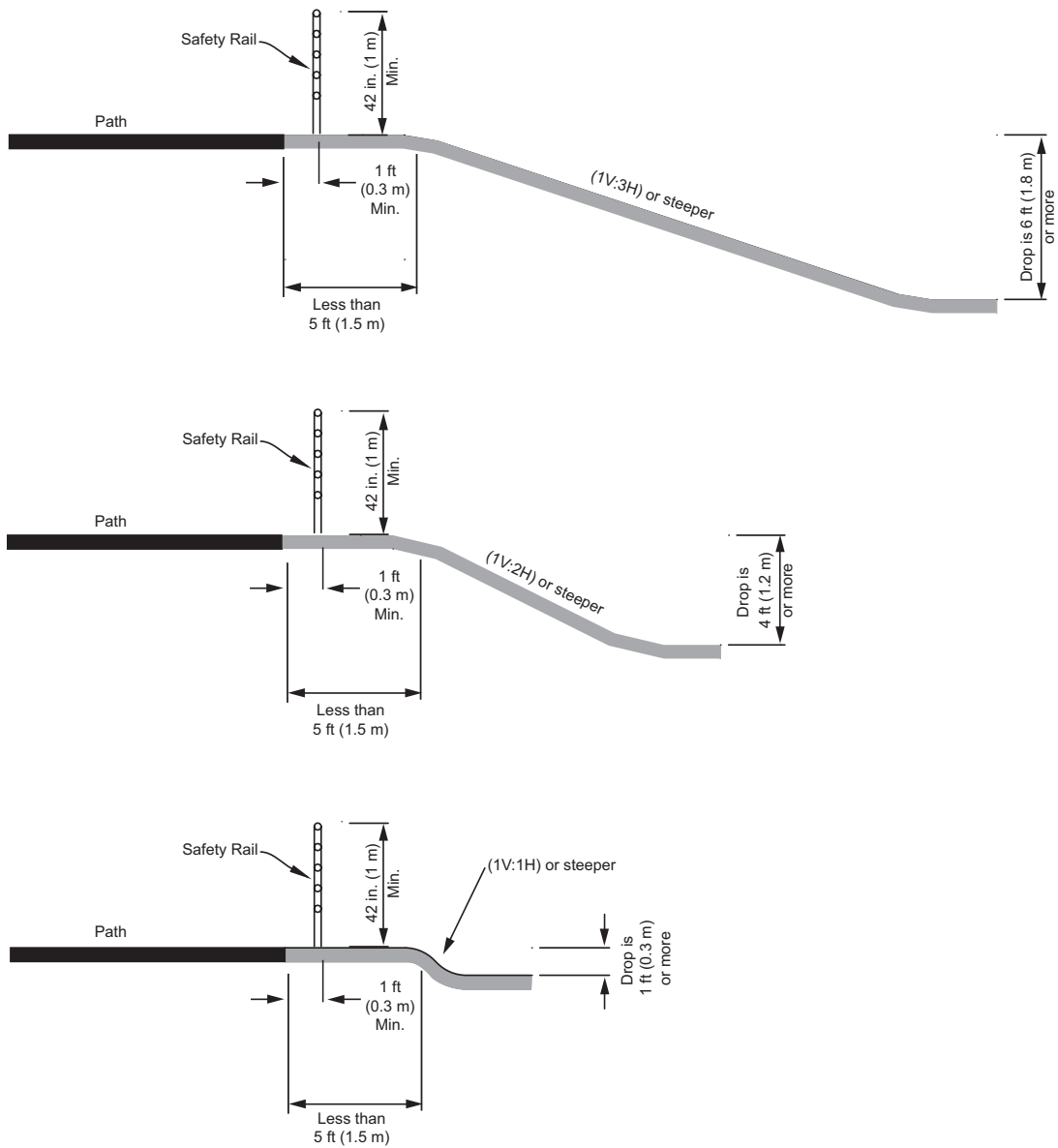


Figure 5-3. Safety Rail Between Path and Adjacent Slope

Research indicates that, under dry conditions, the coefficient of friction of various other path users range from 0.20 for inline skaters to 0.30 for recumbent bicyclists. If users with lower coefficients of friction such as inline skaters or recumbent bicyclists are expected to make up a relatively large percentage of path users, stopping sight distances should be increased. For two-way shared use paths, the sight distance in the descending direction, that is, where “G” is defined as negative, will control the design.

Figure 5-8 is used to select the minimum length of vertical curve needed to provide minimum stopping sight distance at various speeds on crest vertical curves. The eye height of the typical adult bicyclist is assumed to be 4.5 ft (1.4 m), and the object height is assumed to be 0 in. (0 mm) to recognize that impediments to bicycle travel exist at pavement level. The minimum length of vertical curve can also be calculated using the following equation as shown in Table 5-5.

Table 5-5. Length of Crest Vertical Curve to Provide Sight Distance

| U.S. Customary | | | Metric | | |
|--|---|---|--|---|--|
| when $S > L$ $L = 2S \frac{200(\sqrt{h_1} + \sqrt{h_2})^2}{A}$ | | | when $S > L$ $L = 2S \frac{200(\sqrt{h_1} + \sqrt{h_2})^2}{A}$ | | |
| when $S < L$ $L = \frac{AS^2}{100(\sqrt{2h_1} + \sqrt{2h_2})^2}$ | | | when $S < L$ $L = \frac{AS^2}{100(\sqrt{2h_1} + \sqrt{2h_2})^2}$ | | |
| where: | | | where: | | |
| L | = | minimum length of vertical curve (ft) | L | = | minimum length of vertical curve (m) |
| A | = | algebraic grade difference (percent) | A | = | algebraic grade difference (percent) |
| S | = | stopping sight distance (ft) | S | = | stopping sight distance (m) |
| h_1 | = | eye height (4.5 ft for a typical bicyclist) | h_1 | = | eye height (1.4 m for a typical bicyclist) |
| h_2 | = | object height (0 ft) | h_2 | = | object height (0 m) |

Chapter 5: Design of Shared Use Paths

U.S. Customary

| A | S = Stopping Sight Distance (ft) | | | | | | | | | | | | | | | |
|----|----------------------------------|----|----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|-----|
| | (%) | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 |
| 2 | | | | | | | | | | | | | 30 | 70 | 110 | 150 |
| 3 | | | | | | | | 20 | 60 | 100 | 140 | 180 | 220 | 260 | 300 | |
| 4 | | | | | | 15 | 55 | 95 | 135 | 175 | 215 | 256 | 300 | 348 | 400 | |
| 5 | | | | | 20 | 60 | 100 | 140 | 180 | 222 | 269 | 320 | 376 | 436 | 500 | |
| 6 | | | | 10 | 50 | 90 | 130 | 170 | 210 | 267 | 323 | 384 | 451 | 523 | 600 | |
| 7 | | | | 31 | 71 | 111 | 151 | 191 | 231 | 311 | 376 | 448 | 526 | 610 | 700 | |
| 8 | | | 8 | 48 | 88 | 128 | 168 | 208 | 248 | 356 | 430 | 512 | 601 | 697 | 800 | |
| 9 | | | 20 | 60 | 100 | 140 | 180 | 220 | 260 | 400 | 484 | 576 | 676 | 784 | 900 | |
| 10 | | | 30 | 70 | 110 | 150 | 190 | 230 | 270 | 444 | 538 | 640 | 751 | 871 | 1000 | |
| 11 | | | 38 | 78 | 118 | 158 | 198 | 238 | 278 | 489 | 592 | 704 | 826 | 958 | 1100 | |
| 12 | | 5 | 45 | 85 | 125 | 165 | 205 | 245 | 285 | 533 | 645 | 768 | 901 | 1045 | 1200 | |
| 13 | | 11 | 51 | 91 | 131 | 171 | 211 | 251 | 291 | 578 | 699 | 832 | 976 | 1132 | 1300 | |
| 14 | | 16 | 56 | 96 | 136 | 176 | 216 | 256 | 296 | 622 | 753 | 896 | 1052 | 1220 | 1400 | |
| 15 | | 20 | 60 | 100 | 140 | 180 | 220 | 260 | 300 | 667 | 807 | 960 | 1127 | 1307 | 1500 | |
| 16 | | 24 | 64 | 104 | 144 | 184 | 224 | 264 | 304 | 711 | 860 | 1024 | 1202 | 1394 | 1600 | |
| 17 | | 27 | 67 | 107 | 147 | 187 | 227 | 267 | 307 | 756 | 914 | 1088 | 1277 | 1481 | 1700 | |
| 18 | | 30 | 70 | 110 | 150 | 190 | 230 | 270 | 310 | 800 | 968 | 1152 | 1352 | 1568 | 1800 | |
| 19 | | 33 | 73 | 113 | 153 | 193 | 233 | 273 | 313 | 844 | 1022 | 1216 | 1427 | 1655 | 1900 | |
| 20 | | 35 | 75 | 115 | 155 | 195 | 235 | 275 | 315 | 889 | 1076 | 1280 | 1502 | 1742 | 2000 | |
| 21 | | 37 | 77 | 117 | 157 | 197 | 237 | 277 | 317 | 933 | 1129 | 1344 | 1577 | 1829 | 2100 | |
| 22 | | 39 | 79 | 119 | 159 | 199 | 239 | 279 | 319 | 978 | 1183 | 1408 | 1652 | 1916 | 2200 | |
| 23 | | 41 | 81 | 121 | 161 | 201 | 241 | 281 | 321 | 1022 | 1237 | 1472 | 1728 | 2004 | 2300 | |
| 24 | 3 | 43 | 83 | 123 | 163 | 203 | 243 | 283 | 323 | 1067 | 1291 | 1536 | 1803 | 2091 | 2400 | |
| 25 | 4 | 44 | 84 | 124 | 164 | 204 | 244 | 284 | 324 | 1111 | 1344 | 1600 | 1878 | 2178 | 2500 | |

Shaded area represents $S < L$
Minimum length of vertical curve = 3 ft

Figure 5-8. Minimum Length of Crest Vertical Curve Based on Stopping Sight Distance

Metric

| A | S = Stopping Sight Distance (m) | | | | | | | | | | | | | | | | | | |
|-----|---------------------------------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| (%) | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| 2 | | | | | | | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 |
| 3 | | | | | | | | | 7 | 17 | 27 | 37 | 47 | 57 | 67 | 77 | 87 | 97 | 107 |
| 4 | | | | | | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 91 | 103 | 116 | 129 | 143 |
| 5 | | | | | 4 | 14 | 24 | 34 | 44 | 54 | 64 | 75 | 88 | 100 | 114 | 129 | 145 | 161 | 179 |
| 6 | | | | 3 | 13 | 23 | 33 | 43 | 54 | 65 | 77 | 91 | 105 | 121 | 137 | 155 | 174 | 193 | 214 |
| 7 | | | | 10 | 20 | 30 | 40 | 51 | 63 | 76 | 90 | 106 | 123 | 141 | 160 | 181 | 203 | 226 | 250 |
| 8 | | | 5 | 15 | 25 | 35 | 46 | 58 | 71 | 86 | 103 | 121 | 140 | 161 | 183 | 206 | 231 | 258 | 286 |
| 9 | | | 9 | 19 | 29 | 39 | 51 | 65 | 80 | 97 | 116 | 136 | 158 | 181 | 206 | 232 | 260 | 290 | 321 |
| 10 | | 2 | 12 | 22 | 32 | 44 | 57 | 72 | 89 | 108 | 129 | 151 | 175 | 201 | 229 | 258 | 289 | 322 | 357 |
| 11 | | 5 | 15 | 25 | 35 | 48 | 63 | 80 | 98 | 119 | 141 | 166 | 193 | 221 | 251 | 284 | 318 | 355 | 393 |
| 12 | | 7 | 17 | 27 | 39 | 53 | 69 | 87 | 107 | 130 | 154 | 181 | 210 | 241 | 274 | 310 | 347 | 387 | 429 |
| 13 | | 8 | 18 | 29 | 42 | 57 | 74 | 94 | 116 | 140 | 167 | 196 | 228 | 261 | 297 | 335 | 376 | 419 | 464 |
| 14 | | 10 | 20 | 31 | 45 | 61 | 80 | 101 | 125 | 151 | 180 | 211 | 245 | 281 | 320 | 361 | 405 | 451 | 500 |
| 15 | 1 | 11 | 21 | 33 | 48 | 66 | 86 | 108 | 134 | 162 | 193 | 226 | 263 | 301 | 343 | 387 | 434 | 483 | 536 |
| 16 | 3 | 13 | 23 | 36 | 51 | 70 | 91 | 116 | 143 | 173 | 206 | 241 | 280 | 321 | 366 | 413 | 463 | 516 | 571 |
| 17 | 4 | 14 | 24 | 38 | 55 | 74 | 97 | 123 | 152 | 184 | 219 | 257 | 298 | 342 | 389 | 439 | 492 | 548 | 607 |
| 18 | 4 | 14 | 26 | 40 | 58 | 79 | 103 | 130 | 161 | 194 | 231 | 272 | 315 | 362 | 411 | 464 | 521 | 580 | 643 |
| 19 | 5 | 15 | 27 | 42 | 61 | 83 | 109 | 137 | 170 | 205 | 244 | 287 | 333 | 382 | 434 | 490 | 550 | 612 | 679 |
| 20 | 6 | 16 | 29 | 45 | 64 | 88 | 114 | 145 | 179 | 216 | 257 | 302 | 350 | 402 | 457 | 516 | 579 | 645 | 714 |
| 21 | 7 | 17 | 30 | 47 | 68 | 92 | 120 | 152 | 188 | 227 | 270 | 317 | 368 | 422 | 480 | 542 | 608 | 677 | 750 |
| 22 | 7 | 18 | 31 | 49 | 71 | 96 | 126 | 159 | 196 | 238 | 283 | 332 | 385 | 442 | 503 | 568 | 636 | 709 | 786 |
| 23 | 8 | 18 | 33 | 51 | 74 | 101 | 131 | 166 | 205 | 248 | 296 | 347 | 403 | 462 | 526 | 593 | 665 | 741 | 821 |
| 24 | 8 | 19 | 34 | 54 | 77 | 105 | 137 | 174 | 214 | 259 | 309 | 362 | 420 | 482 | 549 | 619 | 694 | 774 | 857 |
| 25 | 9 | 20 | 36 | 56 | 80 | 109 | 143 | 181 | 223 | 270 | 321 | 377 | 438 | 502 | 571 | 645 | 723 | 806 | 893 |

Shaded area represents $S < L$
Minimum length of vertical curve = 1 m

Figure 5-8. Minimum Length of Crest Vertical Curve Based on Stopping Sight Distance (continued)

Other path users such as child bicyclists, hand bicyclists, recumbent bicyclists, and others have lower eye heights than a typical adult bicyclist. Eye heights are approximately 2.6 ft (0.85 m) for hand bicyclists and 3.9 ft (1.2 m) for recumbent bicyclists. When compared to the eye heights of typical bicyclists, these lower eye heights limit sight distance over crest vertical curves. However, since most hand bicyclists and child bicyclists travel slower than typical adult bicyclists, their needs are met by using the values in Figure 5-8. Recumbent bicyclists generally travel faster than typical upright bicyclists, so if they are expected to make up a relatively large percentage of path users, crest vertical curve lengths should be increased accordingly (operating characteristics of recumbent bicyclists are found in Chapter 3).

Figures 5-9, 5-10, and Table 5-6 indicate the minimum clearance that should be used for line-of-sight obstructions for horizontal curves. The lateral clearance (horizontal sight line offset or HSO) is obtained by using the table in Figure 5-9 with the stopping sight distance (Figure 5-6) and the proposed horizontal radius of curvature.

Path users typically travel side-by-side on shared use paths. On narrow paths, bicyclists have a tendency to ride near the middle of the path. For these reasons, and because of the higher likeli-

hood for crashes on curves, lateral clearances on horizontal curves should be calculated based on the sum of the stopping sight distances for path users traveling in opposite directions around the curve. Where this is not practical, consideration should be given to widening the path through the curve, installing a yellow center line stripe, installing turn or curve warning signs (W1 series) in accordance with the MUTCD (7), or a combination of these alternatives. See Sections 5.4.1 and 5.4.2 for more information about center line pavement markings and signs.

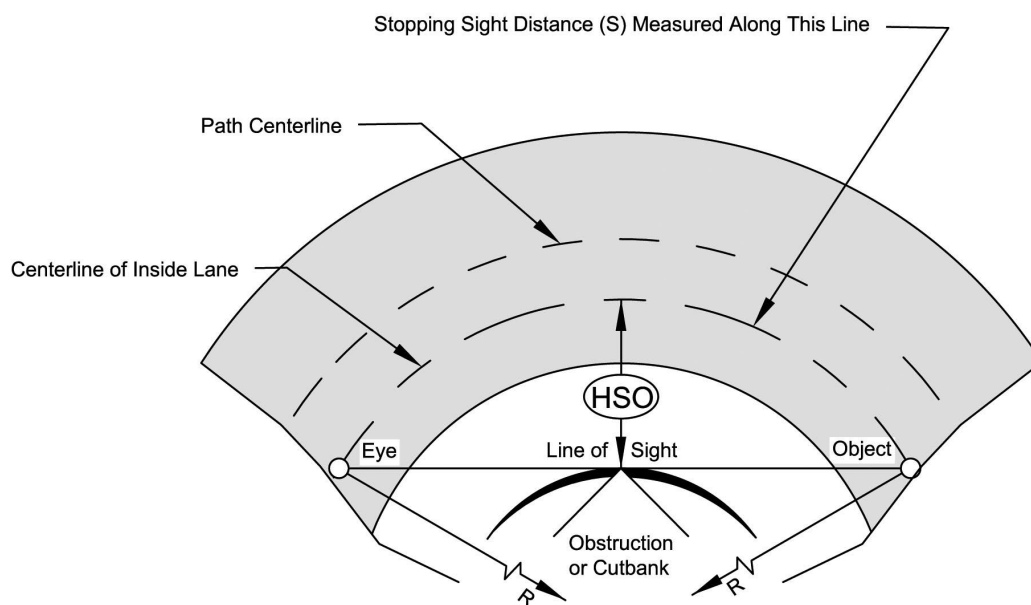


Figure 5-9. Diagram Illustrating Components for Determining Horizontal Sight Distance

Table 5-6. Horizontal Sight Distance

| U.S. Customary | | Metric | |
|---|---|---|--|
| $HSO = R \left[1 - \cos \left(\frac{28.65S}{R} \right) \right]$ $S = \frac{R}{28.65} \left[\cos^{-1} \left(\frac{R - HSO}{R} \right) \right]$ | | $HSO = R \left[1 - \cos \left(\frac{28.65S}{R} \right) \right]$ $S = \frac{R}{28.65} \left[\cos^{-1} \left(\frac{R - HSO}{R} \right) \right]$ | |
| where: | | where: | |
| S | = | stopping sight distance (ft) | stopping sight distance (m) |
| R | = | radius of centerline of lane (ft) | radius of centerline of lane (m) |
| HSO | = | horizontal sightline offset, distance from centerline of lane to obstruction (ft) | horizontal sightline offset, distance from centerline of lane to obstruction (m) |
| Note: Angle is expressed in degrees; line of sight is 2.3 ft above centerline of inside lane at point of obstruction. | | Note: Angle is expressed in degrees; line of sight is 0.7 m above centerline of inside lane at point of obstruction. | |

Table 5-8. Length of Path Leg of Sight Triangle

| U.S. Customary | | | Metric | | |
|--|---|--|--|---|--|
| $t_a = \frac{1.47V_e - 1.47V_b}{a_i}$ $t_g = t_a + \frac{w + L_a}{0.88V_{road}}$ $b = 1.47V_{path}t_g$ | | | $t_a = \frac{0.278V_e - 0.278V_b}{a_i}$ $t_g = t_a + \frac{w + L_a}{0.167V_{road}}$ $b = 0.278V_{path}t_g$ | | |
| where: | | | where: | | |
| t_g | = | travel time to reach and clear the path (s) | t_g | = | travel time to reach and clear the path (s) |
| b | = | length of leg sight triangle along the path approach (ft) | b | = | length of leg sight triangle along the path approach (m) |
| t_a | = | travel time to reach the path from the decision point for a motorist that doesn't stop (s). For road approach grades that exceed 3 percent, value should be adjusted in accordance with AASHTO's <i>A Policy on Geometric Design of Highways and Streets</i> (5) | t_a | = | travel time to reach the path from the decision point for a motorist that doesn't stop (s). For road approach grades that exceed 3 percent, value should be adjusted in accordance with AASHTO's <i>A Policy on Geometric Design of Highways and Streets</i> (5) |
| V_e | = | speed at which the motorist would enter the intersection after decelerating (mph) (assumed $0.60 \times$ road design speed) | V_e | = | speed at which the motorist would enter the intersection after decelerating (km/h) (assumed $0.60 \times$ road design speed) |
| V_b | = | speed at which braking by the motorist begins (mph) (same as road design speed) | V_b | = | speed at which braking by the motorist begins (km/h) (same as road design speed) |
| a_i | = | motorist deceleration rate (ft/s^2) on intersection approach when braking to a stop not initiated (assume -5.0 ft/s^2) | a_i | = | motorist deceleration rate (m/s^2) on intersection approach when braking to a stop not initiated (assume -1.5 m/s^2) |
| w | = | width of the intersection to be crossed (ft) | w | = | width of the intersection to be crossed (m) |
| L_a | = | length of the design vehicle (ft) | L_a | = | length of the design vehicle (m) |
| V_{path} | = | design speed of the path (mph) | V_{path} | = | design speed of the path (km/h) |
| V_{road} | = | design speed of the road (mph) | V_{road} | = | design speed of the road (km/h) |

Note: This table accounts for reduced motor vehicle speeds per standard practice in AASHTO's *A Policy on Geometric Design of Highways and Streets* (5).