

three inches = one foot  
one and one half inches = one foot  
one inch = one foot  
three quarters inch = one foot  
one half inch = one foot  
three eighths inch = one foot  
one quarter inch = one foot  
one eighth inch = one foot

A

B

C

D

E

F

G

TABLE 1 - TENSION DEVELOPMENT AND LAP SPLICE LENGTHS FOR UNCOATED BARS IN BEAMS AND COLUMNS <sup>11</sup>

| BAR SIZE         | LAP CLASS | LENGTHS (in.) PER CONCRETE STRENGTH (psi) |        |        |            |        |        |          |        |        |            |        |        |          |        |        |            |        |        |
|------------------|-----------|---|--------|--------|------------|--------|--------|----------|--------|--------|------------|--------|--------|----------|--------|--------|------------|--------|--------|
|                  |           | 4000 psi                                  |        |        |            |        |        | 5000 psi |        |        |            |        |        | 6000 psi |        |        |            |        |        |
|                  |           | TOP BARS                                  |        |        | OTHER BARS |        |        | TOP BARS |        |        | OTHER BARS |        |        | TOP BARS |        |        | OTHER BARS |        |        |
|                  |           | CASE 1                                    | CASE 2 | CASE 3 | CASE 1     | CASE 2 | CASE 3 | CASE 1   | CASE 2 | CASE 3 | CASE 1     | CASE 2 | CASE 3 | CASE 1   | CASE 2 | CASE 3 | CASE 1     | CASE 2 | CASE 3 |
|                  |           |   |        |        |            |        |        |          |        |        |            |        |        |          |        |        |            |        |        |
| #3               | A         | 12  | 19     | 28     | 12         | 15     | 22     | 12       | 17     | 25     | 12         | 13     | 19     | 12       | 15     | 23     | 12         | 12     | 18     |
| (#10)            | B         | 16  | 24     | 36     | 16         | 19     | 28     | 16       | 22     | 33     | 16         | 17     | 25     | 16       | 20     | 30     | 16         | 16     | 23     |
| #4               | A         | 15  | 25     | 37     | 12         | 19     | 29     | 14       | 22     | 33     | 12         | 17     | 26     | 12       | 20     | 31     | 12         | 16     | 24     |
| (#13)            | B         | 20  | 32     | 48     | 16         | 25     | 37     | 18       | 29     | 43     | 16         | 22     | 33     | 16       | 26     | 40     | 16         | 20     | 31     |
| #5               | A         | 19  | 31     | 47     | 15         | 24     | 36     | 17       | 28     | 42     | 13         | 22     | 32     | 15       | 25     | 38     | 12         | 20     | 29     |
| (#16)            | B         | 24  | 40     | 60     | 19         | 31     | 47     | 22       | 36     | 54     | 17         | 28     | 42     | 20       | 33     | 49     | 16         | 25     | 38     |
| #6               | A         | 23  | 37     | 56     | 17         | 29     | 43     | 20       | 33     | 50     | 16         | 26     | 38     | 18       | 31     | 46     | 14         | 24     | 35     |
| (#19)            | B         | 29  | 48     | 72     | 23         | 37     | 56     | 26       | 43     | 65     | 20         | 33     | 50     | 24       | 40     | 59     | 18         | 31     | 46     |
| #7               | A         | 33  | 54     | 81     | 25         | 42     | 63     | 29       | 49     | 73     | 23         | 37     | 56     | 27       | 44     | 66     | 21         | 34     | 51     |
| (#22)            | B         | 43  | 70     | 106    | 33         | 54     | 81     | 38       | 63     | 94     | 29         | 49     | 73     | 35       | 58     | 86     | 27         | 44     | 66     |
| #8               | A         | 37  | 62     | 93     | 29         | 48     | 71     | 33       | 55     | 83     | 26         | 43     | 64     | 30       | 51     | 76     | 24         | 39     | 59     |
| (#25)            | B         | 49  | 80     | 121    | 37         | 62     | 93     | 43       | 72     | 108    | 33         | 55     | 83     | 40       | 66     | 98     | 31         | 51     | 76     |
| #9               | A         | 42  | 70     | 105    | 33         | 54     | 81     | 38       | 63     | 94     | 29         | 48     | 72     | 34       | 57     | 86     | 27         | 44     | 66     |
| (#29)            | B         | 55  | 91     | 136    | 42         | 70     | 105    | 49       | 81     | 122    | 38         | 63     | 94     | 45       | 74     | 111    | 34         | 57     | 86     |
| #10              | A         | 47  | 79     | 118    | 37         | 61     | 91     | 42       | 70     | 105    | 33         | 54     | 81     | 39       | 64     | 96     | 30         | 49     | 74     |
| (#32)            | B         | 62  | 102    | 153    | 47         | 79     | 118    | 55       | 91     | 137    | 42         | 70     | 105    | 50       | 83     | 125    | 39         | 64     | 96     |
| #11              | A         | 53  | 87     | 131    | 41         | 67     | 101    | 47       | 78     | 117    | 36         | 60     | 90     | 43       | 71     | 107    | 33         | 55     | 82     |
| (#36)            | B         | 68  | 113    | 170    | 53         | 87     | 131    | 61       | 101    | 152    | 47         | 78     | 117    | 56       | 93     | 139    | 43         | 71     | 107    |
| #14 <sup>5</sup> | N/A       | 63  | 105    | 157    | 49         | 81     | 121    | 56       | 94     | 140    | 43         | 72     | 108    | 51       | 86     | 128    | 40         | 66     | 99     |
| (#43)            |           |   |        |        |            |        |        |          |        |        |            |        |        |          |        |        |            |        |        |
| #18 <sup>5</sup> | N/A       | 84  | 139    | 209    | 65         | 107    | 161    | 75       | 125    | 187    | 58         | 96     | 144    | 68       | 114    | 171    | 53         | 88     | 131    |
| (#57)            |           |   |        |        |            |        |        |          |        |        |            |        |        |          |        |        |            |        |        |

BASED ON ACI 318-05, SECTION 12.2 & 12.15

TABLE 3 - TENSION DEVELOPMENT AND LAP SPLICE LENGTHS FOR BARS IN WALLS AND SLABS

| BAR SIZE | LAP CLASS | f'c = 5000 psi         |       |                            |       |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |
|----------|-----------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|
|          |           | CONCRETE COVER = 0.75" |       |                            |       | CONCRETE COVER = 1.00" |       |                            |       | CONCRETE COVER = 1.50" |       |                            |       | CONCRETE COVER = 2.00" |       |                            |       |
|          |           | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       |
|          |           | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER |
|          |           |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |
| #3       | A         | 12                     | 12    | 13                         | 12    | 12                     | 12    | 13                         | 12    | 12                     | 12    | 12                         | 12    | 12                     | 12    | 12                         | 12    |
| (#10)    | B         | 16                     | 16    | 17                         | 16    | 16                     | 16    | 17                         | 16    | 16                     | 16    | 16                         | 16    | 16                     | 16    | 16                         | 16    |
| #4       | A         | 17                     | 13    | 22                         | 20    | 14                     | 12    | 18                         | 16    | 14                     | 12    | 16                         | 13    | 14                     | 12    | 16                         | 13    |
| (#13)    | B         | 22                     | 17    | 29                         | 25    | 18                     | 16    | 23                         | 20    | 18                     | 16    | 21                         | 16    | 18                     | 16    | 21                         | 16    |
| #5       | A         | 25                     | 19    | 32                         | 28    | 20                     | 16    | 26                         | 23    | 17                     | 13    | 22                         | 19    | 17                     | 13    | 20                         | 16    |
| (#16)    | B         | 32                     | 25    | 42                         | 37    | 26                     | 20    | 34                         | 30    | 22                     | 17    | 29                         | 25    | 22                     | 17    | 26                         | 10    |
| #6       | A         | 33                     | 26    | 44                         | 39    | 27                     | 21    | 36                         | 32    | 20                     | 16    | 26                         | 23    | 20                     | 16    | 26                         | 23    |
| (#19)    | B         | 43                     | 33    | 57                         | 50    | 36                     | 27    | 46                         | 41    | 26                     | 20    | 34                         | 30    | 26                     | 20    | 34                         | 30    |
| #7       | A         | 54                     | 41    | -                          | -     | 44                     | 34    | -                          | -     | 33                     | 26    | -                          | -     | 29                     | 23    | -                          | -     |
| (#22)    | B         | 70                     | 54    | -                          | -     | 58                     | 44    | -                          | -     | 43                     | 33    | -                          | -     | 38                     | 29    | -                          | -     |
| #8       | A         | 67                     | 51    | -                          | -     | 56                     | 43    | -                          | -     | 42                     | 32    | -                          | -     | 33                     | 26    | -                          | -     |
| (#25)    | B         | 86                     | 67    | -                          | -     | 72                     | 56    | -                          | -     | 54                     | 42    | -                          | -     | 43                     | 33    | -                          | -     |
| #9       | A         | 81                     | 62    | -                          | -     | 68                     | 52    | -                          | -     | 51                     | 40    | -                          | -     | 41                     | 32    | -                          | -     |
| (#29)    | B         | 105                    | 81    | -                          | -     | 88                     | 68    | -                          | -     | 67                     | 51    | -                          | -     | 54                     | 41    | -                          | -     |
| #10      | A         | 97                     | 75    | -                          | -     | 82                     | 63    | -                          | -     | 63                     | 48    | -                          | -     | 51                     | 39    | -                          | -     |
| (#32)    | B         | 126                    | 97    | -                          | -     | 106                    | 82    | -                          | -     | 82                     | 63    | -                          | -     | 66                     | 51    | -                          | -     |
| #11      | A         | 113                    | 87    | -                          | -     | 97                     | 75    | -                          | -     | 75                     | 58    | -                          | -     | 61                     | 47    | -                          | -     |
| (#36)    | B         | 147                    | 113   | -                          | -     | 126                    | 97    | -                          | -     | 97                     | 75    | -                          | -     | 79                     | 61    | -                          | -     |

BASED ON ACI 318-05, SECTION 12.2 & 12.15

TABLE 2 - TENSION DEVELOPMENT AND LAP SPLICE LENGTHS FOR BARS IN WALLS AND SLABS

| BAR SIZE | LAP CLASS | f'c = 4000 psi         |       |                            |       |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |
|----------|-----------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|
|          |           | CONCRETE COVER = 0.75" |       |                            |       | CONCRETE COVER = 1.00" |       |                            |       | CONCRETE COVER = 1.50" |       |                            |       | CONCRETE COVER = 2.00" |       |                            |       |
|          |           | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       |
|          |           | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER |
|          |           |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |
| #3       | A         | 12                     | 12    | 15                         | 13    | 12                     | 12    | 15                         | 13    | 12                     | 12    | 14                         | 12    | 12                     | 12    | 14                         | 12    |
| (#10)    | B         | 16                     | 16    | 19                         | 17    | 16                     | 16    | 19                         | 17    | 16                     | 16    | 18                         | 16    | 16                     | 16    | 18                         | 16    |
| #4       | A         | 19                     | 15    | 24                         | 22    | 15                     | 12    | 20                         | 17    | 15                     | 12    | 18                         | 14    | 15                     | 12    | 18                         | 14    |
| (#13)    | B         | 24                     | 19    | 32                         | 28    | 20                     | 16    | 25                         | 22    | 20                     | 16    | 23                         | 18    | 20                     | 16    | 23                         | 18    |
| #5       | A         | 28                     | 21    | 36                         | 32    | 22                     | 17    | 29                         | 26    | 19                     | 15    | 24                         | 22    | 19                     | 15    | 22                         | 17    |
| (#16)    | B         | 36                     | 28    | 47                         | 41    | 29                     | 22    | 38                         | 33    | 24                     | 19    | 32                         | 28    | 24                     | 19    | 29                         | 22    |
| #6       | A         | 37                     | 29    | 49                         | 43    | 31                     | 24    | 40                         | 35    | 22                     | 17    | 29                         | 26    | 22                     | 17    | 29                         | 26    |
| (#19)    | B         | 48                     | 37    | 63                         | 56    | 40                     | 31    | 52                         | 46    | 29                     | 22    | 38                         | 34    | 29                     | 22    | 38                         | 34    |
| #7       | A         | 60                     | 46    | -                          | -     | 50                     | 38    | -                          | -     | 37                     | 28    | -                          | -     | 33                     | 25    | -                          | -     |
| (#22)    | B         | 78                     | 60    | -                          | -     | 64                     | 50    | -                          | -     | 48                     | 37    | -                          | -     | 42                     | 33    | -                          | -     |
| #8       | A         | 74                     | 57    | -                          | -     | 62                     | 48    | -                          | -     | 47                     | 36    | -                          | -     | 37                     | 29    | -                          | -     |
| (#25)    | B         | 96                     | 74    | -                          | -     | 80                     | 62    | -                          | -     | 60                     | 47    | -                          | -     | 48                     | 37    | -                          | -     |
| #9       | A         | 90                     | 69    | -                          | -     | 76                     | 58    | -                          | -     | 57                     | 44    | -                          | -     | 46                     | 36    | -                          | -     |
| (#29)    | B         | 117                    | 90    | -                          | -     | 98                     | 76    | -                          | -     | 74                     | 57    | -                          | -     | 60                     | 46    | -                          | -     |
| #10      | A         | 108                    | 83    | -                          | -     | 92                     | 70    | -                          | -     | 70                     | 54    | -                          | -     | 57                     | 44    | -                          | -     |
| (#32)    | B         | 140                    | 108   | -                          | -     | 119                    | 92    | -                          | -     | 91                     | 70    | -                          | -     | 74                     | 57    | -                          | -     |
| #11      | A         | 127                    | 98    | -                          | -     | 108                    | 83    | -                          | -     | 84                     | 64    | -                          | -     | 68                     | 53    | -                          | -     |
| (#36)    | B         | 165                    | 127   | -                          | -     | 141                    | 108   | -                          | -     | 109                    | 84    | -                          | -     | 89                     | 68    | -                          | -     |

BASED ON ACI 318-05, SECTION 12.2 & 12.15

TABLE 4 - TENSION DEVELOPMENT AND LAP SPLICE LENGTHS FOR BARS IN WALLS AND SLABS

| BAR SIZE | LAP CLASS | f'c = 6000 psi         |       |                            |       |                        |       |                            |       |                        |       |                            |       |                        |       |                            |       |
|----------|-----------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|------------------------|-------|----------------------------|-------|
|          |           | CONCRETE COVER = 0.75" |       |                            |       | CONCRETE COVER = 1.00" |       |                            |       | CONCRETE COVER = 1.50" |       |                            |       | CONCRETE COVER = 2.00" |       |                            |       |
|          |           | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       | UNCOATED               |       | EPOXY-COATED <sup>10</sup> |       |
|          |           | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER | TOP                    | OTHER | TOP                        | OTHER |
| #3       | A         | 12                     | 12    | 12                         | 12    | 12                     | 12    | 12                         | 12    | 12                     | 12    | 12                         | 12    | 12                     | 12    | 12                         | 12    |
| (#10)    | B         | 16                     | 16    | 16                         | 16    | 16                     | 16    | 16                         | 16    | 16                     | 16    | 16                         | 16    | 16                     | 16    | 16                         | 16    |
| #4       | A         | 16                     | 12    | 20                         | 18    | 12                     | 12    | 16                         | 14    | 12                     | 12    | 15                         | 12    | 12                     | 12    | 15                         | 12    |
| (#13)    | B         | 20                     | 16    | 26                         | 23    | 16                     | 16    | 21                         | 18    | 16                     | 16    | 19                         | 16    | 16                     | 16    | 19                         | 16    |
| #5       | A         | 23                     | 17    | 29                         | 26    | 18                     | 14    | 24                         | 21    | 16                     | 12    | 20                         | 18    | 16                     | 12    | 18                         | 14    |
| (#16)    | B         | 29                     | 23    | 38                         | 34    | 24                     | 18    | 31                         | 27    | 20                     | 16    | 26                         | 23    | 20                     | 16    | 24                         | 18    |
| #6       | A         | 31                     | 24    | 40                         | 35    | 25                     | 19    | 33                         | 29    | 18                     | 14    | 24                         | 21    | 18                     | 14    | 24                         | 21    |
| (#19)    | B         | 40                     | 31    | 52                         | 46    | 33                     | 25    | 42                         | 37    | 24                     | 18    | 31                         | 28    | 24                     | 18    | 31                         | 28    |
| #7       | A         | 49                     | 38    | -                          | -     | 41                     | 31    | -                          | -     | 30                     | 23    | -                          | -     | 27                     | 21    | -                          | -     |
| (#22)    | B         | 64                     | 49    | -                          | -     | 53                     | 41    | -                          | -     | 39                     | 30    | -                          | -     | 35                     | 27    | -                          | -     |
| #8       | A         | 61                     | 47    | -                          | -     | 51                     | 39    | -                          | -     | 38                     | 29    | -                          | -     | 31                     | 24    | -                          | -     |
| (#25)    | B         | 79                     | 61    | -                          | -     | 66                     | 51    | -                          | -     | 49                     | 38    | -                          | -     | 40                     | 31    | -                          | -     |
| #9       | A         | 74                     | 57    | -                          | -     | 62                     | 48    | -                          | -     | 47                     | 36    | -                          | -     | 38                     | 29    | -                          | -     |
| (#29)    | B         | 95                     | 74    | -                          | -     | 80                     | 62    | -                          | -     | 61                     | 47    | -                          | -     | 49                     | 38    | -                          | -     |
| #10      | A         | 88                     | 68    | -                          | -     | 75                     | 58    | -                          | -     | 57                     | 44    | -                          | -     | 47                     | 36    | -                          | -     |
| (#32)    | B         | 115                    | 88    | -                          | -     | 97                     | 75    | -                          | -     | 75                     | 57    | -                          | -     | 60                     | 47    | -                          | -     |
| #11      | A         | 104                    | 80    | -                          | -     | 88                     | 68    | -                          | -     | 68                     | 53    | -                          | -     | 56                     | 43    | -                          | -     |
| (#36)    | B         | 135                    | 104   | -                          | -     | 115                    | 88    | -                          | -     | 89                     | 68    | -                          | -     | 73                     | 56    | -                          | -     |