

# 玉林市

## 城市暴雨强度公式及计算图表

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## 说明

1. 本计算公式和图表是根据玉林国家基本气象站 30 年（1994~2023 年）的连续自记雨量记录为基础，采用“年最大值法”对暴雨样本资料进行选择，由皮尔逊—III 型分布曲线拟合数据，得到 P-i-t 关系表，再由最小二乘法求解公式参数得到。

2. 以重现期 2、3、5、10、20、30、50、100（年）相应的单一重现期暴雨强度公式制表。设计暴雨强度可按选定设计重现期直接查用表列数值（单一重现期暴雨强度公式见表一）。

3. 若采用其它重现期，设计暴雨强度可用重现期区间参数公式计算：

$$q = \frac{167A}{(t+b)^n}$$

式中：q—设计暴雨强度[升/（秒·公顷）]，t—降雨历时（分钟），A—雨力，b、n—地方常数（A、b、n 按重现期区间参数公式计算，公式见表二）。

4. 考虑到绘制全国城市暴雨强度公式等值线图，列出包含重现期在内的暴雨强度总公式：

$$q = \frac{3844.850 \times (1 + 0.776 \lg P)}{(t + 17.685)^{0.767}}$$

因总公式精度不及重现期区间参数公式，故建议推求其它重现期设计暴雨强度时使用区间参数公式。

5. 本计算公式和图表适用的时间范围是 1~200 分钟，重现期范围是 2~100 年，空间范围是玉林市玉州区（含玉东新区）和福绵区。

应用重现期区间参数公式计算暴雨强度实例：求 P=30 年，t=50 分钟的暴

雨强度  $q$ 。

从重现期区间参数公式 II，得：

$$n = 0.749 + 0.009\ln(T - 7.842) = 0.776884 \quad (\text{取 } 0.777)$$

$$b = 15.734 + 1.031\ln(T - 7.290) = 18.95361 \quad (\text{取 } 18.954)$$

$$A = 15.092 + 11.143\ln(T - 1.764) = 52.31628 \quad (\text{取 } 52.316)$$

配得  $P=30$  年的暴雨强度计算公式如下：

$$q = \frac{167 \times 52.316}{(t + 18.954)^{0.777}}$$

可按上式计算 1~200 分钟中任何时段的暴雨强度。

$$\text{当 } t=50: q = \frac{167 \times 52.316}{(t + 18.954)^{0.777}} = 325.683 \text{ [升/ (秒} \cdot \text{公顷)]}$$

## 5. 公式误差

重现期 2~20 年的暴雨强度总公式的平均绝对均方差为 0.044mm/min，平均相对均方差为 3.16%，区间参数公式的平均绝对均方差为 0.027mm/min，平均相对均方差为 1.73%，均符合《室外排水设计标准》(GB 50014-2021) 的要求 (重现期 2~20 年暴雨强度总公式和单一重现期暴雨强度公式的平均绝对均方差 < 0.05mm/min，平均相对均方差 < 5%。)

表一 玉林市暴雨强度总公式

| 拟合方法  | 总公式  |
|-------|--|
| 最小二乘法 | $q = \frac{3844.850 \times (1 + 0.776 \lg P)}{(t + 17.685)^{0.767}}$ |

表二 单一重现期暴雨强度公式

| 重现期 P (年) | 单一重现期暴雨公式                                    |
|-----------|--|
| P=2       | $q = \frac{4681.177}{(t + 14.896)^{0.795}}$  |
| P=3       | $q = \frac{5036.553}{(t + 15.196)^{0.779}}$  |
| P=5       | $q = \frac{5432.343}{(t + 15.512)^{0.758}}$  |
| P=10      | $q = \frac{6444.029}{(t + 16.762)^{0.756}}$  |
| P=20      | $q = \frac{7923.315}{(t + 18.355)^{0.771}}$  |
| P=30      | $q = \frac{8736.772}{(t + 18.954)^{0.777}}$  |
| P=50      | $q = \frac{9733.261}{(t + 19.605)^{0.783}}$  |
| P=100     | $q = \frac{11053.903}{(t + 20.404)^{0.790}}$ |

表三 重现期区间参数公式

| P (年)                | 区间 | 参数 | 区间参数公式                               |
|----------------------|----|----|--------------------------------------|
| $2 \leq P < 10$      | I  | n  | $n = 0.816 - 0.037 \ln(T - 0.247)$   |
|                      |    | b  | $b = 14.822 + 0.484 \ln(T - 0.836)$  |
|                      |    | A  | $A = 26.844 + 3.86 \ln(T - 0.640)$   |
| $10 \leq P \leq 100$ | II | n  | $n = 0.749 + 0.009 \ln(T - 7.842)$   |
|                      |    | b  | $b = 15.734 + 1.031 \ln(T - 7.290)$  |
|                      |    | A  | $A = 15.092 + 11.143 \ln(T - 1.764)$ |

表四 暴雨强度查算表

P=2a

t (min) q[L/ (s·hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q      | t   | q      |
|----|---------|----|---------|-----|---------|-----|--------|-----|--------|
| 1  | 519.196 | 41 | 191.068 | 81  | 124.401 | 121 | 94.288 | 161 | 76.803 |
| 2  | 494.615 | 42 | 188.393 | 82  | 123.379 | 122 | 93.740 | 162 | 76.457 |
| 3  | 472.513 | 43 | 185.802 | 83  | 122.376 | 123 | 93.199 | 163 | 76.115 |
| 4  | 452.523 | 44 | 183.289 | 84  | 121.391 | 124 | 92.665 | 164 | 75.777 |
| 5  | 434.346 | 45 | 180.852 | 85  | 120.424 | 125 | 92.138 | 165 | 75.442 |
| 6  | 417.739 | 46 | 178.487 | 86  | 119.475 | 126 | 91.618 | 166 | 75.110 |
| 7  | 402.499 | 47 | 176.191 | 87  | 118.541 | 127 | 91.104 | 167 | 74.782 |
| 8  | 388.460 | 48 | 173.960 | 88  | 117.625 | 128 | 90.597 | 168 | 74.457 |
| 9  | 375.480 | 49 | 171.792 | 89  | 116.724 | 129 | 90.096 | 169 | 74.134 |
| 10 | 363.439 | 50 | 169.684 | 90  | 115.838 | 130 | 89.601 | 170 | 73.816 |
| 11 | 352.237 | 51 | 167.634 | 91  | 114.968 | 131 | 89.113 | 171 | 73.500 |
| 12 | 341.785 | 52 | 165.639 | 92  | 114.112 | 132 | 88.630 | 172 | 73.187 |
| 13 | 332.009 | 53 | 163.696 | 93  | 113.270 | 133 | 88.154 | 173 | 72.877 |
| 14 | 322.841 | 54 | 161.805 | 94  | 112.443 | 134 | 87.683 | 174 | 72.570 |
| 15 | 314.226 | 55 | 159.961 | 95  | 111.628 | 135 | 87.217 | 175 | 72.266 |
| 16 | 306.114 | 56 | 158.165 | 96  | 110.827 | 136 | 86.757 | 176 | 71.965 |
| 17 | 298.459 | 57 | 156.414 | 97  | 110.039 | 137 | 86.303 | 177 | 71.667 |
| 18 | 291.223 | 58 | 154.705 | 98  | 109.264 | 138 | 85.854 | 178 | 71.371 |
| 19 | 284.372 | 59 | 153.039 | 99  | 108.500 | 139 | 85.410 | 179 | 71.078 |
| 20 | 277.874 | 60 | 151.412 | 100 | 107.749 | 140 | 84.971 | 180 | 70.788 |
| 21 | 271.702 | 61 | 149.824 | 101 | 107.009 | 141 | 84.538 | 181 | 70.501 |
| 22 | 265.832 | 62 | 148.273 | 102 | 106.281 | 142 | 84.109 | 182 | 70.216 |
| 23 | 260.240 | 63 | 146.758 | 103 | 105.563 | 143 | 83.685 | 183 | 69.934 |
| 24 | 254.906 | 64 | 145.277 | 104 | 104.857 | 144 | 83.266 | 184 | 69.654 |
| 25 | 249.814 | 65 | 143.829 | 105 | 104.161 | 145 | 82.852 | 185 | 69.377 |
| 26 | 244.945 | 66 | 142.414 | 106 | 103.476 | 146 | 82.443 | 186 | 69.102 |
| 27 | 240.286 | 67 | 141.030 | 107 | 102.800 | 147 | 82.037 | 187 | 68.830 |
| 28 | 235.822 | 68 | 139.676 | 108 | 102.135 | 148 | 81.637 | 188 | 68.560 |
| 29 | 231.541 | 69 | 138.351 | 109 | 101.479 | 149 | 81.241 | 189 | 68.293 |
| 30 | 227.431 | 70 | 137.053 | 110 | 100.832 | 150 | 80.849 | 190 | 68.028 |
| 31 | 223.483 | 71 | 135.783 | 111 | 100.195 | 151 | 80.461 | 191 | 67.765 |
| 32 | 219.686 | 72 | 134.540 | 112 | 99.567  | 152 | 80.078 | 192 | 67.504 |
| 33 | 216.032 | 73 | 133.321 | 113 | 98.947  | 153 | 79.698 | 193 | 67.246 |
| 34 | 212.512 | 74 | 132.128 | 114 | 98.336  | 154 | 79.323 | 194 | 66.990 |
| 35 | 209.119 | 75 | 130.958 | 115 | 97.734  | 155 | 78.951 | 195 | 66.736 |
| 36 | 205.846 | 76 | 129.811 | 116 | 97.140  | 156 | 78.584 | 196 | 66.485 |
| 37 | 202.686 | 77 | 128.687 | 117 | 96.554  | 157 | 78.220 | 197 | 66.235 |
| 38 | 199.634 | 78 | 127.584 | 118 | 95.976  | 158 | 77.860 | 198 | 65.988 |
| 39 | 196.683 | 79 | 126.503 | 119 | 95.406  | 159 | 77.504 | 199 | 65.742 |
| 40 | 193.830 | 80 | 125.442 | 120 | 94.843  | 160 | 77.152 | 200 | 65.499 |

P=3a

t (min) q[L/ (s•hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q      |
|----|---------|----|---------|-----|---------|-----|---------|-----|--------|
| 1  | 575.446 | 41 | 218.330 | 81  | 143.633 | 121 | 109.552 | 161 | 89.640 |
| 2  | 549.206 | 42 | 215.350 | 82  | 142.480 | 122 | 108.929 | 162 | 89.246 |
| 3  | 525.548 | 43 | 212.462 | 83  | 141.349 | 123 | 108.315 | 163 | 88.855 |
| 4  | 504.095 | 44 | 209.661 | 84  | 140.238 | 124 | 107.708 | 164 | 88.469 |
| 5  | 484.542 | 45 | 206.943 | 85  | 139.146 | 125 | 107.109 | 165 | 88.086 |
| 6  | 466.640 | 46 | 204.304 | 86  | 138.074 | 126 | 106.518 | 166 | 87.707 |
| 7  | 450.179 | 47 | 201.740 | 87  | 137.020 | 127 | 105.934 | 167 | 87.332 |
| 8  | 434.987 | 48 | 199.249 | 88  | 135.985 | 128 | 105.357 | 168 | 86.960 |
| 9  | 420.918 | 49 | 196.827 | 89  | 134.967 | 129 | 104.787 | 169 | 86.592 |
| 10 | 407.846 | 50 | 194.471 | 90  | 133.966 | 130 | 104.225 | 170 | 86.228 |
| 11 | 395.666 | 51 | 192.179 | 91  | 132.983 | 131 | 103.669 | 171 | 85.867 |
| 12 | 384.285 | 52 | 189.947 | 92  | 132.015 | 132 | 103.120 | 172 | 85.510 |
| 13 | 373.626 | 53 | 187.774 | 93  | 131.064 | 133 | 102.577 | 173 | 85.155 |
| 14 | 363.619 | 54 | 185.657 | 94  | 130.128 | 134 | 102.041 | 174 | 84.805 |
| 15 | 354.203 | 55 | 183.593 | 95  | 129.207 | 135 | 101.512 | 175 | 84.457 |
| 16 | 345.327 | 56 | 181.581 | 96  | 128.301 | 136 | 100.988 | 176 | 84.113 |
| 17 | 336.942 | 57 | 179.619 | 97  | 127.409 | 137 | 100.471 | 177 | 83.772 |
| 18 | 329.009 | 58 | 177.704 | 98  | 126.532 | 138 | 99.960  | 178 | 83.434 |
| 19 | 321.489 | 59 | 175.836 | 99  | 125.668 | 139 | 99.455  | 179 | 83.099 |
| 20 | 314.351 | 60 | 174.011 | 100 | 124.817 | 140 | 98.955  | 180 | 82.767 |
| 21 | 307.565 | 61 | 172.230 | 101 | 123.979 | 141 | 98.461  | 181 | 82.438 |
| 22 | 301.104 | 62 | 170.489 | 102 | 123.155 | 142 | 97.973  | 182 | 82.112 |
| 23 | 294.945 | 63 | 168.788 | 103 | 122.342 | 143 | 97.490  | 183 | 81.789 |
| 24 | 289.067 | 64 | 167.126 | 104 | 121.542 | 144 | 97.013  | 184 | 81.469 |
| 25 | 283.449 | 65 | 165.500 | 105 | 120.753 | 145 | 96.541  | 185 | 81.152 |
| 26 | 278.075 | 66 | 163.910 | 106 | 119.976 | 146 | 96.074  | 186 | 80.838 |
| 27 | 272.927 | 67 | 162.355 | 107 | 119.211 | 147 | 95.612  | 187 | 80.526 |
| 28 | 267.993 | 68 | 160.832 | 108 | 118.456 | 148 | 95.155  | 188 | 80.217 |
| 29 | 263.257 | 69 | 159.342 | 109 | 117.713 | 149 | 94.703  | 189 | 79.911 |
| 30 | 258.708 | 70 | 157.884 | 110 | 116.980 | 150 | 94.257  | 190 | 79.607 |
| 31 | 254.335 | 71 | 156.455 | 111 | 116.257 | 151 | 93.815  | 191 | 79.307 |
| 32 | 250.127 | 72 | 155.055 | 112 | 115.544 | 152 | 93.377  | 192 | 79.008 |
| 33 | 246.075 | 73 | 153.684 | 113 | 114.842 | 153 | 92.944  | 193 | 78.712 |
| 34 | 242.170 | 74 | 152.340 | 114 | 114.149 | 154 | 92.516  | 194 | 78.419 |
| 35 | 238.403 | 75 | 151.023 | 115 | 113.465 | 155 | 92.092  | 195 | 78.128 |
| 36 | 234.768 | 76 | 149.731 | 116 | 112.791 | 156 | 91.673  | 196 | 77.840 |
| 37 | 231.257 | 77 | 148.465 | 117 | 112.125 | 157 | 91.258  | 197 | 77.554 |
| 38 | 227.863 | 78 | 147.222 | 118 | 111.469 | 158 | 90.847  | 198 | 77.271 |
| 39 | 224.581 | 79 | 146.003 | 119 | 110.822 | 159 | 90.441  | 199 | 76.989 |
| 40 | 221.405 | 80 | 144.807 | 120 | 110.182 | 160 | 90.038  | 200 | 76.711 |

P=5a

t (min) q[L/ (s•hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q       |
|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| 1  | 648.478 | 41 | 255.191 | 81  | 170.088 | 121 | 130.776 | 161 | 107.630 |
| 2  | 620.210 | 42 | 251.820 | 82  | 168.765 | 122 | 130.054 | 162 | 107.170 |
| 3  | 594.645 | 43 | 248.551 | 83  | 167.464 | 123 | 129.342 | 163 | 106.714 |
| 4  | 571.398 | 44 | 245.379 | 84  | 166.187 | 124 | 128.639 | 164 | 106.264 |
| 5  | 550.155 | 45 | 242.299 | 85  | 164.932 | 125 | 127.944 | 165 | 105.817 |
| 6  | 530.659 | 46 | 239.307 | 86  | 163.699 | 126 | 127.258 | 166 | 105.375 |
| 7  | 512.693 | 47 | 236.400 | 87  | 162.487 | 127 | 126.581 | 167 | 104.937 |
| 8  | 496.078 | 48 | 233.573 | 88  | 161.296 | 128 | 125.912 | 168 | 104.503 |
| 9  | 480.660 | 49 | 230.823 | 89  | 160.125 | 129 | 125.251 | 169 | 104.074 |
| 10 | 466.310 | 50 | 228.148 | 90  | 158.973 | 130 | 124.598 | 170 | 103.648 |
| 11 | 452.916 | 51 | 225.543 | 91  | 157.841 | 131 | 123.953 | 171 | 103.227 |
| 12 | 440.382 | 52 | 223.006 | 92  | 156.727 | 132 | 123.315 | 172 | 102.809 |
| 13 | 428.624 | 53 | 220.534 | 93  | 155.631 | 133 | 122.685 | 173 | 102.395 |
| 14 | 417.569 | 54 | 218.125 | 94  | 154.552 | 134 | 122.063 | 174 | 101.986 |
| 15 | 407.154 | 55 | 215.776 | 95  | 153.491 | 135 | 121.447 | 175 | 101.579 |
| 16 | 397.322 | 56 | 213.485 | 96  | 152.446 | 136 | 120.839 | 176 | 101.177 |
| 17 | 388.024 | 57 | 211.250 | 97  | 151.418 | 137 | 120.238 | 177 | 100.779 |
| 18 | 379.215 | 58 | 209.068 | 98  | 150.406 | 138 | 119.644 | 178 | 100.384 |
| 19 | 370.856 | 59 | 206.938 | 99  | 149.409 | 139 | 119.057 | 179 | 99.992  |
| 20 | 362.913 | 60 | 204.857 | 100 | 148.428 | 140 | 118.476 | 180 | 99.604  |
| 21 | 355.354 | 61 | 202.824 | 101 | 147.461 | 141 | 117.902 | 181 | 99.220  |
| 22 | 348.150 | 62 | 200.838 | 102 | 146.509 | 142 | 117.334 | 182 | 98.839  |
| 23 | 341.276 | 63 | 198.896 | 103 | 145.571 | 143 | 116.772 | 183 | 98.461  |
| 24 | 334.708 | 64 | 196.997 | 104 | 144.647 | 144 | 116.217 | 184 | 98.087  |
| 25 | 328.427 | 65 | 195.139 | 105 | 143.736 | 145 | 115.668 | 185 | 97.716  |
| 26 | 322.412 | 66 | 193.322 | 106 | 142.839 | 146 | 115.125 | 186 | 97.348  |
| 27 | 316.647 | 67 | 191.543 | 107 | 141.954 | 147 | 114.587 | 187 | 96.983  |
| 28 | 311.115 | 68 | 189.802 | 108 | 141.082 | 148 | 114.056 | 188 | 96.622  |
| 29 | 305.803 | 69 | 188.098 | 109 | 140.222 | 149 | 113.530 | 189 | 96.264  |
| 30 | 300.696 | 70 | 186.428 | 110 | 139.375 | 150 | 113.009 | 190 | 95.908  |
| 31 | 295.783 | 71 | 184.792 | 111 | 138.539 | 151 | 112.495 | 191 | 95.556  |
| 32 | 291.052 | 72 | 183.189 | 112 | 137.714 | 152 | 111.985 | 192 | 95.207  |
| 33 | 286.493 | 73 | 181.618 | 113 | 136.901 | 153 | 111.481 | 193 | 94.861  |
| 34 | 282.096 | 74 | 180.078 | 114 | 136.099 | 154 | 110.982 | 194 | 94.517  |
| 35 | 277.852 | 75 | 178.568 | 115 | 135.308 | 155 | 110.488 | 195 | 94.177  |
| 36 | 273.754 | 76 | 177.087 | 116 | 134.528 | 156 | 110.000 | 196 | 93.839  |
| 37 | 269.793 | 77 | 175.634 | 117 | 133.757 | 157 | 109.516 | 197 | 93.504  |
| 38 | 265.963 | 78 | 174.209 | 118 | 132.997 | 158 | 109.037 | 198 | 93.172  |
| 39 | 262.256 | 79 | 172.810 | 119 | 132.247 | 159 | 108.563 | 199 | 92.843  |
| 40 | 258.668 | 80 | 171.436 | 120 | 131.507 | 160 | 108.094 | 200 | 92.516  |



P=10a

t (min) q[L/ (s•hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q       |
|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| 1  | 732.052 | 41 | 300.162 | 81  | 201.646 | 121 | 155.588 | 161 | 128.316 |
| 2  | 702.358 | 42 | 296.292 | 82  | 200.100 | 122 | 154.739 | 162 | 127.773 |
| 3  | 675.320 | 43 | 292.537 | 83  | 198.582 | 123 | 153.902 | 163 | 127.235 |
| 4  | 650.582 | 44 | 288.889 | 84  | 197.090 | 124 | 153.074 | 164 | 126.702 |
| 5  | 627.852 | 45 | 285.346 | 85  | 195.624 | 125 | 152.257 | 165 | 126.175 |
| 6  | 606.885 | 46 | 281.902 | 86  | 194.183 | 126 | 151.450 | 166 | 125.653 |
| 7  | 587.476 | 47 | 278.554 | 87  | 192.767 | 127 | 150.653 | 167 | 125.135 |
| 8  | 569.450 | 48 | 275.296 | 88  | 191.374 | 128 | 149.866 | 168 | 124.623 |
| 9  | 552.659 | 49 | 272.125 | 89  | 190.005 | 129 | 149.088 | 169 | 124.116 |
| 10 | 536.974 | 50 | 269.038 | 90  | 188.658 | 130 | 148.319 | 170 | 123.613 |
| 11 | 522.286 | 51 | 266.031 | 91  | 187.333 | 131 | 147.560 | 171 | 123.115 |
| 12 | 508.499 | 52 | 263.101 | 92  | 186.029 | 132 | 146.809 | 172 | 122.621 |
| 13 | 495.529 | 53 | 260.245 | 93  | 184.746 | 133 | 146.068 | 173 | 122.133 |
| 14 | 483.302 | 54 | 257.459 | 94  | 183.484 | 134 | 145.335 | 174 | 121.648 |
| 15 | 471.754 | 55 | 254.742 | 95  | 182.241 | 135 | 144.610 | 175 | 121.168 |
| 16 | 460.827 | 56 | 252.091 | 96  | 181.018 | 136 | 143.894 | 176 | 120.693 |
| 17 | 450.470 | 57 | 249.503 | 97  | 179.814 | 137 | 143.186 | 177 | 120.222 |
| 18 | 440.638 | 58 | 246.976 | 98  | 178.628 | 138 | 142.486 | 178 | 119.755 |
| 19 | 431.291 | 59 | 244.508 | 99  | 177.460 | 139 | 141.794 | 179 | 119.292 |
| 20 | 422.392 | 60 | 242.096 | 100 | 176.310 | 140 | 141.109 | 180 | 118.833 |
| 21 | 413.908 | 61 | 239.738 | 101 | 175.177 | 141 | 140.433 | 181 | 118.379 |
| 22 | 405.810 | 62 | 237.434 | 102 | 174.061 | 142 | 139.763 | 182 | 117.928 |
| 23 | 398.070 | 63 | 235.180 | 103 | 172.961 | 143 | 139.101 | 183 | 117.482 |
| 24 | 390.665 | 64 | 232.975 | 104 | 171.877 | 144 | 138.447 | 184 | 117.039 |
| 25 | 383.572 | 65 | 230.817 | 105 | 170.809 | 145 | 137.799 | 185 | 116.600 |
| 26 | 376.771 | 66 | 228.706 | 106 | 169.756 | 146 | 137.159 | 186 | 116.165 |
| 27 | 370.244 | 67 | 226.639 | 107 | 168.718 | 147 | 136.525 | 187 | 115.734 |
| 28 | 363.974 | 68 | 224.614 | 108 | 167.695 | 148 | 135.898 | 188 | 115.306 |
| 29 | 357.945 | 69 | 222.631 | 109 | 166.686 | 149 | 135.278 | 189 | 114.882 |
| 30 | 352.142 | 70 | 220.689 | 110 | 165.691 | 150 | 134.664 | 190 | 114.462 |
| 31 | 346.554 | 71 | 218.785 | 111 | 164.709 | 151 | 134.057 | 191 | 114.045 |
| 32 | 341.168 | 72 | 216.919 | 112 | 163.741 | 152 | 133.456 | 192 | 113.632 |
| 33 | 335.972 | 73 | 215.090 | 113 | 162.786 | 153 | 132.861 | 193 | 113.222 |
| 34 | 330.956 | 74 | 213.296 | 114 | 161.844 | 154 | 132.273 | 194 | 112.816 |
| 35 | 326.111 | 75 | 211.536 | 115 | 160.915 | 155 | 131.690 | 195 | 112.413 |
| 36 | 321.427 | 76 | 209.810 | 116 | 159.998 | 156 | 131.113 | 196 | 112.013 |
| 37 | 316.897 | 77 | 208.116 | 117 | 159.093 | 157 | 130.542 | 197 | 111.617 |
| 38 | 312.512 | 78 | 206.453 | 118 | 158.199 | 158 | 129.977 | 198 | 111.224 |
| 39 | 308.266 | 79 | 204.821 | 119 | 157.318 | 159 | 129.418 | 199 | 110.834 |
| 40 | 304.151 | 80 | 203.219 | 120 | 156.447 | 160 | 128.864 | 200 | 110.447 |

P=20a

t (min) q[L/ (s•hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q       |
|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| 1  | 806.844 | 41 | 340.072 | 81  | 228.599 | 121 | 176.112 | 161 | 144.975 |
| 2  | 776.107 | 42 | 335.720 | 82  | 226.840 | 122 | 175.144 | 162 | 144.355 |
| 3  | 747.933 | 43 | 331.493 | 83  | 225.113 | 123 | 174.188 | 163 | 143.741 |
| 4  | 722.003 | 44 | 327.387 | 84  | 223.415 | 124 | 173.243 | 164 | 143.133 |
| 5  | 698.049 | 45 | 323.395 | 85  | 221.747 | 125 | 172.311 | 165 | 142.531 |
| 6  | 675.846 | 46 | 319.514 | 86  | 220.107 | 126 | 171.390 | 166 | 141.934 |
| 7  | 655.200 | 47 | 315.738 | 87  | 218.494 | 127 | 170.480 | 167 | 141.343 |
| 8  | 635.948 | 48 | 312.063 | 88  | 216.909 | 128 | 169.581 | 168 | 140.758 |
| 9  | 617.948 | 49 | 308.485 | 89  | 215.349 | 129 | 168.693 | 169 | 140.179 |
| 10 | 601.076 | 50 | 304.999 | 90  | 213.815 | 130 | 167.816 | 170 | 139.605 |
| 11 | 585.227 | 51 | 301.603 | 91  | 212.306 | 131 | 166.949 | 171 | 139.036 |
| 12 | 570.305 | 52 | 298.293 | 92  | 210.821 | 132 | 166.092 | 172 | 138.472 |
| 13 | 556.230 | 53 | 295.064 | 93  | 209.360 | 133 | 165.245 | 173 | 137.914 |
| 14 | 542.928 | 54 | 291.915 | 94  | 207.922 | 134 | 164.409 | 174 | 137.361 |
| 15 | 530.334 | 55 | 288.842 | 95  | 206.506 | 135 | 163.581 | 175 | 136.813 |
| 16 | 518.392 | 56 | 285.842 | 96  | 205.113 | 136 | 162.764 | 176 | 136.270 |
| 17 | 507.051 | 57 | 282.913 | 97  | 203.740 | 137 | 161.955 | 177 | 135.732 |
| 18 | 496.263 | 58 | 280.052 | 98  | 202.389 | 138 | 161.156 | 178 | 135.198 |
| 19 | 485.989 | 59 | 277.257 | 99  | 201.058 | 139 | 160.366 | 179 | 134.670 |
| 20 | 476.190 | 60 | 274.525 | 100 | 199.747 | 140 | 159.585 | 180 | 134.146 |
| 21 | 466.833 | 61 | 271.854 | 101 | 198.455 | 141 | 158.812 | 181 | 133.627 |
| 22 | 457.889 | 62 | 269.241 | 102 | 197.183 | 142 | 158.048 | 182 | 133.113 |
| 23 | 449.328 | 63 | 266.686 | 103 | 195.929 | 143 | 157.292 | 183 | 132.603 |
| 24 | 441.127 | 64 | 264.186 | 104 | 194.693 | 144 | 156.545 | 184 | 132.097 |
| 25 | 433.261 | 65 | 261.739 | 105 | 193.475 | 145 | 155.805 | 185 | 131.596 |
| 26 | 425.710 | 66 | 259.344 | 106 | 192.274 | 146 | 155.074 | 186 | 131.099 |
| 27 | 418.455 | 67 | 256.998 | 107 | 191.091 | 147 | 154.350 | 187 | 130.607 |
| 28 | 411.478 | 68 | 254.700 | 108 | 189.924 | 148 | 153.634 | 188 | 130.118 |
| 29 | 404.762 | 69 | 252.449 | 109 | 188.773 | 149 | 152.926 | 189 | 129.634 |
| 30 | 398.293 | 70 | 250.243 | 110 | 187.638 | 150 | 152.225 | 190 | 129.154 |
| 31 | 392.056 | 71 | 248.081 | 111 | 186.519 | 151 | 151.532 | 191 | 128.678 |
| 32 | 386.040 | 72 | 245.962 | 112 | 185.414 | 152 | 150.845 | 192 | 128.207 |
| 33 | 380.231 | 73 | 243.883 | 113 | 184.325 | 153 | 150.166 | 193 | 127.739 |
| 34 | 374.619 | 74 | 241.845 | 114 | 183.250 | 154 | 149.494 | 194 | 127.275 |
| 35 | 369.194 | 75 | 239.845 | 115 | 182.190 | 155 | 148.829 | 195 | 126.814 |
| 36 | 363.946 | 76 | 237.883 | 116 | 181.144 | 156 | 148.170 | 196 | 126.358 |
| 37 | 358.867 | 77 | 235.957 | 117 | 180.111 | 157 | 147.518 | 197 | 125.905 |
| 38 | 353.947 | 78 | 234.067 | 118 | 179.092 | 158 | 146.873 | 198 | 125.457 |
| 39 | 349.179 | 79 | 232.211 | 119 | 178.086 | 159 | 146.234 | 199 | 125.011 |
| 40 | 344.557 | 80 | 230.389 | 120 | 177.092 | 160 | 145.602 | 200 | 124.570 |

P=30a

t (min) q[L/ (s•hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q       |
|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| 1  | 853.548 | 41 | 363.067 | 81  | 244.065 | 121 | 187.897 | 161 | 154.558 |
| 2  | 821.725 | 42 | 358.430 | 82  | 242.185 | 122 | 186.861 | 162 | 153.894 |
| 3  | 792.492 | 43 | 353.927 | 83  | 240.337 | 123 | 185.837 | 163 | 153.236 |
| 4  | 765.533 | 44 | 349.550 | 84  | 238.521 | 124 | 184.826 | 164 | 152.585 |
| 5  | 740.584 | 45 | 345.296 | 85  | 236.737 | 125 | 183.828 | 165 | 151.940 |
| 6  | 717.419 | 46 | 341.159 | 86  | 234.982 | 126 | 182.842 | 166 | 151.301 |
| 7  | 695.848 | 47 | 337.133 | 87  | 233.257 | 127 | 181.868 | 167 | 150.669 |
| 8  | 675.704 | 48 | 333.214 | 88  | 231.561 | 128 | 180.905 | 168 | 150.042 |
| 9  | 656.847 | 49 | 329.397 | 89  | 229.892 | 129 | 179.954 | 169 | 149.421 |
| 10 | 639.151 | 50 | 325.679 | 90  | 228.251 | 130 | 179.015 | 170 | 148.807 |
| 11 | 622.509 | 51 | 322.056 | 91  | 226.637 | 131 | 178.087 | 171 | 148.198 |
| 12 | 606.826 | 52 | 318.524 | 92  | 225.048 | 132 | 177.169 | 172 | 147.594 |
| 13 | 592.018 | 53 | 315.079 | 93  | 223.484 | 133 | 176.263 | 173 | 146.996 |
| 14 | 578.011 | 54 | 311.718 | 94  | 221.946 | 134 | 175.367 | 174 | 146.404 |
| 15 | 564.740 | 55 | 308.438 | 95  | 220.431 | 135 | 174.481 | 175 | 145.817 |
| 16 | 552.146 | 56 | 305.236 | 96  | 218.939 | 136 | 173.605 | 176 | 145.236 |
| 17 | 540.176 | 57 | 302.109 | 97  | 217.471 | 137 | 172.740 | 177 | 144.660 |
| 18 | 528.784 | 58 | 299.054 | 98  | 216.025 | 138 | 171.884 | 178 | 144.089 |
| 19 | 517.926 | 59 | 296.069 | 99  | 214.600 | 139 | 171.038 | 179 | 143.523 |
| 20 | 507.565 | 60 | 293.151 | 100 | 213.197 | 140 | 170.201 | 180 | 142.962 |
| 21 | 497.667 | 61 | 290.298 | 101 | 211.815 | 141 | 169.374 | 181 | 142.406 |
| 22 | 488.199 | 62 | 287.508 | 102 | 210.453 | 142 | 168.556 | 182 | 141.855 |
| 23 | 479.133 | 63 | 284.778 | 103 | 209.111 | 143 | 167.747 | 183 | 141.309 |
| 24 | 470.443 | 64 | 282.107 | 104 | 207.788 | 144 | 166.946 | 184 | 140.768 |
| 25 | 462.106 | 65 | 279.493 | 105 | 206.485 | 145 | 166.154 | 185 | 140.231 |
| 26 | 454.098 | 66 | 276.933 | 106 | 205.199 | 146 | 165.371 | 186 | 139.699 |
| 27 | 446.402 | 67 | 274.427 | 107 | 203.932 | 147 | 164.596 | 187 | 139.172 |
| 28 | 438.997 | 68 | 271.971 | 108 | 202.683 | 148 | 163.830 | 188 | 138.649 |
| 29 | 431.867 | 69 | 269.566 | 109 | 201.451 | 149 | 163.072 | 189 | 138.131 |
| 30 | 424.997 | 70 | 267.208 | 110 | 200.236 | 150 | 162.321 | 190 | 137.617 |
| 31 | 418.371 | 71 | 264.897 | 111 | 199.038 | 151 | 161.578 | 191 | 137.107 |
| 32 | 411.977 | 72 | 262.631 | 112 | 197.856 | 152 | 160.844 | 192 | 136.602 |
| 33 | 405.803 | 73 | 260.409 | 113 | 196.690 | 153 | 160.116 | 193 | 136.101 |
| 34 | 399.836 | 74 | 258.230 | 114 | 195.540 | 154 | 159.397 | 194 | 135.604 |
| 35 | 394.066 | 75 | 256.092 | 115 | 194.405 | 155 | 158.684 | 195 | 135.111 |
| 36 | 388.483 | 76 | 253.994 | 116 | 193.284 | 156 | 157.979 | 196 | 134.623 |
| 37 | 383.077 | 77 | 251.935 | 117 | 192.179 | 157 | 157.281 | 197 | 134.138 |
| 38 | 377.841 | 78 | 249.913 | 118 | 191.088 | 158 | 156.590 | 198 | 133.657 |
| 39 | 372.765 | 79 | 247.929 | 119 | 190.010 | 159 | 155.906 | 199 | 133.181 |
| 40 | 367.843 | 80 | 245.980 | 120 | 188.947 | 160 | 155.228 | 200 | 132.708 |

P=50a

t (min) q[L/ (s·hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q       |
|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| 1  | 910.789 | 41 | 391.340 | 81  | 263.152 | 121 | 202.476 | 161 | 166.433 |
| 2  | 877.612 | 42 | 386.357 | 82  | 261.122 | 122 | 201.356 | 162 | 165.715 |
| 3  | 847.064 | 43 | 381.517 | 83  | 259.127 | 123 | 200.249 | 163 | 165.004 |
| 4  | 818.835 | 44 | 376.812 | 84  | 257.167 | 124 | 199.157 | 164 | 164.300 |
| 5  | 792.660 | 45 | 372.237 | 85  | 255.240 | 125 | 198.077 | 165 | 163.602 |
| 6  | 768.316 | 46 | 367.787 | 86  | 253.346 | 126 | 197.011 | 166 | 162.912 |
| 7  | 745.611 | 47 | 363.457 | 87  | 251.483 | 127 | 195.958 | 167 | 162.228 |
| 8  | 724.378 | 48 | 359.240 | 88  | 249.651 | 128 | 194.918 | 168 | 161.550 |
| 9  | 704.473 | 49 | 355.134 | 89  | 247.849 | 129 | 193.890 | 169 | 160.879 |
| 10 | 685.772 | 50 | 351.132 | 90  | 246.077 | 130 | 192.875 | 170 | 160.215 |
| 11 | 668.164 | 51 | 347.232 | 91  | 244.333 | 131 | 191.871 | 171 | 159.556 |
| 12 | 651.553 | 52 | 343.430 | 92  | 242.617 | 132 | 190.880 | 172 | 158.904 |
| 13 | 635.853 | 53 | 339.720 | 93  | 240.929 | 133 | 189.900 | 173 | 158.257 |
| 14 | 620.989 | 54 | 336.101 | 94  | 239.267 | 134 | 188.931 | 174 | 157.617 |
| 15 | 606.894 | 55 | 332.568 | 95  | 237.630 | 135 | 187.973 | 175 | 156.982 |
| 16 | 593.506 | 56 | 329.119 | 96  | 236.019 | 136 | 187.027 | 176 | 156.354 |
| 17 | 580.773 | 57 | 325.750 | 97  | 234.433 | 137 | 186.091 | 177 | 155.731 |
| 18 | 568.645 | 58 | 322.459 | 98  | 232.871 | 138 | 185.166 | 178 | 155.113 |
| 19 | 557.079 | 59 | 319.243 | 99  | 231.332 | 139 | 184.251 | 179 | 154.501 |
| 20 | 546.035 | 60 | 316.098 | 100 | 229.816 | 140 | 183.347 | 180 | 153.895 |
| 21 | 535.477 | 61 | 313.023 | 101 | 228.323 | 141 | 182.452 | 181 | 153.294 |
| 22 | 525.373 | 62 | 310.016 | 102 | 226.851 | 142 | 181.568 | 182 | 152.698 |
| 23 | 515.692 | 63 | 307.074 | 103 | 225.401 | 143 | 180.693 | 183 | 152.108 |
| 24 | 506.409 | 64 | 304.194 | 104 | 223.972 | 144 | 179.827 | 184 | 151.522 |
| 25 | 497.498 | 65 | 301.375 | 105 | 222.564 | 145 | 178.971 | 185 | 150.942 |
| 26 | 488.936 | 66 | 298.615 | 106 | 221.175 | 146 | 178.125 | 186 | 150.367 |
| 27 | 480.702 | 67 | 295.912 | 107 | 219.806 | 147 | 177.287 | 187 | 149.797 |
| 28 | 472.777 | 68 | 293.264 | 108 | 218.456 | 148 | 176.458 | 188 | 149.232 |
| 29 | 465.144 | 69 | 290.669 | 109 | 217.125 | 149 | 175.638 | 189 | 148.671 |
| 30 | 457.785 | 70 | 288.126 | 110 | 215.812 | 150 | 174.827 | 190 | 148.116 |
| 31 | 450.687 | 71 | 285.633 | 111 | 214.517 | 151 | 174.024 | 191 | 147.565 |
| 32 | 443.834 | 72 | 283.189 | 112 | 213.240 | 152 | 173.229 | 192 | 147.018 |
| 33 | 437.214 | 73 | 280.791 | 113 | 211.980 | 153 | 172.443 | 193 | 146.477 |
| 34 | 430.815 | 74 | 278.440 | 114 | 210.736 | 154 | 171.665 | 194 | 145.939 |
| 35 | 424.625 | 75 | 276.133 | 115 | 209.509 | 155 | 170.894 | 195 | 145.407 |
| 36 | 418.634 | 76 | 273.868 | 116 | 208.299 | 156 | 170.132 | 196 | 144.878 |
| 37 | 412.832 | 77 | 271.646 | 117 | 207.104 | 157 | 169.377 | 197 | 144.354 |
| 38 | 407.210 | 78 | 269.465 | 118 | 205.924 | 158 | 168.630 | 198 | 143.835 |
| 39 | 401.759 | 79 | 267.322 | 119 | 204.760 | 159 | 167.890 | 199 | 143.319 |
| 40 | 396.472 | 80 | 265.219 | 120 | 203.611 | 160 | 167.158 | 200 | 142.808 |

P=100a

t (min) q[L/ (s•hm<sup>2</sup>) ]

| t  | q       | t  | q       | t   | q       | t   | q       | t   | q       |
|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| 1  | 982.975 | 41 | 427.522 | 81  | 287.640 | 121 | 221.192 | 161 | 181.678 |
| 2  | 948.148 | 42 | 422.100 | 82  | 285.419 | 122 | 219.964 | 162 | 180.891 |
| 3  | 915.998 | 43 | 416.832 | 83  | 283.236 | 123 | 218.751 | 163 | 180.111 |
| 4  | 886.215 | 44 | 411.711 | 84  | 281.091 | 124 | 217.553 | 164 | 179.339 |
| 5  | 858.541 | 45 | 406.730 | 85  | 278.982 | 125 | 216.371 | 165 | 178.574 |
| 6  | 832.750 | 46 | 401.883 | 86  | 276.909 | 126 | 215.202 | 166 | 177.817 |
| 7  | 808.650 | 47 | 397.166 | 87  | 274.870 | 127 | 214.048 | 167 | 177.067 |
| 8  | 786.074 | 48 | 392.572 | 88  | 272.865 | 128 | 212.908 | 168 | 176.324 |
| 9  | 764.878 | 49 | 388.097 | 89  | 270.893 | 129 | 211.781 | 169 | 175.589 |
| 10 | 744.935 | 50 | 383.735 | 90  | 268.952 | 130 | 210.668 | 170 | 174.860 |
| 11 | 726.132 | 51 | 379.483 | 91  | 267.043 | 131 | 209.568 | 171 | 174.137 |
| 12 | 708.371 | 52 | 375.337 | 92  | 265.165 | 132 | 208.481 | 172 | 173.422 |
| 13 | 691.565 | 53 | 371.291 | 93  | 263.316 | 133 | 207.407 | 173 | 172.713 |
| 14 | 675.635 | 54 | 367.344 | 94  | 261.496 | 134 | 206.345 | 174 | 172.011 |
| 15 | 660.514 | 55 | 363.490 | 95  | 259.704 | 135 | 205.295 | 175 | 171.315 |
| 16 | 646.139 | 56 | 359.726 | 96  | 257.940 | 136 | 204.257 | 176 | 170.626 |
| 17 | 632.453 | 57 | 356.050 | 97  | 256.203 | 137 | 203.232 | 177 | 169.943 |
| 18 | 619.407 | 58 | 352.457 | 98  | 254.492 | 138 | 202.217 | 178 | 169.266 |
| 19 | 606.955 | 59 | 348.946 | 99  | 252.807 | 139 | 201.214 | 179 | 168.595 |
| 20 | 595.057 | 60 | 345.513 | 100 | 251.147 | 140 | 200.223 | 180 | 167.930 |
| 21 | 583.674 | 61 | 342.155 | 101 | 249.511 | 141 | 199.242 | 181 | 167.271 |
| 22 | 572.772 | 62 | 338.871 | 102 | 247.899 | 142 | 198.272 | 182 | 166.617 |
| 23 | 562.322 | 63 | 335.657 | 103 | 246.311 | 143 | 197.313 | 183 | 165.970 |
| 24 | 552.294 | 64 | 332.512 | 104 | 244.745 | 144 | 196.364 | 184 | 165.328 |
| 25 | 542.662 | 65 | 329.432 | 105 | 243.202 | 145 | 195.426 | 185 | 164.692 |
| 26 | 533.402 | 66 | 326.416 | 106 | 241.681 | 146 | 194.498 | 186 | 164.061 |
| 27 | 524.493 | 67 | 323.462 | 107 | 240.181 | 147 | 193.579 | 187 | 163.436 |
| 28 | 515.914 | 68 | 320.568 | 108 | 238.702 | 148 | 192.670 | 188 | 162.816 |
| 29 | 507.647 | 69 | 317.732 | 109 | 237.244 | 149 | 191.771 | 189 | 162.202 |
| 30 | 499.673 | 70 | 314.953 | 110 | 235.805 | 150 | 190.882 | 190 | 161.592 |
| 31 | 491.978 | 71 | 312.227 | 111 | 234.387 | 151 | 190.001 | 191 | 160.988 |
| 32 | 484.547 | 72 | 309.555 | 112 | 232.987 | 152 | 189.130 | 192 | 160.389 |
| 33 | 477.365 | 73 | 306.934 | 113 | 231.606 | 153 | 188.268 | 193 | 159.795 |
| 34 | 470.419 | 74 | 304.362 | 114 | 230.244 | 154 | 187.415 | 194 | 159.206 |
| 35 | 463.699 | 75 | 301.839 | 115 | 228.899 | 155 | 186.570 | 195 | 158.622 |
| 36 | 457.192 | 76 | 299.363 | 116 | 227.573 | 156 | 185.734 | 196 | 158.043 |
| 37 | 450.889 | 77 | 296.933 | 117 | 226.263 | 157 | 184.907 | 197 | 157.468 |
| 38 | 444.779 | 78 | 294.546 | 118 | 224.971 | 158 | 184.087 | 198 | 156.898 |
| 39 | 438.853 | 79 | 292.203 | 119 | 223.695 | 159 | 183.276 | 199 | 156.333 |
| 40 | 433.103 | 80 | 289.901 | 120 | 222.435 | 160 | 182.473 | 200 | 155.772 |

## 降水强度:

室外排水设计采用的雨水参数是以体积(容量)来表达,需将以毫米(mm)为单位的降水强度(高度),转换为以升(L)为单位的降水体积(容量)。

单位时间(min)单位面积(hm<sup>2</sup>)1mm降雨量转换为容量(L)时,经过以下换算过程:

$$1\text{mm}=0.001\text{m}$$

$$1\text{ hm}^2=10000\text{ m}^2$$

$$1\text{m}^3=1000\text{L}$$

$$1\text{ hm}^2 \times 0.001\text{m} = 10\text{ m}^3=10000\text{L}$$

即单位时间(min)单位面积(hm<sup>2</sup>)的1mm降水换算成容量为10000L,单位时间为1S时,单位面积为1hm<sup>2</sup>的降水容量为10000/60=167L/(S·hm<sup>2</sup>)与降水强度*i*(mm/min)之间可以 $q=167i$ 进行换算。

i=2a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 3.1090 | 41 | 1.1441 | 81  | 0.7449 | 121 | 0.5646 | 161 | 0.4599 |
| 2  | 2.9618 | 42 | 1.1281 | 82  | 0.7388 | 122 | 0.5613 | 162 | 0.4578 |
| 3  | 2.8294 | 43 | 1.1126 | 83  | 0.7328 | 123 | 0.5581 | 163 | 0.4558 |
| 4  | 2.7097 | 44 | 1.0975 | 84  | 0.7269 | 124 | 0.5549 | 164 | 0.4538 |
| 5  | 2.6009 | 45 | 1.0829 | 85  | 0.7211 | 125 | 0.5517 | 165 | 0.4517 |
| 6  | 2.5014 | 46 | 1.0688 | 86  | 0.7154 | 126 | 0.5486 | 166 | 0.4498 |
| 7  | 2.4102 | 47 | 1.0550 | 87  | 0.7098 | 127 | 0.5455 | 167 | 0.4478 |
| 8  | 2.3261 | 48 | 1.0417 | 88  | 0.7043 | 128 | 0.5425 | 168 | 0.4458 |
| 9  | 2.2484 | 49 | 1.0287 | 89  | 0.6989 | 129 | 0.5395 | 169 | 0.4439 |
| 10 | 2.1763 | 50 | 1.0161 | 90  | 0.6936 | 130 | 0.5365 | 170 | 0.4420 |
| 11 | 2.1092 | 51 | 1.0038 | 91  | 0.6884 | 131 | 0.5336 | 171 | 0.4401 |
| 12 | 2.0466 | 52 | 0.9918 | 92  | 0.6833 | 132 | 0.5307 | 172 | 0.4382 |
| 13 | 1.9881 | 53 | 0.9802 | 93  | 0.6783 | 133 | 0.5279 | 173 | 0.4364 |
| 14 | 1.9332 | 54 | 0.9689 | 94  | 0.6733 | 134 | 0.5250 | 174 | 0.4346 |
| 15 | 1.8816 | 55 | 0.9579 | 95  | 0.6684 | 135 | 0.5223 | 175 | 0.4327 |
| 16 | 1.8330 | 56 | 0.9471 | 96  | 0.6636 | 136 | 0.5195 | 176 | 0.4309 |
| 17 | 1.7872 | 57 | 0.9366 | 97  | 0.6589 | 137 | 0.5168 | 177 | 0.4291 |
| 18 | 1.7439 | 58 | 0.9264 | 98  | 0.6543 | 138 | 0.5141 | 178 | 0.4274 |
| 19 | 1.7028 | 59 | 0.9164 | 99  | 0.6497 | 139 | 0.5114 | 179 | 0.4256 |
| 20 | 1.6639 | 60 | 0.9067 | 100 | 0.6452 | 140 | 0.5088 | 180 | 0.4239 |
| 21 | 1.6270 | 61 | 0.8971 | 101 | 0.6408 | 141 | 0.5062 | 181 | 0.4222 |
| 22 | 1.5918 | 62 | 0.8879 | 102 | 0.6364 | 142 | 0.5036 | 182 | 0.4205 |
| 23 | 1.5583 | 63 | 0.8788 | 103 | 0.6321 | 143 | 0.5011 | 183 | 0.4188 |
| 24 | 1.5264 | 64 | 0.8699 | 104 | 0.6279 | 144 | 0.4986 | 184 | 0.4171 |
| 25 | 1.4959 | 65 | 0.8613 | 105 | 0.6237 | 145 | 0.4961 | 185 | 0.4154 |
| 26 | 1.4667 | 66 | 0.8528 | 106 | 0.6196 | 146 | 0.4937 | 186 | 0.4138 |
| 27 | 1.4388 | 67 | 0.8445 | 107 | 0.6156 | 147 | 0.4912 | 187 | 0.4122 |
| 28 | 1.4121 | 68 | 0.8364 | 108 | 0.6116 | 148 | 0.4888 | 188 | 0.4105 |
| 29 | 1.3865 | 69 | 0.8284 | 109 | 0.6077 | 149 | 0.4865 | 189 | 0.4089 |
| 30 | 1.3619 | 70 | 0.8207 | 110 | 0.6038 | 150 | 0.4841 | 190 | 0.4074 |
| 31 | 1.3382 | 71 | 0.8131 | 111 | 0.6000 | 151 | 0.4818 | 191 | 0.4058 |
| 32 | 1.3155 | 72 | 0.8056 | 112 | 0.5962 | 152 | 0.4795 | 192 | 0.4042 |
| 33 | 1.2936 | 73 | 0.7983 | 113 | 0.5925 | 153 | 0.4772 | 193 | 0.4027 |
| 34 | 1.2725 | 74 | 0.7912 | 114 | 0.5888 | 154 | 0.4750 | 194 | 0.4011 |
| 35 | 1.2522 | 75 | 0.7842 | 115 | 0.5852 | 155 | 0.4728 | 195 | 0.3996 |
| 36 | 1.2326 | 76 | 0.7773 | 116 | 0.5817 | 156 | 0.4706 | 196 | 0.3981 |
| 37 | 1.2137 | 77 | 0.7706 | 117 | 0.5782 | 157 | 0.4684 | 197 | 0.3966 |
| 38 | 1.1954 | 78 | 0.7640 | 118 | 0.5747 | 158 | 0.4662 | 198 | 0.3951 |
| 39 | 1.1777 | 79 | 0.7575 | 119 | 0.5713 | 159 | 0.4641 | 199 | 0.3937 |
| 40 | 1.1607 | 80 | 0.7511 | 120 | 0.5679 | 160 | 0.4620 | 200 | 0.3922 |

i=3a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 3.4458 | 41 | 1.3074 | 81  | 0.8601 | 121 | 0.6560 | 161 | 0.5368 |
| 2  | 3.2887 | 42 | 1.2895 | 82  | 0.8532 | 122 | 0.6523 | 162 | 0.5344 |
| 3  | 3.1470 | 43 | 1.2722 | 83  | 0.8464 | 123 | 0.6486 | 163 | 0.5321 |
| 4  | 3.0185 | 44 | 1.2555 | 84  | 0.8397 | 124 | 0.6450 | 164 | 0.5298 |
| 5  | 2.9015 | 45 | 1.2392 | 85  | 0.8332 | 125 | 0.6414 | 165 | 0.5275 |
| 6  | 2.7942 | 46 | 1.2234 | 86  | 0.8268 | 126 | 0.6378 | 166 | 0.5252 |
| 7  | 2.6957 | 47 | 1.2080 | 87  | 0.8205 | 127 | 0.6343 | 167 | 0.5229 |
| 8  | 2.6047 | 48 | 1.1931 | 88  | 0.8143 | 128 | 0.6309 | 168 | 0.5207 |
| 9  | 2.5205 | 49 | 1.1786 | 89  | 0.8082 | 129 | 0.6275 | 169 | 0.5185 |
| 10 | 2.4422 | 50 | 1.1645 | 90  | 0.8022 | 130 | 0.6241 | 170 | 0.5163 |
| 11 | 2.3693 | 51 | 1.1508 | 91  | 0.7963 | 131 | 0.6208 | 171 | 0.5142 |
| 12 | 2.3011 | 52 | 1.1374 | 92  | 0.7905 | 132 | 0.6175 | 172 | 0.5120 |
| 13 | 2.2373 | 53 | 1.1244 | 93  | 0.7848 | 133 | 0.6142 | 173 | 0.5099 |
| 14 | 2.1774 | 54 | 1.1117 | 94  | 0.7792 | 134 | 0.6110 | 174 | 0.5078 |
| 15 | 2.1210 | 55 | 1.0994 | 95  | 0.7737 | 135 | 0.6079 | 175 | 0.5057 |
| 16 | 2.0678 | 56 | 1.0873 | 96  | 0.7683 | 136 | 0.6047 | 176 | 0.5037 |
| 17 | 2.0176 | 57 | 1.0756 | 97  | 0.7629 | 137 | 0.6016 | 177 | 0.5016 |
| 18 | 1.9701 | 58 | 1.0641 | 98  | 0.7577 | 138 | 0.5986 | 178 | 0.4996 |
| 19 | 1.9251 | 59 | 1.0529 | 99  | 0.7525 | 139 | 0.5955 | 179 | 0.4976 |
| 20 | 1.8823 | 60 | 1.0420 | 100 | 0.7474 | 140 | 0.5925 | 180 | 0.4956 |
| 21 | 1.8417 | 61 | 1.0313 | 101 | 0.7424 | 141 | 0.5896 | 181 | 0.4936 |
| 22 | 1.8030 | 62 | 1.0209 | 102 | 0.7375 | 142 | 0.5867 | 182 | 0.4917 |
| 23 | 1.7661 | 63 | 1.0107 | 103 | 0.7326 | 143 | 0.5838 | 183 | 0.4898 |
| 24 | 1.7309 | 64 | 1.0008 | 104 | 0.7278 | 144 | 0.5809 | 184 | 0.4878 |
| 25 | 1.6973 | 65 | 0.9910 | 105 | 0.7231 | 145 | 0.5781 | 185 | 0.4859 |
| 26 | 1.6651 | 66 | 0.9815 | 106 | 0.7184 | 146 | 0.5753 | 186 | 0.4841 |
| 27 | 1.6343 | 67 | 0.9722 | 107 | 0.7138 | 147 | 0.5725 | 187 | 0.4822 |
| 28 | 1.6047 | 68 | 0.9631 | 108 | 0.7093 | 148 | 0.5698 | 188 | 0.4803 |
| 29 | 1.5764 | 69 | 0.9541 | 109 | 0.7049 | 149 | 0.5671 | 189 | 0.4785 |
| 30 | 1.5492 | 70 | 0.9454 | 110 | 0.7005 | 150 | 0.5644 | 190 | 0.4767 |
| 31 | 1.5230 | 71 | 0.9369 | 111 | 0.6961 | 151 | 0.5618 | 191 | 0.4749 |
| 32 | 1.4978 | 72 | 0.9285 | 112 | 0.6919 | 152 | 0.5591 | 192 | 0.4731 |
| 33 | 1.4735 | 73 | 0.9203 | 113 | 0.6877 | 153 | 0.5566 | 193 | 0.4713 |
| 34 | 1.4501 | 74 | 0.9122 | 114 | 0.6835 | 154 | 0.5540 | 194 | 0.4696 |
| 35 | 1.4276 | 75 | 0.9043 | 115 | 0.6794 | 155 | 0.5515 | 195 | 0.4678 |
| 36 | 1.4058 | 76 | 0.8966 | 116 | 0.6754 | 156 | 0.5489 | 196 | 0.4661 |
| 37 | 1.3848 | 77 | 0.8890 | 117 | 0.6714 | 157 | 0.5465 | 197 | 0.4644 |
| 38 | 1.3644 | 78 | 0.8816 | 118 | 0.6675 | 158 | 0.5440 | 198 | 0.4627 |
| 39 | 1.3448 | 79 | 0.8743 | 119 | 0.6636 | 159 | 0.5416 | 199 | 0.4610 |
| 40 | 1.3258 | 80 | 0.8671 | 120 | 0.6598 | 160 | 0.5392 | 200 | 0.4593 |



i=5a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 3.8831 | 41 | 1.5281 | 81  | 1.0185 | 121 | 0.7831 | 161 | 0.6445 |
| 2  | 3.7138 | 42 | 1.5079 | 82  | 1.0106 | 122 | 0.7788 | 162 | 0.6417 |
| 3  | 3.5607 | 43 | 1.4883 | 83  | 1.0028 | 123 | 0.7745 | 163 | 0.6390 |
| 4  | 3.4215 | 44 | 1.4693 | 84  | 0.9951 | 124 | 0.7703 | 164 | 0.6363 |
| 5  | 3.2943 | 45 | 1.4509 | 85  | 0.9876 | 125 | 0.7661 | 165 | 0.6336 |
| 6  | 3.1776 | 46 | 1.4330 | 86  | 0.9802 | 126 | 0.7620 | 166 | 0.6310 |
| 7  | 3.0700 | 47 | 1.4156 | 87  | 0.9730 | 127 | 0.7580 | 167 | 0.6284 |
| 8  | 2.9705 | 48 | 1.3986 | 88  | 0.9658 | 128 | 0.7540 | 168 | 0.6258 |
| 9  | 2.8782 | 49 | 1.3822 | 89  | 0.9588 | 129 | 0.7500 | 169 | 0.6232 |
| 10 | 2.7923 | 50 | 1.3662 | 90  | 0.9519 | 130 | 0.7461 | 170 | 0.6206 |
| 11 | 2.7121 | 51 | 1.3506 | 91  | 0.9452 | 131 | 0.7422 | 171 | 0.6181 |
| 12 | 2.6370 | 52 | 1.3354 | 92  | 0.9385 | 132 | 0.7384 | 172 | 0.6156 |
| 13 | 2.5666 | 53 | 1.3206 | 93  | 0.9319 | 133 | 0.7346 | 173 | 0.6131 |
| 14 | 2.5004 | 54 | 1.3061 | 94  | 0.9255 | 134 | 0.7309 | 174 | 0.6107 |
| 15 | 2.4380 | 55 | 1.2921 | 95  | 0.9191 | 135 | 0.7272 | 175 | 0.6083 |
| 16 | 2.3792 | 56 | 1.2784 | 96  | 0.9129 | 136 | 0.7236 | 176 | 0.6059 |
| 17 | 2.3235 | 57 | 1.2650 | 97  | 0.9067 | 137 | 0.7200 | 177 | 0.6035 |
| 18 | 2.2707 | 58 | 1.2519 | 98  | 0.9006 | 138 | 0.7164 | 178 | 0.6011 |
| 19 | 2.2207 | 59 | 1.2391 | 99  | 0.8947 | 139 | 0.7129 | 179 | 0.5988 |
| 20 | 2.1731 | 60 | 1.2267 | 100 | 0.8888 | 140 | 0.7094 | 180 | 0.5964 |
| 21 | 2.1279 | 61 | 1.2145 | 101 | 0.8830 | 141 | 0.7060 | 181 | 0.5941 |
| 22 | 2.0847 | 62 | 1.2026 | 102 | 0.8773 | 142 | 0.7026 | 182 | 0.5918 |
| 23 | 2.0436 | 63 | 1.1910 | 103 | 0.8717 | 143 | 0.6992 | 183 | 0.5896 |
| 24 | 2.0042 | 64 | 1.1796 | 104 | 0.8661 | 144 | 0.6959 | 184 | 0.5873 |
| 25 | 1.9666 | 65 | 1.1685 | 105 | 0.8607 | 145 | 0.6926 | 185 | 0.5851 |
| 26 | 1.9306 | 66 | 1.1576 | 106 | 0.8553 | 146 | 0.6894 | 186 | 0.5829 |
| 27 | 1.8961 | 67 | 1.1470 | 107 | 0.8500 | 147 | 0.6862 | 187 | 0.5807 |
| 28 | 1.8630 | 68 | 1.1365 | 108 | 0.8448 | 148 | 0.6830 | 188 | 0.5786 |
| 29 | 1.8312 | 69 | 1.1263 | 109 | 0.8397 | 149 | 0.6798 | 189 | 0.5764 |
| 30 | 1.8006 | 70 | 1.1163 | 110 | 0.8346 | 150 | 0.6767 | 190 | 0.5743 |
| 31 | 1.7712 | 71 | 1.1065 | 111 | 0.8296 | 151 | 0.6736 | 191 | 0.5722 |
| 32 | 1.7428 | 72 | 1.0969 | 112 | 0.8246 | 152 | 0.6706 | 192 | 0.5701 |
| 33 | 1.7155 | 73 | 1.0875 | 113 | 0.8198 | 153 | 0.6676 | 193 | 0.5680 |
| 34 | 1.6892 | 74 | 1.0783 | 114 | 0.8150 | 154 | 0.6646 | 194 | 0.5660 |
| 35 | 1.6638 | 75 | 1.0693 | 115 | 0.8102 | 155 | 0.6616 | 195 | 0.5639 |
| 36 | 1.6392 | 76 | 1.0604 | 116 | 0.8056 | 156 | 0.6587 | 196 | 0.5619 |
| 37 | 1.6155 | 77 | 1.0517 | 117 | 0.8009 | 157 | 0.6558 | 197 | 0.5599 |
| 38 | 1.5926 | 78 | 1.0432 | 118 | 0.7964 | 158 | 0.6529 | 198 | 0.5579 |
| 39 | 1.5704 | 79 | 1.0348 | 119 | 0.7919 | 159 | 0.6501 | 199 | 0.5559 |
| 40 | 1.5489 | 80 | 1.0266 | 120 | 0.7875 | 160 | 0.6473 | 200 | 0.5540 |

i=10a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 4.3835 | 41 | 1.7974 | 81  | 1.2075 | 121 | 0.9317 | 161 | 0.7684 |
| 2  | 4.2057 | 42 | 1.7742 | 82  | 1.1982 | 122 | 0.9266 | 162 | 0.7651 |
| 3  | 4.0438 | 43 | 1.7517 | 83  | 1.1891 | 123 | 0.9216 | 163 | 0.7619 |
| 4  | 3.8957 | 44 | 1.7299 | 84  | 1.1802 | 124 | 0.9166 | 164 | 0.7587 |
| 5  | 3.7596 | 45 | 1.7087 | 85  | 1.1714 | 125 | 0.9117 | 165 | 0.7555 |
| 6  | 3.6340 | 46 | 1.6880 | 86  | 1.1628 | 126 | 0.9069 | 166 | 0.7524 |
| 7  | 3.5178 | 47 | 1.6680 | 87  | 1.1543 | 127 | 0.9021 | 167 | 0.7493 |
| 8  | 3.4099 | 48 | 1.6485 | 88  | 1.1460 | 128 | 0.8974 | 168 | 0.7462 |
| 9  | 3.3093 | 49 | 1.6295 | 89  | 1.1378 | 129 | 0.8927 | 169 | 0.7432 |
| 10 | 3.2154 | 50 | 1.6110 | 90  | 1.1297 | 130 | 0.8881 | 170 | 0.7402 |
| 11 | 3.1275 | 51 | 1.5930 | 91  | 1.1218 | 131 | 0.8836 | 171 | 0.7372 |
| 12 | 3.0449 | 52 | 1.5755 | 92  | 1.1139 | 132 | 0.8791 | 172 | 0.7343 |
| 13 | 2.9672 | 53 | 1.5584 | 93  | 1.1063 | 133 | 0.8747 | 173 | 0.7313 |
| 14 | 2.8940 | 54 | 1.5417 | 94  | 1.0987 | 134 | 0.8703 | 174 | 0.7284 |
| 15 | 2.8249 | 55 | 1.5254 | 95  | 1.0913 | 135 | 0.8659 | 175 | 0.7256 |
| 16 | 2.7594 | 56 | 1.5095 | 96  | 1.0839 | 136 | 0.8616 | 176 | 0.7227 |
| 17 | 2.6974 | 57 | 1.4940 | 97  | 1.0767 | 137 | 0.8574 | 177 | 0.7199 |
| 18 | 2.6386 | 58 | 1.4789 | 98  | 1.0696 | 138 | 0.8532 | 178 | 0.7171 |
| 19 | 2.5826 | 59 | 1.4641 | 99  | 1.0626 | 139 | 0.8491 | 179 | 0.7143 |
| 20 | 2.5293 | 60 | 1.4497 | 100 | 1.0557 | 140 | 0.8450 | 180 | 0.7116 |
| 21 | 2.4785 | 61 | 1.4356 | 101 | 1.0490 | 141 | 0.8409 | 181 | 0.7089 |
| 22 | 2.4300 | 62 | 1.4218 | 102 | 1.0423 | 142 | 0.8369 | 182 | 0.7062 |
| 23 | 2.3837 | 63 | 1.4083 | 103 | 1.0357 | 143 | 0.8329 | 183 | 0.7035 |
| 24 | 2.3393 | 64 | 1.3951 | 104 | 1.0292 | 144 | 0.8290 | 184 | 0.7008 |
| 25 | 2.2968 | 65 | 1.3821 | 105 | 1.0228 | 145 | 0.8251 | 185 | 0.6982 |
| 26 | 2.2561 | 66 | 1.3695 | 106 | 1.0165 | 146 | 0.8213 | 186 | 0.6956 |
| 27 | 2.2170 | 67 | 1.3571 | 107 | 1.0103 | 147 | 0.8175 | 187 | 0.6930 |
| 28 | 2.1795 | 68 | 1.3450 | 108 | 1.0042 | 148 | 0.8138 | 188 | 0.6905 |
| 29 | 2.1434 | 69 | 1.3331 | 109 | 0.9981 | 149 | 0.8100 | 189 | 0.6879 |
| 30 | 2.1086 | 70 | 1.3215 | 110 | 0.9922 | 150 | 0.8064 | 190 | 0.6854 |
| 31 | 2.0752 | 71 | 1.3101 | 111 | 0.9863 | 151 | 0.8027 | 191 | 0.6829 |
| 32 | 2.0429 | 72 | 1.2989 | 112 | 0.9805 | 152 | 0.7991 | 192 | 0.6804 |
| 33 | 2.0118 | 73 | 1.2880 | 113 | 0.9748 | 153 | 0.7956 | 193 | 0.6780 |
| 34 | 1.9818 | 74 | 1.2772 | 114 | 0.9691 | 154 | 0.7921 | 194 | 0.6755 |
| 35 | 1.9528 | 75 | 1.2667 | 115 | 0.9636 | 155 | 0.7886 | 195 | 0.6731 |
| 36 | 1.9247 | 76 | 1.2563 | 116 | 0.9581 | 156 | 0.7851 | 196 | 0.6707 |
| 37 | 1.8976 | 77 | 1.2462 | 117 | 0.9527 | 157 | 0.7817 | 197 | 0.6684 |
| 38 | 1.8713 | 78 | 1.2362 | 118 | 0.9473 | 158 | 0.7783 | 198 | 0.6660 |
| 39 | 1.8459 | 79 | 1.2265 | 119 | 0.9420 | 159 | 0.7750 | 199 | 0.6637 |
| 40 | 1.8213 | 80 | 1.2169 | 120 | 0.9368 | 160 | 0.7716 | 200 | 0.6614 |

i=20a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 4.8314 | 41 | 2.0364 | 81  | 1.3689 | 121 | 1.0546 | 161 | 0.8681 |
| 2  | 4.6473 | 42 | 2.0103 | 82  | 1.3583 | 122 | 1.0488 | 162 | 0.8644 |
| 3  | 4.4786 | 43 | 1.9850 | 83  | 1.3480 | 123 | 1.0430 | 163 | 0.8607 |
| 4  | 4.3234 | 44 | 1.9604 | 84  | 1.3378 | 124 | 1.0374 | 164 | 0.8571 |
| 5  | 4.1799 | 45 | 1.9365 | 85  | 1.3278 | 125 | 1.0318 | 165 | 0.8535 |
| 6  | 4.0470 | 46 | 1.9133 | 86  | 1.3180 | 126 | 1.0263 | 166 | 0.8499 |
| 7  | 3.9234 | 47 | 1.8906 | 87  | 1.3083 | 127 | 1.0208 | 167 | 0.8464 |
| 8  | 3.8081 | 48 | 1.8686 | 88  | 1.2989 | 128 | 1.0155 | 168 | 0.8429 |
| 9  | 3.7003 | 49 | 1.8472 | 89  | 1.2895 | 129 | 1.0101 | 169 | 0.8394 |
| 10 | 3.5993 | 50 | 1.8263 | 90  | 1.2803 | 130 | 1.0049 | 170 | 0.8360 |
| 11 | 3.5044 | 51 | 1.8060 | 91  | 1.2713 | 131 | 0.9997 | 171 | 0.8325 |
| 12 | 3.4150 | 52 | 1.7862 | 92  | 1.2624 | 132 | 0.9946 | 172 | 0.8292 |
| 13 | 3.3307 | 53 | 1.7669 | 93  | 1.2537 | 133 | 0.9895 | 173 | 0.8258 |
| 14 | 3.2511 | 54 | 1.7480 | 94  | 1.2450 | 134 | 0.9845 | 174 | 0.8225 |
| 15 | 3.1757 | 55 | 1.7296 | 95  | 1.2366 | 135 | 0.9795 | 175 | 0.8192 |
| 16 | 3.1041 | 56 | 1.7116 | 96  | 1.2282 | 136 | 0.9746 | 176 | 0.8160 |
| 17 | 3.0362 | 57 | 1.6941 | 97  | 1.2200 | 137 | 0.9698 | 177 | 0.8128 |
| 18 | 2.9716 | 58 | 1.6770 | 98  | 1.2119 | 138 | 0.9650 | 178 | 0.8096 |
| 19 | 2.9101 | 59 | 1.6602 | 99  | 1.2039 | 139 | 0.9603 | 179 | 0.8064 |
| 20 | 2.8514 | 60 | 1.6439 | 100 | 1.1961 | 140 | 0.9556 | 180 | 0.8033 |
| 21 | 2.7954 | 61 | 1.6279 | 101 | 1.1884 | 141 | 0.9510 | 181 | 0.8002 |
| 22 | 2.7418 | 62 | 1.6122 | 102 | 1.1807 | 142 | 0.9464 | 182 | 0.7971 |
| 23 | 2.6906 | 63 | 1.5969 | 103 | 1.1732 | 143 | 0.9419 | 183 | 0.7940 |
| 24 | 2.6415 | 64 | 1.5820 | 104 | 1.1658 | 144 | 0.9374 | 184 | 0.7910 |
| 25 | 2.5944 | 65 | 1.5673 | 105 | 1.1585 | 145 | 0.9330 | 185 | 0.7880 |
| 26 | 2.5492 | 66 | 1.5530 | 106 | 1.1513 | 146 | 0.9286 | 186 | 0.7850 |
| 27 | 2.5057 | 67 | 1.5389 | 107 | 1.1443 | 147 | 0.9243 | 187 | 0.7821 |
| 28 | 2.4639 | 68 | 1.5252 | 108 | 1.1373 | 148 | 0.9200 | 188 | 0.7792 |
| 29 | 2.4237 | 69 | 1.5117 | 109 | 1.1304 | 149 | 0.9157 | 189 | 0.7763 |
| 30 | 2.3850 | 70 | 1.4985 | 110 | 1.1236 | 150 | 0.9115 | 190 | 0.7734 |
| 31 | 2.3476 | 71 | 1.4855 | 111 | 1.1169 | 151 | 0.9074 | 191 | 0.7705 |
| 32 | 2.3116 | 72 | 1.4728 | 112 | 1.1103 | 152 | 0.9033 | 192 | 0.7677 |
| 33 | 2.2768 | 73 | 1.4604 | 113 | 1.1037 | 153 | 0.8992 | 193 | 0.7649 |
| 34 | 2.2432 | 74 | 1.4482 | 114 | 1.0973 | 154 | 0.8952 | 194 | 0.7621 |
| 35 | 2.2107 | 75 | 1.4362 | 115 | 1.0910 | 155 | 0.8912 | 195 | 0.7594 |
| 36 | 2.1793 | 76 | 1.4244 | 116 | 1.0847 | 156 | 0.8872 | 196 | 0.7566 |
| 37 | 2.1489 | 77 | 1.4129 | 117 | 1.0785 | 157 | 0.8833 | 197 | 0.7539 |
| 38 | 2.1194 | 78 | 1.4016 | 118 | 1.0724 | 158 | 0.8795 | 198 | 0.7512 |
| 39 | 2.0909 | 79 | 1.3905 | 119 | 1.0664 | 159 | 0.8757 | 199 | 0.7486 |
| 40 | 2.0632 | 80 | 1.3796 | 120 | 1.0604 | 160 | 0.8719 | 200 | 0.7459 |

i=30a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 5.1111 | 41 | 2.1741 | 81  | 1.4615 | 121 | 1.1251 | 161 | 0.9255 |
| 2  | 4.9205 | 42 | 2.1463 | 82  | 1.4502 | 122 | 1.1189 | 162 | 0.9215 |
| 3  | 4.7455 | 43 | 2.1193 | 83  | 1.4391 | 123 | 1.1128 | 163 | 0.9176 |
| 4  | 4.5840 | 44 | 2.0931 | 84  | 1.4283 | 124 | 1.1067 | 164 | 0.9137 |
| 5  | 4.4346 | 45 | 2.0676 | 85  | 1.4176 | 125 | 1.1008 | 165 | 0.9098 |
| 6  | 4.2959 | 46 | 2.0429 | 86  | 1.4071 | 126 | 1.0949 | 166 | 0.9060 |
| 7  | 4.1668 | 47 | 2.0188 | 87  | 1.3967 | 127 | 1.0890 | 167 | 0.9022 |
| 8  | 4.0461 | 48 | 1.9953 | 88  | 1.3866 | 128 | 1.0833 | 168 | 0.8985 |
| 9  | 3.9332 | 49 | 1.9724 | 89  | 1.3766 | 129 | 1.0776 | 169 | 0.8947 |
| 10 | 3.8273 | 50 | 1.9502 | 90  | 1.3668 | 130 | 1.0719 | 170 | 0.8911 |
| 11 | 3.7276 | 51 | 1.9285 | 91  | 1.3571 | 131 | 1.0664 | 171 | 0.8874 |
| 12 | 3.6337 | 52 | 1.9073 | 92  | 1.3476 | 132 | 1.0609 | 172 | 0.8838 |
| 13 | 3.5450 | 53 | 1.8867 | 93  | 1.3382 | 133 | 1.0555 | 173 | 0.8802 |
| 14 | 3.4611 | 54 | 1.8666 | 94  | 1.3290 | 134 | 1.0501 | 174 | 0.8767 |
| 15 | 3.3817 | 55 | 1.8469 | 95  | 1.3199 | 135 | 1.0448 | 175 | 0.8732 |
| 16 | 3.3063 | 56 | 1.8278 | 96  | 1.3110 | 136 | 1.0396 | 176 | 0.8697 |
| 17 | 3.2346 | 57 | 1.8090 | 97  | 1.3022 | 137 | 1.0344 | 177 | 0.8662 |
| 18 | 3.1664 | 58 | 1.7907 | 98  | 1.2936 | 138 | 1.0292 | 178 | 0.8628 |
| 19 | 3.1014 | 59 | 1.7729 | 99  | 1.2850 | 139 | 1.0242 | 179 | 0.8594 |
| 20 | 3.0393 | 60 | 1.7554 | 100 | 1.2766 | 140 | 1.0192 | 180 | 0.8561 |
| 21 | 2.9800 | 61 | 1.7383 | 101 | 1.2684 | 141 | 1.0142 | 181 | 0.8527 |
| 22 | 2.9233 | 62 | 1.7216 | 102 | 1.2602 | 142 | 1.0093 | 182 | 0.8494 |
| 23 | 2.8691 | 63 | 1.7053 | 103 | 1.2522 | 143 | 1.0045 | 183 | 0.8462 |
| 24 | 2.8170 | 64 | 1.6893 | 104 | 1.2442 | 144 | 0.9997 | 184 | 0.8429 |
| 25 | 2.7671 | 65 | 1.6736 | 105 | 1.2364 | 145 | 0.9949 | 185 | 0.8397 |
| 26 | 2.7192 | 66 | 1.6583 | 106 | 1.2287 | 146 | 0.9902 | 186 | 0.8365 |
| 27 | 2.6731 | 67 | 1.6433 | 107 | 1.2212 | 147 | 0.9856 | 187 | 0.8334 |
| 28 | 2.6287 | 68 | 1.6286 | 108 | 1.2137 | 148 | 0.9810 | 188 | 0.8302 |
| 29 | 2.5860 | 69 | 1.6142 | 109 | 1.2063 | 149 | 0.9765 | 189 | 0.8271 |
| 30 | 2.5449 | 70 | 1.6000 | 110 | 1.1990 | 150 | 0.9720 | 190 | 0.8241 |
| 31 | 2.5052 | 71 | 1.5862 | 111 | 1.1918 | 151 | 0.9675 | 191 | 0.8210 |
| 32 | 2.4669 | 72 | 1.5726 | 112 | 1.1848 | 152 | 0.9631 | 192 | 0.8180 |
| 33 | 2.4300 | 73 | 1.5593 | 113 | 1.1778 | 153 | 0.9588 | 193 | 0.8150 |
| 34 | 2.3942 | 74 | 1.5463 | 114 | 1.1709 | 154 | 0.9545 | 194 | 0.8120 |
| 35 | 2.3597 | 75 | 1.5335 | 115 | 1.1641 | 155 | 0.9502 | 195 | 0.8091 |
| 36 | 2.3262 | 76 | 1.5209 | 116 | 1.1574 | 156 | 0.9460 | 196 | 0.8061 |
| 37 | 2.2939 | 77 | 1.5086 | 117 | 1.1508 | 157 | 0.9418 | 197 | 0.8032 |
| 38 | 2.2625 | 78 | 1.4965 | 118 | 1.1442 | 158 | 0.9377 | 198 | 0.8003 |
| 39 | 2.2321 | 79 | 1.4846 | 119 | 1.1378 | 159 | 0.9336 | 199 | 0.7975 |
| 40 | 2.2027 | 80 | 1.4729 | 120 | 1.1314 | 160 | 0.9295 | 200 | 0.7947 |

i=50a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 5.4538 | 41 | 2.3434 | 81  | 1.5758 | 121 | 1.2124 | 161 | 0.9966 |
| 2  | 5.2552 | 42 | 2.3135 | 82  | 1.5636 | 122 | 1.2057 | 162 | 0.9923 |
| 3  | 5.0722 | 43 | 2.2845 | 83  | 1.5517 | 123 | 1.1991 | 163 | 0.9880 |
| 4  | 4.9032 | 44 | 2.2564 | 84  | 1.5399 | 124 | 1.1926 | 164 | 0.9838 |
| 5  | 4.7465 | 45 | 2.2290 | 85  | 1.5284 | 125 | 1.1861 | 165 | 0.9797 |
| 6  | 4.6007 | 46 | 2.2023 | 86  | 1.5170 | 126 | 1.1797 | 166 | 0.9755 |
| 7  | 4.4647 | 47 | 2.1764 | 87  | 1.5059 | 127 | 1.1734 | 167 | 0.9714 |
| 8  | 4.3376 | 48 | 2.1511 | 88  | 1.4949 | 128 | 1.1672 | 168 | 0.9674 |
| 9  | 4.2184 | 49 | 2.1265 | 89  | 1.4841 | 129 | 1.1610 | 169 | 0.9633 |
| 10 | 4.1064 | 50 | 2.1026 | 90  | 1.4735 | 130 | 1.1549 | 170 | 0.9594 |
| 11 | 4.0010 | 51 | 2.0792 | 91  | 1.4631 | 131 | 1.1489 | 171 | 0.9554 |
| 12 | 3.9015 | 52 | 2.0565 | 92  | 1.4528 | 132 | 1.1430 | 172 | 0.9515 |
| 13 | 3.8075 | 53 | 2.0343 | 93  | 1.4427 | 133 | 1.1371 | 173 | 0.9476 |
| 14 | 3.7185 | 54 | 2.0126 | 94  | 1.4327 | 134 | 1.1313 | 174 | 0.9438 |
| 15 | 3.6341 | 55 | 1.9914 | 95  | 1.4229 | 135 | 1.1256 | 175 | 0.9400 |
| 16 | 3.5539 | 56 | 1.9708 | 96  | 1.4133 | 136 | 1.1199 | 176 | 0.9362 |
| 17 | 3.4777 | 57 | 1.9506 | 97  | 1.4038 | 137 | 1.1143 | 177 | 0.9325 |
| 18 | 3.4051 | 58 | 1.9309 | 98  | 1.3944 | 138 | 1.1088 | 178 | 0.9288 |
| 19 | 3.3358 | 59 | 1.9116 | 99  | 1.3852 | 139 | 1.1033 | 179 | 0.9252 |
| 20 | 3.2697 | 60 | 1.8928 | 100 | 1.3761 | 140 | 1.0979 | 180 | 0.9215 |
| 21 | 3.2064 | 61 | 1.8744 | 101 | 1.3672 | 141 | 1.0925 | 181 | 0.9179 |
| 22 | 3.1459 | 62 | 1.8564 | 102 | 1.3584 | 142 | 1.0872 | 182 | 0.9144 |
| 23 | 3.0880 | 63 | 1.8388 | 103 | 1.3497 | 143 | 1.0820 | 183 | 0.9108 |
| 24 | 3.0324 | 64 | 1.8215 | 104 | 1.3412 | 144 | 1.0768 | 184 | 0.9073 |
| 25 | 2.9790 | 65 | 1.8046 | 105 | 1.3327 | 145 | 1.0717 | 185 | 0.9038 |
| 26 | 2.9278 | 66 | 1.7881 | 106 | 1.3244 | 146 | 1.0666 | 186 | 0.9004 |
| 27 | 2.8785 | 67 | 1.7719 | 107 | 1.3162 | 147 | 1.0616 | 187 | 0.8970 |
| 28 | 2.8310 | 68 | 1.7561 | 108 | 1.3081 | 148 | 1.0566 | 188 | 0.8936 |
| 29 | 2.7853 | 69 | 1.7405 | 109 | 1.3001 | 149 | 1.0517 | 189 | 0.8902 |
| 30 | 2.7412 | 70 | 1.7253 | 110 | 1.2923 | 150 | 1.0469 | 190 | 0.8869 |
| 31 | 2.6987 | 71 | 1.7104 | 111 | 1.2845 | 151 | 1.0421 | 191 | 0.8836 |
| 32 | 2.6577 | 72 | 1.6957 | 112 | 1.2769 | 152 | 1.0373 | 192 | 0.8803 |
| 33 | 2.6180 | 73 | 1.6814 | 113 | 1.2693 | 153 | 1.0326 | 193 | 0.8771 |
| 34 | 2.5797 | 74 | 1.6673 | 114 | 1.2619 | 154 | 1.0279 | 194 | 0.8739 |
| 35 | 2.5427 | 75 | 1.6535 | 115 | 1.2545 | 155 | 1.0233 | 195 | 0.8707 |
| 36 | 2.5068 | 76 | 1.6399 | 116 | 1.2473 | 156 | 1.0188 | 196 | 0.8675 |
| 37 | 2.4720 | 77 | 1.6266 | 117 | 1.2401 | 157 | 1.0142 | 197 | 0.8644 |
| 38 | 2.4384 | 78 | 1.6136 | 118 | 1.2331 | 158 | 1.0098 | 198 | 0.8613 |
| 39 | 2.4057 | 79 | 1.6007 | 119 | 1.2261 | 159 | 1.0053 | 199 | 0.8582 |
| 40 | 2.3741 | 80 | 1.5881 | 120 | 1.2192 | 160 | 1.0009 | 200 | 0.8551 |

i=100a

t (min) i(mm/min)

| t  | i      | t  | i      | t   | i      | t   | i      | t   | i      |
|----|--------|----|--------|-----|--------|-----|--------|-----|--------|
| 1  | 5.8861 | 41 | 2.5600 | 81  | 1.7224 | 121 | 1.3245 | 161 | 1.0879 |
| 2  | 5.6775 | 42 | 2.5275 | 82  | 1.7091 | 122 | 1.3171 | 162 | 1.0832 |
| 3  | 5.4850 | 43 | 2.4960 | 83  | 1.6960 | 123 | 1.3099 | 163 | 1.0785 |
| 4  | 5.3067 | 44 | 2.4653 | 84  | 1.6832 | 124 | 1.3027 | 164 | 1.0739 |
| 5  | 5.1410 | 45 | 2.4355 | 85  | 1.6706 | 125 | 1.2956 | 165 | 1.0693 |
| 6  | 4.9865 | 46 | 2.4065 | 86  | 1.6581 | 126 | 1.2886 | 166 | 1.0648 |
| 7  | 4.8422 | 47 | 2.3782 | 87  | 1.6459 | 127 | 1.2817 | 167 | 1.0603 |
| 8  | 4.7070 | 48 | 2.3507 | 88  | 1.6339 | 128 | 1.2749 | 168 | 1.0558 |
| 9  | 4.5801 | 49 | 2.3239 | 89  | 1.6221 | 129 | 1.2682 | 169 | 1.0514 |
| 10 | 4.4607 | 50 | 2.2978 | 90  | 1.6105 | 130 | 1.2615 | 170 | 1.0471 |
| 11 | 4.3481 | 51 | 2.2724 | 91  | 1.5991 | 131 | 1.2549 | 171 | 1.0427 |
| 12 | 4.2417 | 52 | 2.2475 | 92  | 1.5878 | 132 | 1.2484 | 172 | 1.0385 |
| 13 | 4.1411 | 53 | 2.2233 | 93  | 1.5767 | 133 | 1.2420 | 173 | 1.0342 |
| 14 | 4.0457 | 54 | 2.1997 | 94  | 1.5658 | 134 | 1.2356 | 174 | 1.0300 |
| 15 | 3.9552 | 55 | 2.1766 | 95  | 1.5551 | 135 | 1.2293 | 175 | 1.0258 |
| 16 | 3.8691 | 56 | 2.1540 | 96  | 1.5446 | 136 | 1.2231 | 176 | 1.0217 |
| 17 | 3.7871 | 57 | 2.1320 | 97  | 1.5341 | 137 | 1.2170 | 177 | 1.0176 |
| 18 | 3.7090 | 58 | 2.1105 | 98  | 1.5239 | 138 | 1.2109 | 178 | 1.0136 |
| 19 | 3.6345 | 59 | 2.0895 | 99  | 1.5138 | 139 | 1.2049 | 179 | 1.0095 |
| 20 | 3.5632 | 60 | 2.0689 | 100 | 1.5039 | 140 | 1.1989 | 180 | 1.0056 |
| 21 | 3.4951 | 61 | 2.0488 | 101 | 1.4941 | 141 | 1.1931 | 181 | 1.0016 |
| 22 | 3.4298 | 62 | 2.0292 | 102 | 1.4844 | 142 | 1.1873 | 182 | 0.9977 |
| 23 | 3.3672 | 63 | 2.0099 | 103 | 1.4749 | 143 | 1.1815 | 183 | 0.9938 |
| 24 | 3.3071 | 64 | 1.9911 | 104 | 1.4655 | 144 | 1.1758 | 184 | 0.9900 |
| 25 | 3.2495 | 65 | 1.9726 | 105 | 1.4563 | 145 | 1.1702 | 185 | 0.9862 |
| 26 | 3.1940 | 66 | 1.9546 | 106 | 1.4472 | 146 | 1.1647 | 186 | 0.9824 |
| 27 | 3.1407 | 67 | 1.9369 | 107 | 1.4382 | 147 | 1.1592 | 187 | 0.9787 |
| 28 | 3.0893 | 68 | 1.9196 | 108 | 1.4294 | 148 | 1.1537 | 188 | 0.9749 |
| 29 | 3.0398 | 69 | 1.9026 | 109 | 1.4206 | 149 | 1.1483 | 189 | 0.9713 |
| 30 | 2.9921 | 70 | 1.8859 | 110 | 1.4120 | 150 | 1.1430 | 190 | 0.9676 |
| 31 | 2.9460 | 71 | 1.8696 | 111 | 1.4035 | 151 | 1.1377 | 191 | 0.9640 |
| 32 | 2.9015 | 72 | 1.8536 | 112 | 1.3951 | 152 | 1.1325 | 192 | 0.9604 |
| 33 | 2.8585 | 73 | 1.8379 | 113 | 1.3869 | 153 | 1.1274 | 193 | 0.9569 |
| 34 | 2.8169 | 74 | 1.8225 | 114 | 1.3787 | 154 | 1.1222 | 194 | 0.9533 |
| 35 | 2.7766 | 75 | 1.8074 | 115 | 1.3707 | 155 | 1.1172 | 195 | 0.9498 |
| 36 | 2.7377 | 76 | 1.7926 | 116 | 1.3627 | 156 | 1.1122 | 196 | 0.9464 |
| 37 | 2.6999 | 77 | 1.7780 | 117 | 1.3549 | 157 | 1.1072 | 197 | 0.9429 |
| 38 | 2.6633 | 78 | 1.7637 | 118 | 1.3471 | 158 | 1.1023 | 198 | 0.9395 |
| 39 | 2.6279 | 79 | 1.7497 | 119 | 1.3395 | 159 | 1.0975 | 199 | 0.9361 |
| 40 | 2.5934 | 80 | 1.7359 | 120 | 1.3319 | 160 | 1.0927 | 200 | 0.9328 |

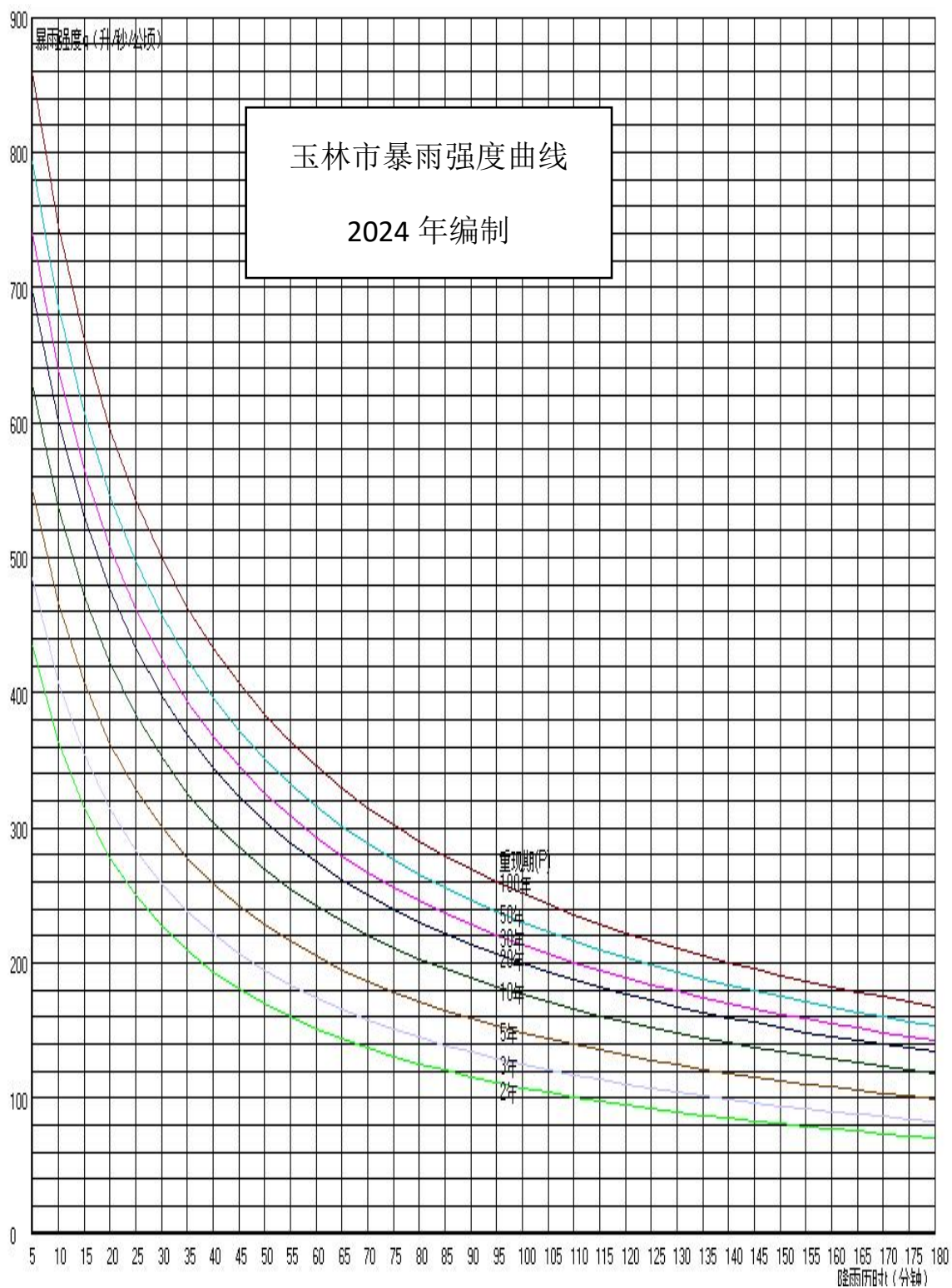


图 1 不同重现期下暴雨强度随历时变化曲线图

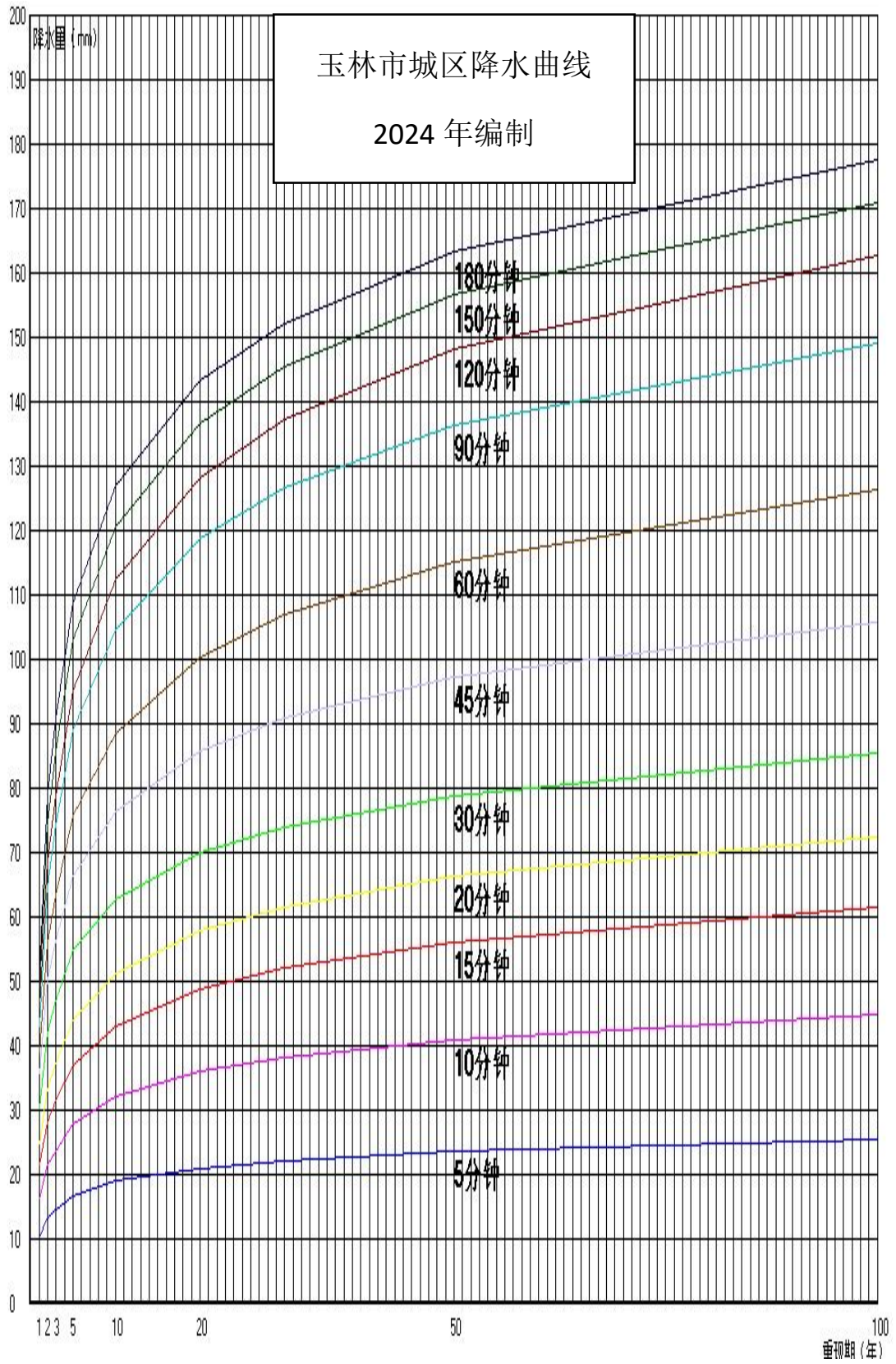


图2玉林市不同历时降雨曲线图