



## WELDED WIRE REINFORCEMENT FOR CIRCULAR CONCRETE PIPE

Concrete pipe producers everywhere have long relied on welded wire reinforcement (WWR) in the manufacture of their products. Government agencies and private developers have come to rely on the structural integrity and performance of these products to provide a safe and healthy living environment. The producers of WWR continue to play an important role in the ever expanding proven track record of reinforced concrete pipe by supplying quality materials in the most efficient configurations.

This document is intended to provide sound recommendations for use in estimating the reinforcing steel in a concrete pipe. The following pages were compiled using the published reinforcing designs of the American Society for Testing and Materials “*Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Designation C 76*”

WWR for the reinforced concrete pipe (RCP) industry is produced in accordance with ASTM A 1064, Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete. The RCP industry uses a unique nomenclature when describing WWR that is different from most other reinforced products. The wires providing the structural integrity to the pipe run circumferentially within the pipe wall. These wires are referred to as circumferential wires. The wires which run from spigot to bell, or tongue to groove, are called cross wires.

Although C 76 does not require any longitudinal reinforcement in the pipe, cross wires are present primarily for three reasons. First, the cross wires provide assurance that the circumferential wires remain at the correct spacing during cage fabrication and pipe casting. Second, the cross wires provide support for the freshly cast pipe while it cures. Third, a minimum cross wire area equal to 40% of the circumferential wire area is required by ASTM specifications A 1064 to ensure strong welds.

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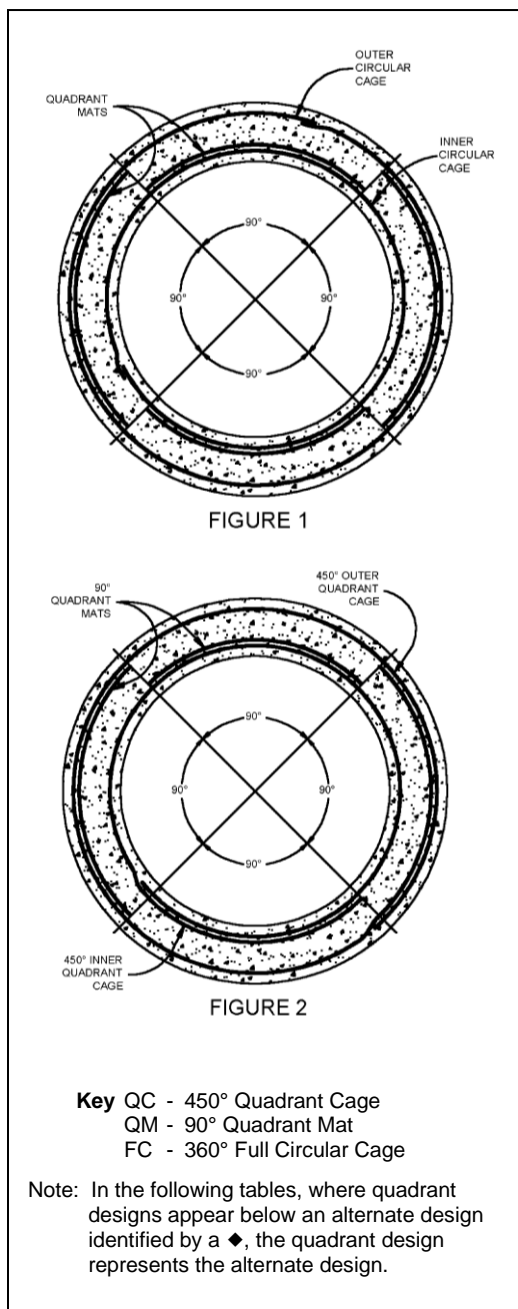
The tables on the following pages list only the most common styles used throughout the RCP industry today. They are also some of the most efficient. Here are the conventions that were used to develop these tables:

- The minimum cross wire size is W2.5.
- Cross wire spacing in single cage pipe is 6 inches, and in double cage pipe is 8 inches.
- Maximum circumferential wire size is W12.
- Wire size increments are by half W-number.
- Only B-wall and C-wall, Class II through Class V designs are shown.
- Weights were calculated using a fabric width of 93" (+1,+1) for 3" spaced styles, and a width of 94" (+1,+0) for 2" spaced styles for pipe with a laying length of 8'-0".
- Expandable bell reinforcing cages were excluded.
- Cage lengths were calculated to provide 1" clear cover, a minimum 2" welded lap, then rounded to the next higher cross wire space.
- Elliptical cage configurations are not shown.
- Elliptical areas are shown for reference only.

Wire sizes are based on nominal diameters and/or weights per LF. Tolerances per ASTM A 1064 apply. The user of this document is responsible for making any adjustments necessary to meet specific conditions, should they differ from these conventions. Wire size increments of 0.1 W-number and sizes larger than W12 are available upon request. C 76 provides the RCP producer with several provisions regarding reinforcing cage configuration. The tables on the following pages take advantage of all these provisions to arrive at the most efficient cage configuration possible with the conventions listed. One such provision is found in C 76 Table 4, footnote B, which states that C-wall 24-in. to 33-in. diameter pipe may utilize a single cage having an area not less than the sum of the inner and outer specified areas. This provision creates efficiencies over the standard two-cage design simply because there is one less cage to fabricate.

A similar provision is found in two places in C 76. Tables 2 and 3, footnote E permits the use of a single reinforcing cage for 36-in. diameter B-wall and C-wall pipe, but calls out specific areas to be met.

Another provision is found in all the tables under footnote B which permits the use of quadrant mats. This may very well be the single most economical configuration available in the C 76 specification. This provision is used primarily where steel areas above 0.60 in.<sup>2</sup> per linear foot are required. When applied to both the inner and outer cages, steel savings can range from 20% to 37%. Figures 1 and 2 illustrate the concept of quadrant mat reinforcing. Very simply, this provision allows the producer to concentrate the placement of the steel to the regions or "quadrants" of the pipe wall where it is needed. When a concrete pipe is loaded, tension develops in the crown and invert on the inside face of the pipe wall, and at the springline on the outside face of the pipe wall. The quadrant mats are placed in these areas to resist the tensile forces that develop. Opposite these locations the pipe wall is in compression, which the concrete alone can resist. The typical quadrant mat configuration consists of a full circular cage having an area of at least 25% of the specified area for that cage, with the remaining area provided by each of two 90° quadrant mats placed as shown in Figure 1. The combined areas of the full circular cage and either single quadrant mat must be equal to or greater than the area specified for that cage.



A more practical quadrant mat configuration is the use of a "quadrant cage" and a single quadrant mat (Figure 2). The quadrant cage is rolled 1 1/4 turns (450°) and overlapped by 90 to include the first "quadrant mat". Then a single 90° quadrant mat is rolled and placed opposite the 90° overlap. The quadrant cage and quadrant mat are rolled from the same style which is at least 50% of the specified cage area. Where the overlap occurs and where the quadrant mat is placed, the total area is equal to or greater than the specified cage area. When this configuration is used, labor is minimized and a steel savings of up to 25% is realized. This quadrant cage (QC) and quadrant mat (QM) configuration is used throughout the following tables where specified areas exceed 0.60 in.2 per linear foot of pipe wall.

Probably the least understood provision in C76 is found under Permissible Variations Section 12.5.2 – Area of Reinforcement. It uses the alternate elliptical cage area listed in the table for a given pipe diameter and class to calculate the permissible variations of the inner and outer cages. It states that when inner and outer circular cages are used, the area of the inner cage must be at least 85% of the specified alternate elliptical cage area and the area of the outer cage must be at least 51% of the elliptical area, but the total area of the inner and outer cages must be at least 140% of the elliptical area. This allows for small adjustments in the inner and outer cage areas that can result in savings of nearly 10% (see page 10 – 66" Class III C-wall design). The designs created using Permissible Variations Section 12.5.2 are identified by a u in the following tables.

The format of the tables on the following pages has been revised from previous printings of this Tech Fact. The left third of each table lists the design requirements of ASTM C 76-97, including diameter, class, 0.01-inch crack and ultimate D-Loads, wall designation and thickness, and concrete strength. The center third lists the inner cage data, including minimum area required, wire spacing, wire size, cage length, and cage weight per linear foot of pipe. The right third lists the corresponding outer cage data, and along the far right side of each table is the total cage weight per linear foot of pipe and the specified alternate elliptical cage area used in Section 12.5.2 calculations.

The purpose of this document is to provide guidance and suggestions for reinforcing configurations that meet the minimum reinforcing requirements of the ASTM C 76-97 Specification. Naturally there are many other configurations available to the concrete pipe producer for their use. These are simply the most common being used in today's market.

Contact a WRI member producer for specific requests and conditions that are not addressed in this document. Styles and wire sizes other than those shown in the tables are available upon request. This Tech Fact was prepared under the direction of the Pipe Fabric Committee of the Wire Reinforcement Institute, Inc.

*Some technical publications and standards referenced herein may not be the most recently available editions. User is responsible for assessing the applicability of this document to design and construction applications*

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| ASTM C 76  |               |                   |                  |                          |                             |                             |                        |                         |                           |                            |                             | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                         |                           |                            |      |      |                                     |  |  |  |  |  | Alternate<br>Elliptical<br>Area<br>sq.in./ft. |
|--|---------------|-------------------|------------------|--------------------------|-----------------------------|-----------------------------|------------------------|-------------------------|---------------------------|----------------------------|-----------------------------|--|-------------------------|---------------------------|----------------------------|------|------|-------------------------------------|--|--|--|--|--|---|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |               |                   |                  |                          |                             | INNER CAGE                  |                        |                         |                           |                            |                             | OUTER CAGE   |                         |                           |                            |      |      | Total<br>Cage<br>Weight<br>lbs./ft. |  |  |  |  |  |   |
| Internal<br>Diameter<br>in.                      | Pipe<br>Class | D-Load            |                  | Wall<br>Thickness<br>in. | Concrete<br>Strength<br>psi | Area<br>Req'd<br>sq.in./ft. | Wire<br>Spacing<br>in. | Wire<br>Sizes<br>W or D | Cage<br>Length<br>ft.-in. | Cage<br>Weight<br>lbs./ft. | Area<br>Req'd<br>sq.in./ft. | Wire<br>Spacing<br>in.                             | Wire<br>Sizes<br>W or D | Cage<br>Length<br>ft.-in. | Cage<br>Weight<br>lbs./ft. |      |      |                                     |  |  |  |  |  |   |
|  |               | 0.01"<br>lbs./ft. | Ult.<br>lbs./ft. |                          |                             |                             |                        |                         |                           |                            |                             |  |                         |                           |                            |      |      |                                     |  |  |  |  |  |   |
| 12"  | IV            | 2,000             | 3,000            | B                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 4'-0"                     | 1.76                       | -                           | -  | -                       | -                         | -                          | 1.76 | -    |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 4'-0"                     | 1.76                       | -                           | -  | -                       | -                         | -                          | 1.76 | -    |                                     |  |  |  |  |  |   |
| 12"  | V             | 3,000             | 3,750            | B                        | 6,000                       | 0.10                        | 3 x 6                  | 2.5 x 2.5               | 4'-0"                     | 2.03                       | -                           | -  | -                       | -                         | -                          | 2.03 | -    |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 6,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 4'-0"                     | 1.76                       | -                           | -  | -                       | -                         | -                          | 1.76 | -    |                                     |  |  |  |  |  |   |
| 15"  | III           | 1,350             | 2,000            | B                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-0"                     | 2.20                       | -                           | -  | -                       | -                         | -                          | 2.20 | -    |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-0"                     | 2.20                       | -                           | -  | -                       | -                         | -                          | 2.20 | -    |                                     |  |  |  |  |  |   |
| 15"  | IV            | 2,000             | 3,000            | B                        | 4,000                       | 0.10                        | 3 x 6                  | 2.5 x 2.5               | 5'-0"                     | 2.54                       | -                           | -  | -                       | -                         | -                          | 2.54 | -    |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-0"                     | 2.20                       | -                           | -  | -                       | -                         | -                          | 2.20 | -    |                                     |  |  |  |  |  |   |
| 15"  | V             | 3,000             | 3,750            | B                        | 6,000                       | 0.14                        | 3 x 6                  | 3.5 x 2.5               | 5'-0"                     | 3.22                       | -                           | -  | -                       | -                         | -                          | 3.22 | -    |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 6,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-0"                     | 2.20                       | -                           | -  | -                       | -                         | -                          | 2.20 | -    |                                     |  |  |  |  |  |   |
| 18"  | III           | 1,350             | 2,000            | B                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-6"                     | 2.42                       | -                           | -  | -                       | -                         | -                          | 2.42 | 0.07 |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-6"                     | 2.42                       | -                           | -  | -                       | -                         | -                          | 2.42 | 0.07 |                                     |  |  |  |  |  |   |
| 18"  | IV            | 2,000             | 3,000            | B                        | 4,000                       | 0.14                        | 3 x 6                  | 3.5 x 2.5               | 5'-6"                     | 3.54                       | -                           | -  | -                       | -                         | -                          | 3.54 | 0.11 |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 4,000                       | 0.07                        | 3 x 6                  | 2.0 x 2.5               | 5'-6"                     | 2.42                       | -                           | -  | -                       | -                         | -                          | 2.42 | 0.07 |                                     |  |  |  |  |  |   |
| 18"  | V             | 3,000             | 3,750            | B                        | 6,000                       | 0.19                        | 3 x 6                  | 5.0 x 3.0               | 5'-6"                     | 4.85                       | -                           | -  | -                       | -                         | -                          | 4.85 | 0.16 |                                     |  |  |  |  |  |   |
|  |               |                   |                  | C                        | 6,000                       | 0.10                        | 3 x 6                  | 2.5 x 2.5               | 5'-6"                     | 2.79                       | -                           | -  | -                       | -                         | -                          | 2.79 | -    |                                     |  |  |  |  |  |   |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |                      |                       |                          |                          |                     |                      |                        |                         | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                     |                      |                        |                         |                               |      |  |  |  | Alternate Elliptical Area<br>sq.in./ft. |
|--|------------|----------------------|-----------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|-------------------------|--|---------------------|----------------------|------------------------|-------------------------|-------------------------------|------|--|--|--|---|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |                      |                       |                          | INNER CAGE               |                     |                      |                        |                         | OUTER CAGE   |                     |                      |                        |                         | Total Cage Weight<br>lbs./ft. |      |  |  |  |   |
| Internal Diameter<br>in.                         | Pipe Class | D-Load<br>0.01" Ult. | Wall Thickness<br>in. | Concrete Strength<br>psi | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. | Area Req'd<br>sq.in./ft.                           | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. |                               |      |  |  |  |   |
| 21"  | III        | 1,350                | B                     | 4,000                    | 0.07                     | 3 x 6               | 2.0 x 2.5            | 6'-6"                  | 2.86                    | -  | -                   | -                    | -                      | -                       | 2.86                          | 0.07 |  |  |  |   |
| 21"  | IV         | 2,000                | B                     | 4,000                    | 0.20                     | 3 x 6               | 5.0 x 3.0            | 6'-6"                  | 5.73                    | -  | -                   | -                    | -                      | -                       | 5.73                          | 0.17 |  |  |  |   |
| 21"  | V          | 3,000                | B                     | 6,000                    | 0.24                     | 2 x 6               | 4.0 x 2.5            | 6'-6"                  | 6.40                    | -  | -                   | -                    | -                      | -                       | 6.40                          | 0.21 |  |  |  |   |
| 24"  | III        | 1,350                | C                     | 6,000                    | 0.10                     | 3 x 6               | 2.5 x 2.5            | 6'-6"                  | 3.30                    | -  | -                   | -                    | -                      | -                       | 3.30                          | -    |  |  |  |   |
| 24"  | IV         | 2,000                | B                     | 4,000                    | 0.07                     | 3 x 6               | 2.0 x 2.5            | 7'-6"                  | 3.30                    | -  | -                   | -                    | -                      | -                       | 3.30                          | 0.07 |  |  |  |   |
| 24"  | V          | 3,000                | C                     | 4,000                    | 0.07                     | 3 x 6               | 2.0 x 2.5            | 7'-6"                  | 3.30                    | -  | -                   | -                    | -                      | -                       | 3.30                          | 0.07 |  |  |  |   |
| 24"  | IV         | 2,000                | B                     | 4,000                    | 0.27                     | 2 x 6               | 4.5 x 2.5            | 7'-6"                  | 8.15                    | -  | -                   | -                    | -                      | -                       | 8.15                          | 0.23 |  |  |  |   |
| 24"  | V          | 3,000                | C                     | 4,000                    | 0.07                     | 3 x 8               | 2.0 x 2.5            | 7'-4"                  | 2.92                    | 0.07   | 3 x 8               | 2.0 x 2.5            | 8'-0"                  | 3.19                    | 6.11                          | 0.08 |  |  |  |   |
| 24"  | V          | 3,000                | C                     | 4,000                    | 0.14                     | 3 x 6               | 3.5 x 2.5            | 7'-6"                  | 4.83                    | -  | -                   | -                    | -                      | -                       | 4.83                          | -    |  |  |  |   |
| 24"  | V          | 3,000                | B                     | 6,000                    | 0.30                     | 2 x 6               | 5.0 x 3.0            | 7'-6"                  | 9.16                    | -  | -                   | -                    | -                      | -                       | 9.16                          | 0.24 |  |  |  |   |
| 24"  | V          | 3,000                | C                     | 6,000                    | 0.12                     | 3 x 8               | 3.0 x 2.5            | 7'-4"                  | 3.92                    | 0.07   | 3 x 8               | 2.0 x 2.5            | 8'-0"                  | 3.19                    | 7.11                          | 0.13 |  |  |  |   |
| 27"  | II         | 1,000                | B                     | 4,000                    | 0.13                     | 2 x 6               | 2.5 x 2.5            | 8'-0"                  | 5.43                    | -  | -                   | -                    | -                      | -                       | 5.43                          | 0.11 |  |  |  |   |
| 27"  | III        | 1,350                | C                     | 4,000                    | 0.07                     | 3 x 6               | 2.0 x 2.5            | 8'-0"                  | 3.52                    | -  | -                   | -                    | -                      | -                       | 3.52                          | 0.07 |  |  |  |   |
| 27"  | III        | 1,350                | B                     | 4,000                    | 0.16                     | 3 x 6               | 4.0 x 2.5            | 8'-0"                  | 5.70                    | -  | -                   | -                    | -                      | -                       | 5.70                          | 0.14 |  |  |  |   |
| 27"  | III        | 1,350                | C                     | 4,000                    | 0.08                     | 3 x 6               | 2.0 x 2.5            | 8'-0"                  | 3.52                    | -  | -                   | -                    | -                      | -                       | 3.52                          | 0.07 |  |  |  |   |



| WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT            |            |        |       |                |                   |                          |              |                         |                        |                |                          |                      | Alternate Elliptical Area<br>sq.in./ft. |                                     |                           |                      |                               |                |
|---|------------|--------|-------|----------------|-------------------|--------------------------|--------------|-------------------------|------------------------|----------------|--------------------------|----------------------|---|-------------------------------------|---------------------------|----------------------|-------------------------------|----------------|
| ASTM C 76<br>DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |        |       |                |                   | INNER CAGE               |              |                         |                        |                |                          | OUTER CAGE           |   |                                     |                           |                      |                               |                |
| Internal Diameter<br>in.                                      | Pipe Class | D-Load |       | Wall Thickness | Concrete Strength | Area Req'd<br>sq.in./ft. | Wire Spacing | Wire Sizes              | Cage Length            | Cage Weight    | Area Req'd<br>sq.in./ft. | Wire Spacing         |   | Wire Sizes                          | Cage Length               | Cage Weight          | Total Cage Weight<br>lbs./ft. |                |
|   |            | 0.01"  | Ult.  |                |                   |                          |              |                         |                        |                |                          |                      | in.                                     |                                     |                           |                      |                               | psi            |
| 27"   | IV         | 2,000  | 3,000 | B              | 3 1/4"            | 4,000                    | 0.31         | 2 x 6                   | 5.5 x 3.0              | 8'-0"          | 10.59                    | -                    | -                                       | -                                   | -                         | -                    | 10.59                         | 0.25           |
|   |            |        |       | C              | 4"                | 4,000                    | 0.08         | 3 x 8                   | 2.0 x 2.5              | 8'-0"          | 3.19                     | 0.07                 | 3 x 8                                   | 2.0 x 2.5                           | 9'-4"                     | 3.72                 | 6.91                          | 0.09           |
|   |            |        |       | C              | 4"                | 4,000                    | 0.15         | 2 x 6<br>3 x 6          | 2.5 x 2.5<br>4.0 x 2.5 | 8'-0"<br>8'-0" | 5.43<br>5.70             | -                    | -                                       | -                                   | -                         | -                    | -                             | 5.43<br>5.70   |
| 27"   | V          | 3,000  | 3,750 | B              | 3 1/4"            | 6,000                    | 0.38         | 2 x 8                   | 6.5 x 3.0              | 8'-0"          | 11.82                    | 0.23                 | 2 x 8                                   | 4.0 x 2.5                           | 8'-8"                     | 8.16                 | 19.98                         | 0.42           |
|   |            |        |       | C              | 4"                | 6,000                    | 0.14         | 3 x 8                   | 3.5 x 2.5              | 8'-0"          | 4.82                     | 0.08                 | 3 x 8                                   | 2.0 x 2.5                           | 9'-4"                     | 3.72                 | 8.54                          | 0.16           |
| 30"   | II         | 1,000  | 1,500 | B              | 3 1/2"            | 4,000                    | 0.14         | 3 x 6                   | 3.5 x 2.5              | 9'-0"          | 5.80                     | -                    | -                                       | -                                   | -                         | -                    | 5.80                          | 0.12           |
|   |            |        |       | C              | 4 1/4"            | 4,000                    | 0.07         | 3 x 6                   | 2.0 x 2.5              | 9'-0"          | 3.96                     | -                    | -                                       | -                                   | -                         | -                    | 3.96                          | 0.07           |
| 30"   | III        | 1,350  | 2,000 | B              | 3 1/2"            | 4,000                    | 0.18         | 3 x 6                   | 4.5 x 2.5              | 9'-0"          | 7.02                     | -                    | -                                       | -                                   | -                         | -                    | 7.02                          | 0.15           |
|   |            |        |       | C              | 4 1/4"            | 4,000                    | 0.10         | 3 x 6                   | 2.5 x 2.5              | 9'-0"          | 4.57                     | -                    | -                                       | -                                   | -                         | -                    | 4.57                          | 0.08           |
| 30"   | IV         | 2,000  | 3,000 | B              | 3 1/2"            | 4,000                    | 0.35         | 2 x 6                   | 6.0 x 3.0              | 9'-0"          | 12.83                    | -                    | -                                       | -                                   | -                         | -                    | 12.83                         | 0.28           |
|   |            |        |       | C              | 4 1/4"            | 4,000                    | 0.09         | 3 x 8                   | 2.5 x 2.5              | 8'-8"          | 4.04                     | 0.07                 | 3 x 8                                   | 2.0 x 2.5                           | 10'-0"                    | 3.98                 | 8.02                          | 0.10           |
|   |            |        |       | C              | 4 1/4"            | 4,000                    | 0.16         | 3 x 6                   | 4.0 x 2.5              | 9'-0"          | 6.41                     | -                    | -                                       | -                                   | -                         | -                    | 6.41                          | -              |
| 30"   | V          | 3,000  | 3,750 | B              | 3 1/2"            | 6,000                    | 0.41         | 2 x 8                   | 7.0 x 3.0              | 8'-8"          | 13.69                    | 0.25                 | 2 x 8                                   | 4.5 x 2.5                           | 9'-4"                     | 9.74                 | 23.43                         | 0.46           |
|   |            |        |       | C              | 4 1/4"            | 6,000                    | 0.18         | 2 x 8<br>3 x 8<br>3 x 8 | 4.5 x 2.5<br>4.5 x 2.5 | 8'-8"<br>8'-8" | 6.40<br>6.40             | 0.24<br>0.11<br>0.10 | 2 x 8<br>2 x 8<br>3 x 8<br>3 x 8        | 4.0 x 2.5<br>3.0 x 2.5<br>2.5 x 2.5 | 9'-4"<br>10'-0"<br>10'-0" | 8.79<br>5.34<br>4.66 | 22.48<br>11.74<br>11.06       | -<br>0.20<br>- |
| 33"   | II         | 1,000  | 1,500 | B              | 3 3/4"            | 4,000                    | 0.15         | 2 x 6<br>3 x 6          | 2.5 x 2.5<br>4.0 x 2.5 | 9'-6"<br>9'-6" | 6.44<br>6.77             | -                    | -                                       | -                                   | -                         | -                    | 6.44<br>6.77                  | 0.13           |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |        |       |                |                   |            |              |            |             | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |            |              |            |             |             |            |              |            |             | Alternate Elliptical Area |                   |                           |            |          |            |          |            |          |  |                   |
|--|------------|--------|-------|----------------|-------------------|------------|--------------|------------|-------------|--|------------|--------------|------------|-------------|-------------|------------|--------------|------------|-------------|---------------------------|-------------------|---------------------------|------------|----------|------------|----------|------------|----------|--|-------------------|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |        |       |                |                   |            |              |            |             | INNER CAGE   |            |              |            |             |             |            |              |            |             | OUTER CAGE                |                   |                           |            |          |            |          |            |          |  | Total Cage Weight |
| Internal Diameter                                | Pipe Class | D-Load |       | Wall Thickness | Concrete Strength | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight  | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight               | Total Cage Weight | Alternate Elliptical Area |            |          |            |          |            |          |  |                   |
|  |            | 0.01"  | Ult.  |                |                   |            |              |            |             |  |            |              |            |             |             |            |              |            |             |                           |                   |                           | sq.in./ft. | lbs./ft. | sq.in./ft. | lbs./ft. | sq.in./ft. | lbs./ft. |  |                   |
| 33"  | II         | 1,000  | 1,500 | C              | 4,000             | 0.07       | 3 x 6        | 2.0 x 2.5  | 9'-6"       | 4.18   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 4.18              | 0.07                      |            |          |            |          |            |          |  |                   |
| 33"  | III        | 1,350  | 2,000 | B              | 4,000             | 0.20       | 3 x 6        | 5.0 x 3.0  | 9'-6"       | 8.38   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 8.38              | 0.17                      |            |          |            |          |            |          |  |                   |
| 33"  |            |        |       | C              | 4,000             | 0.12       | 3 x 6        | 3.0 x 2.5  | 9'-6"       | 5.47   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 5.47              | 0.10                      |            |          |            |          |            |          |  |                   |
| 33"  | IV         | 2,000  | 3,000 | B              | 4,000             | 0.27       | 2 x 8        | 4.5 x 2.5  | 10'-0"      | 10.44  | 0.16       | 3 x 8        | 4.0 x 2.5  | 10'-8"      | 7.15        | 0.16       | 3 x 8        | 4.0 x 2.5  | 10'-8"      | 7.15                      | 17.59             | 0.30                      |            |          |            |          |            |          |  |                   |
| 33"  |            |        |       | C              | 4,000             | 0.11       | 3 x 8        | 3.0 x 2.5  | 10'-0"      | 5.34   | 0.07       | 3 x 8        | 2.0 x 2.5  | 10'-8"      | 4.25        | 0.07       | 3 x 8        | 2.0 x 2.5  | 10'-8"      | 4.25                      | 9.59              | 0.12                      |            |          |            |          |            |          |  |                   |
| 33"  |            |        |       | C              | 4,000             | 0.18       | 3 x 6        | 4.5 x 2.5  | 9'-6"       | 7.41   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 7.41              | -                         |            |          |            |          |            |          |  |                   |
| 33"  | V          | 3,000  | 3,750 | B              | 6,000             | 0.46       | 2 x 8        | 8.0 x 3.5  | 10'-0"      | 18.08  | 0.28       | 2 x 8        | 5.0 x 3.0  | 10'-8"      | 12.49       | 0.28       | 2 x 8        | 5.0 x 3.0  | 10'-8"      | 12.49                     | 30.57             | 0.51                      |            |          |            |          |            |          |  |                   |
| 33"  |            |        |       | C              | 6,000             | 0.23       | 3 x 8        | 5.5 x 3.0  | 10'-0"      | 8.99   | 0.14       | 3 x 8        | 3.5 x 2.5  | 10'-8"      | 6.42        | 0.14       | 3 x 8        | 3.5 x 2.5  | 10'-8"      | 6.42                      | 15.84             | 0.25                      |            |          |            |          |            |          |  |                   |
| 33"  |            |        |       | C              | 6,000             | 0.22       | 3 x 8        | 5.5 x 3.0  | 10'-0"      | 8.99   | 0.14       | 3 x 8        | 3.5 x 2.5  | 10'-8"      | 6.42        | 0.14       | 3 x 8        | 3.5 x 2.5  | 10'-8"      | 6.42                      | 15.41             | -                         |            |          |            |          |            |          |  |                   |
| 36"  | II         | 1,000  | 1,500 | B              | 4,000             | 0.12       | 3 x 8        | 3.0 x 2.5  | 10'-8"      | 5.70   | 0.07       | 3 x 8        | 2.0 x 2.5  | 11'-4"      | 4.51        | 0.07       | 3 x 8        | 2.0 x 2.5  | 11'-4"      | 4.51                      | 10.21             | 0.13                      |            |          |            |          |            |          |  |                   |
| 36"  |            |        |       | B              | 4,000             | 0.20       | 3 x 6        | 5.0 x 3.0  | 10'-6"      | 9.26   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 9.26              | -                         |            |          |            |          |            |          |  |                   |
| 36"  |            |        |       | C              | 4,000             | 0.07       | 3 x 8        | 2.0 x 2.5  | 10'-8"      | 4.25   | 0.07       | 3 x 8        | 2.0 x 2.5  | 11'-4"      | 4.51        | 0.07       | 3 x 8        | 2.0 x 2.5  | 11'-4"      | 4.51                      | 8.76              | 0.08                      |            |          |            |          |            |          |  |                   |
| 36"  |            |        |       | C              | 4,000             | 0.16       | 3 x 6        | 4.0 x 2.5  | 10'-6"      | 7.48   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 7.48              | -                         |            |          |            |          |            |          |  |                   |
| 36"  | III        | 1,350  | 2,000 | B              | 4,000             | 0.17       | 3 x 8        | 4.5 x 2.5  | 10'-8"      | 7.87   | 0.10       | 3 x 8        | 2.5 x 2.5  | 11'-4"      | 5.28        | 0.10       | 3 x 8        | 2.5 x 2.5  | 11'-4"      | 5.28                      | 13.15             | 0.19                      |            |          |            |          |            |          |  |                   |
| 36"  |            |        |       | B              | 4,000             | 0.30       | 2 x 6        | 5.0 x 3.0  | 10'-6"      | 12.83  | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 12.83             | -                         |            |          |            |          |            |          |  |                   |
| 36"  |            |        |       | C              | 4,000             | 0.08       | 3 x 8        | 2.0 x 2.5  | 10'-8"      | 4.25   | 0.07       | 3 x 8        | 2.0 x 2.5  | 12'-0"      | 4.78        | 0.07       | 3 x 8        | 2.0 x 2.5  | 12'-0"      | 4.78                      | 9.03              | 0.09                      |            |          |            |          |            |          |  |                   |
| 36"  |            |        |       | C              | 4,000             | 0.20       | 3 x 6        | 5.0 x 3.0  | 10'-6"      | 9.26   | -          | -            | -          | -           | -           | -          | -            | -          | -           | -                         | 9.26              | -                         |            |          |            |          |            |          |  |                   |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |                      |                    |                       |                          |                          |                     |                      |                        | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                          |                     |                      |                        |                         |       |      |  |  | Alternate Elliptical Area<br>sq.in./ft. |                               |
|--|------------|----------------------|--------------------|-----------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|--|--------------------------|---------------------|----------------------|------------------------|-------------------------|-------|------|--|--|---|-------------------------------|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |                      |                    |                       |                          |                          |                     |                      |                        | INNER CAGE   |                          |                     |                      |                        | OUTER CAGE              |       |      |  |  |   | Total Cage Weight<br>lbs./ft. |
| Internal Diameter<br>in.                         | Pipe Class | D-Load<br>0.01" Ult. | D-Load<br>lbs./ft. | Wall Thickness<br>in. | Concrete Strength<br>psi | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft.                            | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. |       |      |  |  |   |                               |
|  | -          |                      |                    |                       |                          |                          |                     |                      |                        |  |                          |                     |                      |                        |                         |       |      |  |  |   |                               |
| 36"  | IV         | 2,000                | 3,000              | B                     | 4"                       | 4,000                    | 0.30                | 2 x 8                | 5.0 x 3.0              | 10'-8"   | 12.49                    | 3 x 8               | 4.5 x 2.5            | 11'-4"                 | 8.36                    | 20.85 | 0.33 |  |  |   |                               |
|  |            |                      |                    | C                     | 4 3/4"                   | 4,000                    | 0.14                | 3 x 8                | 3.5 x 2.5              | 10'-8"   | 6.42                     | 3 x 8               | 2.0 x 2.5            | 12'-0"                 | 4.78                    | 11.20 | 0.15 |  |  |   |                               |
| 36"  | V          | 3,000                | 3,750              | B                     | 4"                       | 6,000                    | 0.50                | 2 x 8                | 8.5 x 3.5              | 10'-8"   | 20.38                    | 2 x 8               | 5.0 x 3.0            | 11'-4"                 | 13.27                   | 33.65 | 0.56 |  |  |   |                               |
|  |            |                      |                    | C                     | 4 3/4"                   | 6,000                    | 0.27                | 2 x 8                | 4.5 x 2.5              | 10'-8"   | 11.14                    | 3 x 8               | 4.0 x 2.5            | 12'-0"                 | 8.04                    | 19.18 | 0.30 |  |  |   |                               |
| 42"  | II         | 1,000                | 1,500              | B                     | 4 1/2"                   | 4,000                    | 0.15                | 2 x 8                | 2.5 x 2.5              | 12'-0"   | 7.63                     | 3 x 8               | 2.5 x 2.5            | 13'-4"                 | 6.21                    | 13.84 | 0.17 |  |  |   |                               |
|  |            |                      |                    | C                     | 5 1/4"                   | 4,000                    | 0.10                | 3 x 8                | 2.5 x 2.5              | 12'-0"   | 5.59                     | 3 x 8               | 2.0 x 2.5            | 14'-0"                 | 5.57                    | 11.16 | 0.11 |  |  |   |                               |
| 42"  | III        | 1,350                | 2,000              | B                     | 4 1/2"                   | 4,000                    | 0.21                | 2 x 8                | 3.5 x 2.5              | 12'-0"   | 10.08                    | 3 x 8               | 3.5 x 2.5            | 13'-4"                 | 8.03                    | 18.11 | 0.23 |  |  |   |                               |
|  |            |                      |                    | C                     | 5 1/4"                   | 4,000                    | 0.12                | 3 x 8                | 3.0 x 2.5              | 12'-0"   | 6.41                     | 3 x 8               | 2.0 x 2.5            | 14'-0"                 | 5.57                    | 11.98 | 0.13 |  |  |   |                               |
| 42"  | IV         | 2,000                | 3,000              | B                     | 4 1/2"                   | 4,000                    | 0.35                | 2 x 8                | 6.0 x 3.0              | 12'-0"   | 16.50                    | 2 x 8               | 3.5 x 2.5            | 13'-4"                 | 11.20                   | 27.70 | 0.39 |  |  |   |                               |
|  |            |                      |                    | C                     | 5 1/4"                   | 4,000                    | 0.36                | 2 x 8                | 6.0 x 3.0              | 12'-0"   | 16.50                    | 3 x 8               | 5.5 x 3.0            | 13'-4"                 | 11.99                   | 28.49 | -    |  |  |   |                               |
| 42"  | V          | 3,000                | 3,750              | B                     | 4 1/2"                   | 6,000                    | 0.60                | 2 x 8                | 10.0 x 4.0             | 12'-0"   | 26.90                    | 2 x 8               | 6.0 x 3.0            | 13'-4"                 | 18.34                   | 45.24 | 0.67 |  |  |   |                               |
|  |            |                      |                    | C                     | 5 1/4"                   | 6,000                    | 0.36                | 2 x 8                | 6.0 x 3.0              | 12'-0"   | 16.50                    | 3 x 8               | 5.5 x 3.0            | 14'-0"                 | 12.59                   | 29.09 | 0.40 |  |  |   |                               |
| 48"  | II         | 1,000                | 1,500              | B                     | 5"                       | 4,000                    | 0.18                | 3 x 8                | 4.5 x 2.5              | 13'-4"   | 9.84                     | 3 x 8               | 3.0 x 2.5            | 15'-4"                 | 8.19                    | 18.03 | 0.20 |  |  |   |                               |
|  |            |                      |                    | C                     | 5 3/4"                   | 4,000                    | 0.14                | 3 x 8                | 3.5 x 2.5              | 13'-4"   | 8.03                     | 3 x 8               | 2.5 x 2.5            | 15'-4"                 | 7.15                    | 16.99 | -    |  |  |   |                               |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

Wire size increments of 0.1 W-number and sizes larger than W12 are available.



| ASTM C 76  |            |        |       |                |                   |            |              |            |             | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |            |              |            |             |             |                   |                           |            |          | Alternate Elliptical Area |
|--|------------|--------|-------|----------------|-------------------|------------|--------------|------------|-------------|--|------------|--------------|------------|-------------|-------------|-------------------|---------------------------|------------|----------|---------------------------|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |        |       |                |                   |            |              |            |             | OUTER CAGE   |            |              |            |             |             |                   |                           |            |          | Total Cage Weight         |
| Internal Diameter                                | Pipe Class | D-Load |       | Wall Thickness | Concrete Strength | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight  | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight | Total Cage Weight | Alternate Elliptical Area |            |          |                           |
|  |            | 0.01"  | Ult.  |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | sq.in./ft. | lbs./ft. | sq.in./ft.                |
| 48"  | III        | 1,350  | 2,000 | B              | 4,000             | 0.24       | 2 x 8        | 4.0 x 2.5  | 13'-4"      | 12.56  | 0.14       | 3 x 8        | 3.5 x 2.5  | 15'-4"      | 9.23        | 21.79             | 0.27                      |            |          |                           |
|  |            |        |       | C              | 4,000             | 0.16       | 3 x 8        | 4.0 x 2.5  | 13'-4"      | 8.93   | 0.10       | 3 x 8        | 2.5 x 2.5  | 15'-4"      | 7.15        | 16.08             | 0.18                      |            |          |                           |
| 48"  | IV         | 2,000  | 3,000 | B              | 4,000             | 0.42       | 2 x 8        | 7.0 x 3.0  | 13'-4"      | 21.06  | 0.25       | 2 x 8        | 4.5 x 2.5  | 15'-4"      | 16.01       | 37.07             | 0.47                      |            |          |                           |
|  |            |        |       | C              | 4,000             | 0.42       | 2 x 8        | 7.0 x 3.0  | 13'-4"      | 21.06  | 0.24       | 2 x 8        | 4.0 x 2.5  | 15'-4"      | 14.44       | 35.50             | -                         |            |          |                           |
| 48"  | V          | 3,000  | 3,750 | B              | 6,000             | 0.73       | 2 x 8        | 12.5 x 5.0 | 13'-4"      | 37.36  | 0.44       | 2 x 8        | 7.5 x 3.0  | 15'-4"      | 25.78       | 63.14             | 0.81                      |            |          |                           |
|  |            |        |       | C              | 6,000             | 0.72       | 2 x 8        | 12.0 x 5.0 | 13'-4"      | 36.00  | 0.42       | 2 x 8        | 7.0 x 3.0  | 15'-4"      | 24.21       | 60.21             | -                         |            |          |                           |
| 54"  | II         | 1,000  | 1,500 | B              | 4,000             | 0.22       | 3 x 8        | 5.5 x 3.0  | 15'-4"      | 13.79  | 0.13       | 3 x 8        | 3.5 x 2.5  | 16'-8"      | 10.04       | 23.83             | 0.24                      |            |          |                           |
|  |            |        |       | C              | 4,000             | 0.22       | 3 x 8        | 5.5 x 3.0  | 15'-4"      | 13.79  | 0.12       | 3 x 8        | 3.0 x 2.5  | 16'-8"      | 8.90        | 22.69             | -                         |            |          |                           |
| 54"  | III        | 1,350  | 2,000 | B              | 4,000             | 0.29       | 2 x 8        | 5.0 x 3.0  | 15'-4"      | 17.96  | 0.17       | 3 x 8        | 4.5 x 2.5  | 16'-8"      | 12.30       | 30.26             | 0.32                      |            |          |                           |
|  |            |        |       | C              | 4,000             | 0.30       | 2 x 8        | 5.0 x 3.0  | 15'-4"      | 17.96  | 0.16       | 3 x 8        | 4.0 x 2.5  | 16'-8"      | 11.17       | 29.13             | -                         |            |          |                           |
| 54"  | IV         | 2,000  | 3,000 | B              | 4,000             | 0.21       | 2 x 8        | 3.5 x 2.5  | 15'-4"      | 12.88  | 0.13       | 3 x 8        | 3.5 x 2.5  | 17'-4"      | 10.44       | 23.32             | 0.23                      |            |          |                           |
|  |            |        |       | C              | 4,000             | 0.20       | 3 x 8        | 5.5 x 3.0  | 15'-4"      | 13.79  | 0.12       | 3 x 8        | 3.0 x 2.5  | 17'-4"      | 9.26        | 24.23             | -                         |            |          |                           |
| 54"  | V          | 3,000  | 3,750 | B              | 6,000             | 0.50       | 2 x 8        | 8.5 x 3.5  | 15'-4"      | 29.29  | 0.30       | 2 x 8        | 5.0 x 3.0  | 16'-8"      | 19.52       | 48.81             | 0.55                      |            |          |                           |
|  |            |        |       | C              | 6,000             | 0.48       | 2 x 8        | 8.0 x 3.5  | 15'-4"      | 27.73  | 0.30       | 2 x 8        | 5.0 x 3.0  | 16'-8"      | 19.52       | 47.25             | -                         |            |          |                           |
| 54"  |            |        |       | B              | 4,000             | 0.34       | 2 x 8        | 6.0 x 3.0  | 15'-4"      | 21.09  | 0.20       | 3 x 8        | 5.0 x 3.0  | 17'-4"      | 14.41       | 35.50             | 0.38                      |            |          |                           |
|  |            |        |       | C              | 4,000             | 0.33       | 2 x 8        | 5.5 x 3.0  | 15'-4"      | 19.52  | 0.20       | 3 x 8        | 5.0 x 3.0  | 17'-4"      | 14.41       | 33.93             | -                         |            |          |                           |
| 54"  |            |        |       | B              | 6,000             | 0.58       | 2 x 8        | 10.0 x 4.0 | 15'-4"      | 34.37  | 0.35       | 2 x 8        | 6.0 x 3.0  | 17'-4"      | 23.84       | 58.21             | 0.64                      |            |          |                           |
|  |            |        |       | C              | 6,000             | 0.57       | 2 x 8        | 9.5 x 4.0  | 15'-4"      | 32.81  | 0.33       | 2 x 8        | 5.5 x 3.0  | 17'-4"      | 22.07       | 54.88             | -                         |            |          |                           |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |                             |                            |                       |                          |                          |                     |                      |                        | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                          |                     |                      |                        |                         |                          |                     |                      |                        | Alternate Elliptical Area<br>sq.in./ft. |                         |                               |  |  |  |  |  |  |  |  |
|--|------------|-----------------------------|----------------------------|-----------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|--|--------------------------|---------------------|----------------------|------------------------|-------------------------|--------------------------|---------------------|----------------------|------------------------|---|-------------------------|-------------------------------|--|--|--|--|--|--|--|--|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |                             |                            |                       |                          |                          |                     |                      |                        | INNER CAGE   |                          |                     |                      |                        |                         |                          |                     |                      |                        |   | OUTER CAGE              |                               |  |  |  |  |  |  |  |  |
| Internal Diameter<br>in.                         | Pipe Class | D-Load<br>0.01"<br>lbs./ft. | D-Load<br>Ult.<br>lbs./ft. | Wall Thickness<br>in. | Concrete Strength<br>psi | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft.                            | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. |   | Cage Weight<br>lbs./ft. | Total Cage Weight<br>lbs./ft. |  |  |  |  |  |  |  |  |
| 60"  | II         | 1,000                       | 1,500                      | B                     | 4,000                    | 0.25                     | 2 x 8               | 4.5 x 2.5            | 16'-8"                 | 17.40  | 0.15                     | 2 x 8               | 2.5 x 2.5            | 18'-8"                 | 11.87                   | 0.15                     | 2 x 8               | 2.5 x 2.5            | 18'-8"                 | 11.87                                   | 29.27                   | 0.28                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            | C                     | 4,000                    | ◆ 0.24                   | 2 x 8               | 4.0 x 2.5            | 16'-8"                 | 15.70  | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 18'-8"                 | 12.51                   | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 18'-8"                 | 12.51                                   | 29.91                   | -                             |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | ◆ 0.22                   | 3 x 8               | 5.5 x 3.0            | 16'-8"                 | 14.99  | 0.13                     | 3 x 8               | 3.5 x 2.5            | 19'-4"                 | 11.64                   | ◆ 0.12                   | 3 x 8               | 3.0 x 2.5            | 19'-4"                 | 10.33                                   | 26.63                   | 0.24                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | ◆ 0.22                   | 3 x 8               | 5.5 x 3.0            | 16'-8"                 | 14.99  | ◆ 0.12                   | 3 x 8               | 3.0 x 2.5            | 19'-4"                 | 10.33                   | ◆ 0.12                   | 3 x 8               | 3.0 x 2.5            | 19'-4"                 | 10.33                                   | 25.32                   | -                             |  |  |  |  |  |  |  |  |
| 60"  | III        | 1,350                       | 2,000                      | B                     | 4,000                    | 0.34                     | 2 x 8               | 6.0 x 3.0            | 16'-8"                 | 22.92  | 0.20                     | 2 x 8               | 5.0 x 3.0            | 18'-8"                 | 15.52                   | 0.20                     | 3 x 8               | 5.0 x 3.0            | 18'-8"                 | 15.52                                   | 38.44                   | 0.38                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            | C                     | 4,000                    | ◆ 0.33                   | 2 x 8               | 5.5 x 3.0            | 16'-8"                 | 21.22  | ◆ 0.20                   | 2 x 8               | 5.0 x 3.0            | 18'-8"                 | 15.52                   | ◆ 0.20                   | 3 x 8               | 5.0 x 3.0            | 18'-8"                 | 15.52                                   | 36.74                   | -                             |  |  |  |  |  |  |  |  |
| 60"  | III        | 1,350                       | 2,000                      | C                     | 4,000                    | 0.25                     | 2 x 8               | 4.5 x 2.5            | 16'-8"                 | 17.40  | 0.15                     | 2 x 8               | 4.5 x 2.5            | 16'-8"                 | 12.30                   | 0.15                     | 2 x 8               | 2.5 x 2.5            | 19'-4"                 | 12.30                                   | 29.70                   | 0.28                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | ◆ 0.24                   | 2 x 8               | 4.0 x 2.5            | 16'-8"                 | 15.70  | ◆ 0.16                   | 2 x 8               | 4.0 x 2.5            | 19'-4"                 | 12.96                   | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 19'-4"                 | 12.96                                   | 30.36                   | -                             |  |  |  |  |  |  |  |  |
| 60"  | IV         | 2,000                       | 3,000                      | B                     | 5,000                    | 0.59                     | 2 x 8               | 10.0 x 4.0           | 16'-8"                 | 37.36  | 0.35                     | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                   | 0.35                     | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                                   | 63.03                   | 0.66                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 5,000                    | ◆ 0.57                   | 2 x 8               | 9.5 x 4.0            | 16'-8"                 | 35.66  | ◆ 0.36                   | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                   | ◆ 0.36                   | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                                   | 61.33                   | -                             |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | QC                       | 2 x 8               | 5.0 x 3.0            | 20'-8"                 | 24.21  | FC                       | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                   | FC                       | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                                   | 55.35                   | 0.46                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | QM                       | 2 x 8               | 5.0 x 3.0            | 4'-8"                  | 5.47   | FC                       | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                   | FC                       | 2 x 8               | 6.0 x 3.0            | 18'-8"                 | 25.67                                   | 44.53                   | -                             |  |  |  |  |  |  |  |  |
|  |            |                             |                            | C                     | 4,000                    | 0.41                     | 2 x 8               | 7.0 x 3.0            | 16'-8"                 | 26.32  | 0.25                     | 2 x 8               | 4.5 x 2.5            | 19'-4"                 | 20.18                   | 0.25                     | 2 x 8               | 4.5 x 2.5            | 19'-4"                 | 20.18                                   | 46.50                   | 0.46                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | ◆ 0.42                   | 2 x 8               | 7.0 x 3.0            | 16'-8"                 | 26.32  | ◆ 0.24                   | 2 x 8               | 4.0 x 2.5            | 19'-4"                 | 18.21                   | ◆ 0.24                   | 2 x 8               | 4.0 x 2.5            | 19'-4"                 | 18.21                                   | 44.53                   | -                             |  |  |  |  |  |  |  |  |
| 60"  | V          | 3,000                       | 3,750                      | C                     | 6,000                    | 0.70                     | 2 x 8               | 12.0 x 5.0           | 16'-8"                 | 45.00  | 0.42                     | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                   | 0.42                     | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                                   | 75.53                   | 0.78                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 6,000                    | ◆ 0.69                   | 2 x 8               | 11.5 x 5.0           | 16'-8"                 | 43.30  | ◆ 0.42                   | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                   | ◆ 0.42                   | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                                   | 73.83                   | -                             |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | QC                       | 2 x 8               | 6.0 x 3.0            | 20'-8"                 | 28.42  | FC                       | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                   | FC                       | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                                   | 65.37                   | 0.34                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | QM                       | 2 x 8               | 6.0 x 3.0            | 4'-8"                  | 6.42   | FC                       | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                   | FC                       | 2 x 8               | 7.0 x 3.0            | 19'-4"                 | 30.53                                   | 40.10                   | -                             |  |  |  |  |  |  |  |  |
| 66"  | II         | 1,000                       | 1,500                      | B                     | 4,000                    | 0.31                     | 2 x 8               | 5.5 x 3.0            | 18'-0"                 | 22.92  | 0.19                     | 3 x 8               | 5.0 x 3.0            | 20'-8"                 | 17.18                   | 0.19                     | 3 x 8               | 5.0 x 3.0            | 20'-8"                 | 17.18                                   | 40.10                   | 0.34                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            | C                     | 4,000                    | ◆ 0.30                   | 2 x 8               | 5.0 x 3.0            | 18'-0"                 | 21.08  | ◆ 0.18                   | 3 x 8               | 4.5 x 2.5            | 20'-8"                 | 15.25                   | ◆ 0.18                   | 3 x 8               | 4.5 x 2.5            | 20'-8"                 | 15.25                                   | 36.33                   | -                             |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | 0.25                     | 2 x 8               | 4.5 x 2.5            | 18'-0"                 | 18.79  | 0.15                     | 2 x 8               | 2.5 x 2.5            | 21'-4"                 | 13.57                   | 0.15                     | 2 x 8               | 2.5 x 2.5            | 21'-4"                 | 13.57                                   | 32.36                   | 0.28                          |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | ◆ 0.24                   | 2 x 8               | 4.0 x 2.5            | 18'-0"                 | 16.96  | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 21'-4"                 | 14.30                   | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 21'-4"                 | 14.30                                   | 33.09                   | -                             |  |  |  |  |  |  |  |  |
|  |            |                             |                            |                       | 4,000                    | ◆ 0.24                   | 2 x 8               | 4.0 x 2.5            | 18'-0"                 | 16.96  | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 21'-4"                 | 14.30                   | ◆ 0.16                   | 3 x 8               | 4.0 x 2.5            | 21'-4"                 | 14.30                                   | 31.26                   | -                             |  |  |  |  |  |  |  |  |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |        |       |                       |                          |                          |                     |                      |                        | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                          |                     |                      |                        |                         |                               |   |  |  |
|--|------------|--------|-------|-----------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|--|--------------------------|---------------------|----------------------|------------------------|-------------------------|-------------------------------|---|--|--|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |        |       |                       | INNER CAGE               |                          |                     |                      |                        | OUTER CAGE   |                          |                     |                      |                        | Total Cage Weight       |                               | Alternate Elliptical Area               |  |  |
| Internal Diameter<br>in.                         | Pipe Class | D-Load |       | Wall Thickness<br>in. | Concrete Strength<br>psi | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft.                            | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. | Total Cage Weight<br>lbs./ft. | Alternate Elliptical Area<br>sq.in./ft. |  |  |
|  |            | 0.01"  | Ult.  |                       |                          |                          |                     |                      |                        |  |                          |                     |                      |                        |                         |                               |   |  |  |
| 66"  | III        | 1,350  | 2,000 | B                     | 4,000                    | 0.41<br>◆                | 2 x 8               | 7.0 x 3.0            | 18'-0"                 | 28.43  | 0.25                     | 2 x 8               | 4.5 x 2.5            | 20'-8"                 | 21.58                   | 50.01                         | 0.46                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.42<br>◆                | 2 x 8               | 7.0 x 3.0            | 18'-0"                 | 28.43  | 0.24<br>◆                | 2 x 8               | 4.0 x 2.5            | 20'-8"                 | 19.47                   | 47.90                         | -                                       |  |  |
| 66"  | IV         | 2,000  | 3,000 | B                     | 5,000                    | 0.31<br>◆                | 2 x 8               | 5.5 x 3.0            | 18'-0"                 | 22.92  | 0.19                     | 3 x 8               | 5.0 x 3.0            | 21'-4"                 | 17.73                   | 40.65                         | 0.34                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.30<br>◆                | 2 x 8               | 5.0 x 3.0            | 18'-0"                 | 21.08  | 0.18<br>◆                | 3 x 8               | 4.5 x 2.5            | 21'-4"                 | 15.75                   | 36.83                         | -                                       |  |  |
| 66"  | V          | 3,000  | 3,750 | C                     | 6,000                    | 0.69<br>◆                | 2 x 8               | 11.5 x 5.0           | 18'-0"                 | 46.76  | 0.41                     | 2 x 8               | 7.0 x 3.0            | 20'-8"                 | 32.64                   | 79.40                         | 0.77                                    |  |  |
|  |            |        |       |                       | 4,000                    | 0.66<br>◆                | 2 x 8               | 11.0 x 4.5           | 18'-0"                 | 44.47  | 0.42<br>◆                | 2 x 8               | 7.0 x 3.0            | 20'-8"                 | 32.64                   | 77.11                         | -                                       |  |  |
| 66"  | V          | 1,000  | 1,500 | B                     | 4,000                    | QC                       | 2 x 8               | 5.5 x 3.0            | 22'-8"                 | 28.86  | FC                       | 2 x 8               | 7.0 x 3.0            | 20'-8"                 | 32.64                   | 67.44                         | -                                       |  |  |
|  |            |        |       | C                     | 4,000                    | QM                       | 2 x 8               | 5.5 x 3.0            | 4'-8"                  | 5.94   | FC                       | 2 x 8               | 7.0 x 3.0            | 20'-8"                 | 32.64                   | 67.44                         | -                                       |  |  |
| 66"  | V          | 3,000  | 3,750 | C                     | 6,000                    | 0.51<br>◆                | 2 x 8               | 8.5 x 3.5            | 18'-0"                 | 34.39  | 0.31                     | 2 x 8               | 5.5 x 3.0            | 21'-4"                 | 27.16                   | 61.55                         | 0.57                                    |  |  |
|  |            |        |       |                       | 4,000                    | 0.51<br>◆                | 2 x 8               | 8.5 x 3.5            | 18'-0"                 | 34.39  | 0.30<br>◆                | 2 x 8               | 5.0 x 3.0            | 21'-4"                 | 24.99                   | 59.38                         | -                                       |  |  |
| 66"  | V          | 1,000  | 1,500 | B                     | 4,000                    | QC                       | 2 x 8               | 4.5 x 2.5            | 22'-8"                 | 23.67  | FC                       | 2 x 8               | 5.0 x 3.0            | 21'-4"                 | 24.99                   | 53.53                         | -                                       |  |  |
|  |            |        |       | C                     | 4,000                    | QM                       | 2 x 8               | 4.5 x 2.5            | 4'-8"                  | 4.87   | FC                       | 2 x 8               | 5.0 x 3.0            | 21'-4"                 | 24.99                   | 53.53                         | -                                       |  |  |
| 72"  | II         | 1,000  | 1,500 | B                     | 4,000                    | 0.84<br>◆                | (2) 2 x 8           | 7.0 x 3.0            | 18'-0"                 | 56.86  | 0.50                     | 2 x 8               | 8.5 x 3.5            | 21'-4"                 | 40.76                   | 97.62                         | 0.93                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.84<br>◆                | (2) 2 x 8           | 7.0 x 3.0            | 18'-0"                 | 56.86  | 0.48<br>◆                | 2 x 8               | 8.0 x 3.5            | 21'-4"                 | 38.58                   | 95.44                         | -                                       |  |  |
| 72"  | II         | 1,000  | 1,500 | B                     | 4,000                    | QC                       | 2 x 8               | 7.0 x 3.0            | 22'-8"                 | 35.80  | QC                       | 2 x 8               | 4.0 x 2.5            | 26'-0"                 | 24.49                   | 72.68                         | -                                       |  |  |
|  |            |        |       | C                     | 4,000                    | QM                       | 2 x 8               | 7.0 x 3.0            | 4'-8"                  | 7.37   | QM                       | 2 x 8               | 4.0 x 2.5            | 5'-4"                  | 5.02                    | 72.68                         | -                                       |  |  |
| 72"  | III        | 1,350  | 2,000 | B                     | 4,000                    | 0.35                     | 2 x 8               | 6.0 x 3.0            | 20'-0"                 | 27.50  | 0.21                     | 2 x 8               | 3.5 x 2.5            | 22'-8"                 | 19.04                   | 46.54                         | 0.39                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.36<br>◆                | 2 x 8               | 6.0 x 3.0            | 20'-0"                 | 27.50  | 0.20<br>◆                | 3 x 8               | 5.5 x 3.0            | 22'-8"                 | 20.38                   | 47.88                         | -                                       |  |  |
| 72"  | III        | 1,350  | 2,000 | B                     | 4,000                    | 0.30                     | 2 x 8               | 5.0 x 3.0            | 20'-0"                 | 23.43  | 0.18                     | 3 x 8               | 5.0 x 3.0            | 22'-8"                 | 16.73                   | 40.16                         | 0.33                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.30                     | 2 x 8               | 5.0 x 3.0            | 20'-0"                 | 23.43  | 0.18                     | 3 x 8               | 4.5 x 2.5            | 22'-8"                 | 16.73                   | 40.16                         | 0.33                                    |  |  |
| 72"  | III        | 1,350  | 2,000 | B                     | 4,000                    | 0.49<br>◆                | 2 x 8               | 8.5 x 3.5            | 20'-0"                 | 38.21  | 0.29                     | 2 x 8               | 5.0 x 3.0            | 22'-8"                 | 26.55                   | 64.76                         | 0.54                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.48<br>◆                | 2 x 8               | 8.0 x 3.5            | 20'-0"                 | 36.17  | 0.30<br>◆                | 2 x 8               | 5.0 x 3.0            | 22'-8"                 | 26.55                   | 62.72                         | -                                       |  |  |
| 72"  | III        | 1,350  | 2,000 | B                     | 4,000                    | QC                       | 2 x 8               | 4.0 x 2.5            | 24'-8"                 | 23.24  | FC                       | 2 x 8               | 5.0 x 3.0            | 22'-8"                 | 26.55                   | 54.81                         | -                                       |  |  |
|  |            |        |       | C                     | 4,000                    | QM                       | 2 x 8               | 4.0 x 2.5            | 5'-4"                  | 5.02   | FC                       | 2 x 8               | 5.0 x 3.0            | 22'-8"                 | 26.55                   | 54.81                         | -                                       |  |  |
| 72"  | III        | 1,350  | 2,000 | B                     | 4,000                    | 0.36                     | 2 x 8               | 6.0 x 3.0            | 20'-0"                 | 27.50  | 0.22                     | 3 x 8               | 5.5 x 3.0            | 22'-8"                 | 20.38                   | 47.88                         | 0.40                                    |  |  |
|  |            |        |       | C                     | 4,000                    | 0.36                     | 2 x 8               | 6.0 x 3.0            | 20'-0"                 | 27.50  | 0.22                     | 3 x 8               | 5.5 x 3.0            | 22'-8"                 | 20.38                   | 47.88                         | 0.40                                    |  |  |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

Wire size increments of 0.1 W-number and sizes larger than W12 are available.

| ASTM C 76  |            |        |       |                |                   |            |                        |                          |                  | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                |                |                                     |                            |                         |                         |                           |            |          | Alternate Elliptical Area |          |            |          |  |  |  |  |  |  |                   |
|--|------------|--------|-------|----------------|-------------------|------------|------------------------|--------------------------|------------------|--|----------------|----------------|-------------------------------------|----------------------------|-------------------------|-------------------------|---------------------------|------------|----------|---------------------------|----------|------------|----------|--|--|--|--|--|--|-------------------|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |        |       |                |                   |            |                        |                          |                  | INNER CAGE   |                |                |                                     |                            |                         |                         |                           |            |          | OUTER CAGE                |          |            |          |  |  |  |  |  |  | Total Cage Weight |
| Internal Diameter                                | Pipe Class | D-Load |       | Wall Thickness | Concrete Strength | Area Req'd | Wire Spacing           | Wire Sizes               | Cage Length      | Cage Weight  | Area Req'd     | Wire Spacing   | Wire Sizes                          | Cage Length                | Cage Weight             | Total Cage Weight       | Alternate Elliptical Area |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            | 0.01"  | Ult.  |                |                   |            |                        |                          |                  |  |                |                |                                     |                            |                         |                         |                           | sq.in./ft. | lbs./ft. | sq.in./ft.                | lbs./ft. | sq.in./ft. | lbs./ft. |  |  |  |  |  |  |                   |
| 72"  | IV         | 2,000  | 3,000 | B              | 7"                | 5,000      | (2) 2 x 8<br>(2) 2 x 8 | 7.0 x 3.0<br>6.5 x 3.0   | 20'-0"<br>20'-0" | 63.16<br>59.08                                     | 0.79<br>◆ 0.78 | 2 x 8<br>2 x 8 | 8.0 x 3.5<br>7.5 x 3.0              | 22'-8"<br>22'-8"           | 40.99<br>38.11          | 104.15<br>97.19         | 0.88<br>-                 |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       | C              | 7 3/4"            | 5,000      | 2 x 8<br>2 x 8         | 6.5 x 3.0<br>6.5 x 3.0   | 24'-8"<br>5'-4"  | 36.44<br>7.88                                      | QC<br>QM       | 2 x 8          | 7.5 x 3.0                           | 22'-8"                     | 38.11                   | 82.43                   | 0.68<br>-                 |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       |                |                   |            | 2 x 8<br>2 x 8         | 10.5 x 4.5<br>10.0 x 4.0 | 20'-0"<br>20'-0" | 47.38<br>44.83                                     | 0.61<br>◆ 0.60 | 2 x 8<br>2 x 8 | 6.5 x 3.0<br>6.0 x 3.0              | 22'-8"<br>22'-8"           | 33.48<br>31.17          | 80.86<br>76.00          |                           |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       |                |                   |            | 2 x 8<br>2 x 8         | 5.0 x 3.0<br>5.0 x 3.0   | 24'-8"<br>5'-4"  | 28.89<br>6.25                                      | QC<br>QM       | 2 x 8          | 6.0 x 3.0                           | 22'-8"                     | 31.17                   | 66.31                   |                           |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
| 72"  | V          | 3,000  | 3,750 | C              | 7 3/4"            | 6,000      | (2) 2 x 8<br>(2) 2 x 8 | 8.5 x 3.5<br>8.0 x 3.5   | 20'-0"<br>20'-0" | 76.42<br>72.34                                     | 0.99<br>◆ 0.96 | 2 x 8<br>2 x 8 | 10.0 x 4.0<br>10.0 x 4.0            | 22'-8"<br>22'-8"           | 50.81<br>50.81          | 127.23<br>123.15        | 1.10<br>-                 |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       |                |                   |            | 2 x 8<br>2 x 8         | 8.0 x 3.5<br>8.0 x 3.5   | 24'-8"<br>5'-4"  | 44.61<br>9.64                                      | QC<br>QM       | 2 x 8<br>2 x 8 | 5.0 x 3.0<br>5.0 x 3.0              | 28'-0"<br>6'-0"            | 32.80<br>7.03           | 94.08                   |                           |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
| 78"  | II         | 1,000  | 1,500 | B              | 7 1/2"            | 4,000      | 2 x 8<br>2 x 8         | 7.0 x 3.0<br>6.5 x 3.0   | 21'-4"<br>21'-4" | 33.69<br>31.51                                     | 0.40<br>◆ 0.39 | 2 x 8<br>2 x 8 | 4.0 x 2.5<br>4.0 x 2.5              | 24'-0"<br>24'-0"           | 22.61<br>22.61          | 56.30<br>54.12          | 0.44<br>0.39              |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       | C              | 8 1/4"            | 4,000      | 2 x 8<br>2 x 8         | 6.0 x 3.0<br>6.0 x 3.0   | 21'-4"<br>21'-4" | 29.34<br>29.34                                     | 0.35<br>◆ 0.36 | 2 x 8<br>2 x 8 | 3.5 x 2.5<br>5.5 x 3.0<br>5.0 x 3.0 | 24'-8"<br>24'-8"<br>24'-8" | 20.72<br>22.18<br>20.51 | 50.06<br>51.52<br>49.85 | -                         |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
| 78"  | III        | 1,350  | 2,000 | B              | 7 1/2"            | 4,000      | 2 x 8<br>2 x 8         | 9.5 x 4.0<br>9.5 x 4.0   | 21'-4"<br>21'-4" | 45.65<br>45.65                                     | 0.57<br>◆ 0.57 | 2 x 8<br>2 x 8 | 6.0 x 3.0<br>5.5 x 3.0              | 24'-0"<br>24'-0"           | 33.01<br>30.56          | 78.66<br>76.21          | 0.63<br>-                 |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       | C              | 8 1/4"            | 4,000      | 2 x 8<br>2 x 8         | 5.0 x 3.0<br>5.0 x 3.0   | 26'-8"<br>5'-4"  | 31.23<br>6.25                                      | QC<br>QM       | 2 x 8          | 5.5 x 3.0                           | 24'-0"                     | 30.56                   | 68.04                   |                           |            |          |                           |          |            |          |  |  |  |  |  |  |                   |
|  |            |        |       |                |                   |            | 2 x 8<br>2 x 8         | 7.0 x 3.0<br>7.0 x 3.0   | 21'-4"<br>21'-4" | 33.69<br>33.69                                     | 0.42<br>◆ 0.42 | 2 x 8<br>2 x 8 | 4.5 x 2.5<br>4.0 x 2.5              | 24'-8"<br>24'-8"           | 25.75<br>23.24          | 59.44<br>56.93          | 0.47<br>-                 |            |          |                           |          |            |          |  |  |  |  |  |  |                   |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |              |                |                   |                |                        |                          |                  |                | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                |                        |                  |                |                  |            |                           |            |  |
|--|------------|--------------|----------------|-------------------|----------------|------------------------|--------------------------|------------------|----------------|--|----------------|------------------------|------------------|----------------|------------------|------------|---------------------------|------------|--|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |              |                |                   | INNER CAGE     |                        |                          |                  |                | OUTER CAGE   |                |                        |                  |                | Total            |            | Alternate Elliptical Area |            |  |
| Internal Diameter                                | Pipe Class | D-Load       | Wall Thickness | Concrete Strength | Area Req'd     | Wire Spacing           | Wire Sizes               | Cage Length      | Cage Weight    | Area Req'd   | Wire Spacing   | Wire Sizes             | Cage Length      | Cage Weight    | lbs./ft.         | lbs./ft.   |                           | sq.in./ft. |  |
| in.  | -          | lbs./ft./ft. | in.            | psi               | sq.in./ft.     | in.                    | W or D                   | ft.-in.          | lbs./ft.       | sq.in./ft.   | in.            | W or D                 | ft.-in.          | lbs./ft.       | lbs./ft.         | sq.in./ft. | sq.in./ft.                |            |  |
| 78"  | IV         | 2,000        | C 8 1/4"       | 5,000             | 0.71<br>◆ 0.69 | 2 x 8<br>2 x 8         | 12.0 x 5.0<br>11.5 x 5.0 | 21'-4"<br>21'-4" | 57.60<br>55.42 | 0.43<br>◆ 0.42                                     | 2 x 8<br>2 x 8 | 7.5 x 3.0<br>7.0 x 3.0 | 24'-8"<br>24'-8" | 41.47<br>38.95 | 99.07<br>94.37   | 0.79<br>-  |                           |            |  |
|  |            |              |                |                   | QC<br>QM       | 2 x 8<br>2 x 8         | 6.0 x 3.0<br>6.0 x 3.0   | 26'-8"<br>5'-4"  | 36.67<br>7.33  | FC   | 2 x 8          | 7.0 x 3.0              | 24'-8"           | 38.95          | 82.95            |            |                           |            |  |
| 84"  | II         | 1,000        | B 8"           | 4,000             | 0.46<br>◆ 0.45 | 2 x 8<br>2 x 8         | 8.0 x 3.5<br>7.5 x 3.0   | 23'-4"<br>23'-4" | 42.20<br>39.23 | 0.28<br>◆ 0.27                                     | 2 x 8<br>2 x 8 | 5.0 x 3.0<br>4.5 x 2.5 | 26'-0"<br>26'-0" | 30.45<br>27.15 | 72.65<br>66.38   | 0.51<br>-  |                           |            |  |
|  |            |              |                |                   | 0.41<br>◆ 0.42 | 2 x 8<br>2 x 8         | 7.0 x 3.0<br>7.0 x 3.0   | 23'-4"<br>23'-4" | 36.85<br>36.85 | 0.25<br>◆ 0.24                                     | 2 x 8<br>2 x 8 | 4.5 x 2.5<br>4.0 x 2.5 | 26'-8"<br>26'-8" | 27.84<br>25.12 | 64.69<br>61.97   | 0.46<br>-  |                           |            |  |
| 84"  | III        | 1,350        | B 8"           | 4,000             | 0.64<br>◆ 0.63 | 2 x 8<br>2 x 8         | 11.0 x 4.5<br>10.5 x 4.5 | 23'-4"<br>23'-4" | 57.65<br>55.27 | 0.38<br>◆ 0.39                                     | 2 x 8<br>2 x 8 | 6.5 x 3.0<br>6.5 x 3.0 | 26'-0"<br>26'-0" | 38.41<br>38.41 | 96.06<br>93.68   | 0.71<br>-  |                           |            |  |
|  |            |              |                |                   | QC<br>QM       | 2 x 8<br>2 x 8         | 5.5 x 3.0<br>5.5 x 3.0   | 28'-8"<br>6'-0"  | 36.50<br>7.64  | FC   | 2 x 8          | 6.5 x 3.0              | 26'-0"           | 38.41          | 82.55            | 0.56       |                           |            |  |
|  |            |              |                |                   | 0.50           | 2 x 8                  | 8.5 x 3.5                | 23'-4"           | 44.58          | 0.30   | 2 x 8          | 5.0 x 3.0              | 26'-8"           | 31.23          | 75.81            |            |                           |            |  |
|  |            |              |                |                   | QC<br>QM       | 2 x 8<br>2 x 8         | 4.5 x 2.5<br>4.5 x 2.5   | 28'-8"<br>6'-0"  | 29.93<br>6.26  | FC   | 2 x 8          | 5.0 x 3.0              | 26'-8"           | 31.23          | 67.42            |            |                           |            |  |
| 84"  | IV         | 2,000        | C 8 3/4"       | 5,000             | 0.85<br>◆ 0.84 | (2) 2 x 8<br>(2) 2 x 8 | 7.5 x 3.0<br>7.0 x 3.0   | 23'-4"<br>23'-4" | 78.46<br>73.70 | 0.51<br>◆ 0.48                                     | 2 x 8<br>2 x 8 | 8.5 x 3.5<br>8.0 x 3.5 | 26'-8"<br>26'-8" | 50.94<br>48.22 | 129.40<br>121.92 | 0.94<br>-  |                           |            |  |
|  |            |              |                |                   | QC<br>QM       | 2 x 8<br>2 x 8         | 7.0 x 3.0<br>7.0 x 3.0   | 28'-8"<br>6'-0"  | 45.27<br>9.48  | QC<br>QM   | 2 x 8<br>2 x 8 | 4.0 x 2.5<br>4.0 x 2.5 | 32'-8"<br>6'-8"  | 30.77<br>6.28  | 91.80            |            |                           |            |  |
| 90"  | II         | 1,000        | B 8 1/2"       | 4,000             | 0.51<br>◆ 0.51 | 2 x 8<br>2 x 8         | 8.5 x 3.5<br>8.5 x 3.5   | 24'-8"<br>24'-8" | 47.12<br>47.12 | 0.31<br>◆ 0.30                                     | 2 x 8<br>2 x 8 | 5.5 x 3.0<br>5.0 x 3.0 | 28'-0"<br>28'-0" | 35.65<br>32.80 | 82.77<br>79.92   | 0.57<br>-  |                           |            |  |
|  |            |              |                |                   | QC<br>QM       | 2 x 8<br>2 x 8         | 4.5 x 2.5<br>4.5 x 2.5   | 30'-8"<br>6'-8"  | 32.02<br>6.96  | FC   | 2 x 8          | 5.0 x 3.0              | 28'-0"           | 32.80          | 71.78            |            |                           |            |  |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |        |       |                |                   |            |              |            |             | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |            |              |            |             |             |                   |                           |          |            | Alternate Elliptical Area |        |         |          |            |           |        |         |          |   |                   |
|--|------------|--------|-------|----------------|-------------------|------------|--------------|------------|-------------|--|------------|--------------|------------|-------------|-------------|-------------------|---------------------------|----------|------------|---------------------------|--------|---------|----------|------------|-----------|--------|---------|----------|---|-------------------|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |        |       |                |                   |            |              |            |             | INNER CAGE   |            |              |            |             |             |                   |                           |          |            | OUTER CAGE                |        |         |          |            |           |        |         |          |   | Total Cage Weight |
| Internal Diameter                                | Pipe Class | D-Load |       | Wall Thickness | Concrete Strength | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight  | Area Req'd | Wire Spacing | Wire Sizes | Cage Length | Cage Weight | Total Cage Weight | Alternate Elliptical Area |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            | 0.01"  | Ult.  |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | lbs./ft. | sq.in./ft. | in.                       | W or D | ft.-in. | lbs./ft. | sq.in./ft. | in.       | W or D | ft.-in. | lbs./ft. |   |                   |
| 90"  | II         | 1,000  | 1,500 | C              | 4,000             | 0.48       | 2 x 8        | 8.0 x 3.5  | 24'-8"      | 44.61  | 0.29       | 2 x 8        | 5.0 x 3.0  | 28'-8"      | 33.58       | 78.19             | 0.53                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.48     | 2 x 8      | 8.0 x 3.5                 | 24'-8" | 44.61   | 0.27     | 2 x 8      | 4.5 x 2.5 | 28'-8" | 29.93   | 74.54    | - |                   |
| 90"  | III        | 1,350  | 2,000 | B              | 5,000             | 0.69       | 2 x 8        | 11.5 x 5.0 | 24'-8"      | 64.08  | 0.41       | 2 x 8        | 7.0 x 3.0  | 28'-0"      | 44.22       | 108.30            | 0.77                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.69     | 2 x 8      | 11.5 x 5.0                | 24'-8" | 64.08   | 0.39     | 2 x 8      | 6.5 x 3.0 | 28'-0" | 41.36   | 105.44   | - |                   |
| 90"  | III        | 1,350  | 2,000 | C              | 5,000             | 0.59       | 2 x 8        | 10.0 x 4.0 | 24'-8"      | 55.29  | 0.35       | 2 x 8        | 6.0 x 3.0  | 28'-8"      | 39.42       | 94.71             | 0.66                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.57     | 2 x 8      | 9.5 x 4.0                 | 24'-8" | 52.78   | 0.36     | 2 x 8      | 6.0 x 3.0 | 28'-8" | 39.42   | 92.20    | - |                   |
| 96"  | II         | 1,000  | 1,500 | B              | 4,000             | 0.57       | 2 x 8        | 9.5 x 4.0  | 26'-0"      | 55.63  | 0.34       | 2 x 8        | 6.0 x 3.0  | 30'-0"      | 41.26       | 96.89             | 0.63                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.57     | 2 x 8      | 9.5 x 4.0                 | 26'-0" | 55.63   | 0.33     | 2 x 8      | 5.5 x 3.0 | 30'-0" | 38.20   | 93.83    | - |                   |
| 96"  | III        | 1,350  | 2,000 | B              | 5,000             | 0.76       | (2) 2 x 8    | 6.5 x 3.0  | 26'-0"      | 76.82  | 0.46       | 2 x 8        | 8.0 x 3.5  | 30'-0"      | 54.25       | 131.07            | 0.84                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.72     | (2) 2 x 8  | 6.0 x 3.0                 | 26'-0" | 71.51   | 0.48     | 2 x 8      | 8.0 x 3.5 | 30'-0" | 54.25   | 125.76   | - |                   |
| 96"  | III        | 1,350  | 2,000 | C              | 4,000             | 0.55       | 2 x 8        | 9.5 x 4.0  | 26'-0"      | 52.98  | 0.33       | 2 x 8        | 5.5 x 3.0  | 30'-0"      | 38.20       | 93.83             | 0.61                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.54     | 2 x 8      | 9.0 x 4.0                 | 26'-0" | 52.98   | 0.33     | 2 x 8      | 5.5 x 3.0 | 30'-0" | 38.20   | 91.18    | - |                   |
| 96"  | III        | 1,350  | 2,000 | B              | 5,000             | 0.76       | 2 x 8        | 4.5 x 2.5  | 32'-8"      | 34.11  | FC         | 2 x 8        | 5.5 x 3.0  | 30'-0"      | 38.20       | 79.27             | 0.84                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.72     | 2 x 8      | 4.5 x 2.5                 | 32'-8" | 6.96    | FC       | 2 x 8      | 5.5 x 3.0 | 30'-0" | 38.20   | 79.27    | - |                   |
| 96"  | III        | 1,350  | 2,000 | B              | 5,000             | 0.76       | (2) 2 x 8    | 6.5 x 3.0  | 26'-0"      | 76.82  | 0.46       | 2 x 8        | 8.0 x 3.5  | 30'-0"      | 54.25       | 131.07            | 0.84                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.72     | (2) 2 x 8  | 6.0 x 3.0                 | 26'-0" | 71.51   | 0.48     | 2 x 8      | 8.0 x 3.5 | 30'-0" | 54.25   | 125.76   | - |                   |
| 96"  | III        | 1,350  | 2,000 | C              | 4,000             | 0.76       | 2 x 8        | 6.0 x 3.0  | 32'-8"      | 44.92  | QC         | 2 x 8        | 4.0 x 2.5  | 36'-8"      | 34.54       | 95.54             | 0.84                      |          |            |                           |        |         |          |            |           |        |         |          |   |                   |
|  |            |        |       |                |                   |            |              |            |             |  |            |              |            |             |             |                   |                           | 0.72     | 2 x 8      | 6.0 x 3.0                 | 32'-8" | 9.17    | QM       | 2 x 8      | 4.0 x 2.5 | 7'-4"  | 6.91    | 95.54    | - |                   |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.



| WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT            |            |                                 |                      |                       |                          |                          |                     |                      |                        | Alternate Elliptical Area<br>sq.in./ft. |                         |                          |                     |                      |                        |                         |                               |
|---|------------|---------------------------------|----------------------|-----------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|---|-------------------------|--------------------------|---------------------|----------------------|------------------------|-------------------------|-------------------------------|
| ASTM C 76<br>DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |                                 |                      |                       | INNER CAGE               |                          |                     |                      |                        |   | OUTER CAGE              |                          |                     |                      |                        |                         |                               |
| Internal Diameter<br>in.                                      | Pipe Class | D-Load<br>0.01"<br>lbs./ft./ft. | Ult.<br>lbs./ft./ft. | Wall Thickness<br>in. | Concrete Strength<br>psi | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. |   | Cage Weight<br>lbs./ft. | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. | Total Cage Weight<br>lbs./ft. |
| 96"   | III        | 1,350                           | 2,000                | C 9 3/4"              | 5,000                    | 0.70                     | 2 x 8               | 12.0 x 5.0           | 26'-0"                 | 70.20                                   | 0.42                    | 2 x 8                    | 7.0 x 3.0           | 30'-0"               | 47.38                  | 117.58                  | -                             |
| 102"  | II         | 1,000                           | 1,500                | B 9 1/2"              | 5,000                    | 0.68                     | 2 x 8               | 11.5 x 5.0           | 28'-0"                 | 72.75                                   | 0.41                    | 2 x 8                    | 7.0 x 3.0           | 31'-4"               | 49.48                  | 122.23                  | -                             |
|   |            |                                 |                      |                       |                          | QC                       | 2 x 8               | 6.0 x 3.0            | 34'-8"                 | 47.68                                   | FC                      | 2 x 8                    | 7.0 x 3.0           | 31'-4"               | 49.48                  | 107.25                  |                               |
|   |            |                                 |                      |                       |                          | QM                       | 2 x 8               | 6.0 x 3.0            | 7'-4"                  | 10.09                                   | FC                      | 2 x 8                    | 7.0 x 3.0           | 31'-4"               | 49.48                  | 107.25                  |                               |
|   |            |                                 |                      | C 10 1/4"             | 5,000                    | 0.62                     | 2 x 8               | 10.5 x 4.5           | 28'-0"                 | 66.33                                   | 0.37                    | 2 x 8                    | 6.5 x 3.0           | 32'-0"               | 47.27                  | 113.60                  | -                             |
|   |            |                                 |                      |                       |                          | QC                       | 2 x 8               | 5.5 x 3.0            | 34'-8"                 | 44.14                                   | FC                      | 2 x 8                    | 6.5 x 3.0           | 32'-0"               | 47.27                  | 100.75                  |                               |
|   |            |                                 |                      |                       |                          | QM                       | 2 x 8               | 5.5 x 3.0            | 7'-4"                  | 9.34                                    | FC                      | 2 x 8                    | 6.5 x 3.0           | 32'-0"               | 47.27                  | 100.75                  |                               |
| 102"  | III        | 1,350                           | 2,000                | B 9 1/2"              | 5,000                    | 0.90                     | (2) 2 x 8           | 7.5 x 3.0            | 28'-0"                 | 94.15                                   | 0.54                    | 2 x 8                    | 9.0 x 4.0           | 31'-4"               | 63.85                  | 158.00                  | -                             |
|   |            |                                 |                      |                       |                          | QC                       | 2 x 8               | 7.5 x 3.0            | 34'-8"                 | 58.28                                   | QC                      | 2 x 8                    | 4.5 x 2.5           | 39'-4"               | 41.07                  | 120.03                  |                               |
|   |            |                                 |                      |                       |                          | QM                       | 2 x 8               | 7.5 x 3.0            | 7'-4"                  | 12.33                                   | QM                      | 2 x 8                    | 4.5 x 2.5           | 8'-0"                | 8.35                   | 120.03                  |                               |
|   |            |                                 |                      | C 10 1/4"             | 5,000                    | 0.83                     | (2) 2 x 8           | 7.0 x 3.0            | 28'-0"                 | 88.44                                   | 0.50                    | 2 x 8                    | 8.5 x 3.5           | 32'-0"               | 61.13                  | 149.57                  | -                             |
|   |            |                                 |                      |                       |                          | QC                       | 2 x 8               | 7.0 x 3.0            | 34'-8"                 | 54.75                                   | QC                      | 2 x 8                    | 4.5 x 2.5           | 40'-0"               | 41.76                  | 116.44                  |                               |
|   |            |                                 |                      |                       |                          | QM                       | 2 x 8               | 7.0 x 3.0            | 7'-4"                  | 11.58                                   | QM                      | 2 x 8                    | 4.5 x 2.5           | 8'-0"                | 8.35                   | 116.44                  |                               |
| 108"  | II         | 1,000                           | 1,500                | B 10"                 | 5,000                    | 0.76                     | (2) 2 x 8           | 6.5 x 3.0            | 29'-4"                 | 86.66                                   | 0.46                    | 2 x 8                    | 8.0 x 3.5           | 33'-4"               | 60.28                  | 146.94                  | -                             |
|   |            |                                 |                      |                       |                          | QC                       | 2 x 8               | 6.5 x 3.0            | 36'-0"                 | 53.18                                   | QC                      | 2 x 8                    | 4.0 x 2.5           | 41'-4"               | 38.94                  | 111.11                  |                               |
|   |            |                                 |                      |                       |                          | QM                       | 2 x 8               | 6.5 x 3.0            | 7'-4"                  | 10.83                                   | QM                      | 2 x 8                    | 4.0 x 2.5           | 8'-8"                | 8.16                   | 111.11                  |                               |
|   |            |                                 |                      | C 10 3/4"             | 5,000                    | 0.70                     | 2 x 8               | 12.0 x 5.0           | 29'-4"                 | 79.20                                   | 0.42                    | 2 x 8                    | 7.0 x 3.0           | 34'-0"               | 53.69                  | 132.89                  | -                             |
|   |            |                                 |                      |                       |                          | QC                       | 2 x 8               | 6.0 x 3.0            | 36'-0"                 | 49.51                                   | FC                      | 2 x 8                    | 7.0 x 3.0           | 34'-0"               | 53.69                  | 113.29                  |                               |
|   |            |                                 |                      |                       |                          | QM                       | 2 x 8               | 6.0 x 3.0            | 7'-4"                  | 10.09                                   | FC                      | 2 x 8                    | 7.0 x 3.0           | 34'-0"               | 53.69                  | 113.29                  |                               |

◆ Allowable alternate design per ASTM C76 Section 12.5.2.

| ASTM C 76  |            |                         |                       |                          |                          |                     |                      |                        |                         | WELDED WIRE REINFORCEMENT - CIRCULAR REINFORCEMENT |                     |                      |                        |                         |                               |   |  |  |  | Alternate Elliptical Area<br>sq.in./ft. |
|--|------------|-------------------------|-----------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|-------------------------|--|---------------------|----------------------|------------------------|-------------------------|-------------------------------|---|--|--|--|---|
| DESIGN REQUIREMENTS FOR REINFORCED CONCRETE PIPE |            |                         |                       |                          | INNER CAGE               |                     |                      |                        |                         | OUTER CAGE   |                     |                      |                        |                         | Total Cage Weight<br>lbs./ft. |   |  |  |  |   |
| Internal Diameter<br>in.                         | Pipe Class | D-Load<br>0.01"<br>Ult. | Wall Thickness<br>in. | Concrete Strength<br>psi | Area Req'd<br>sq.in./ft. | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. | Area Req'd<br>sq.in./ft.                           | Wire Spacing<br>in. | Wire Sizes<br>W or D | Cage Length<br>ft.-in. | Cage Weight<br>lbs./ft. |                               |   |  |  |  |   |
| 108"   | III        | 1,350                   | 2,000                 | B                        | 5,000                    | 1.08                | (2) 2 x 8            | 9.0 x 4.0              | 29'-4"                  | 119.54   | 2 x 8               | 11.0 x 4.5           | 33'-4"                 | 82.36                   | 201.90                        | - |  |  |  |   |
|  |            |                         |                       |                          |                          | QC                  | 2 x 8                | 9.0 x 4.0              | 36'-0"                  | 73.35  | 2 x 8               | 5.5 x 3.0            | 41'-4"                 | 52.63                   | 151.95                        |   |  |  |  |   |
|  |            |                         |                       |                          |                          | QM                  | 2 x 8                | 9.0 x 4.0              | 7'-4"                   | 14.94  | 2 x 8               | 5.5 x 3.0            | 8'-8"                  | 11.03                   |                               |   |  |  |  |   |
|  |            |                         |                       | C                        | 5,000                    | 0.99                | (2) 2 x 8            | 8.5 x 3.5              | 29'-4"                  | 112.08   | 2 x 8               | 10.0 x 4.0           | 34'-0"                 | 76.21                   | 188.29                        | - |  |  |  |   |
|  |            |                         |                       |                          |                          | QC                  | 2 x 8                | 8.5 x 3.5              | 36'-0"                  | 68.77  | 2 x 8               | 5.0 x 3.0            | 42'-0"                 | 49.19                   | 142.12                        |   |  |  |  |   |
|  |            |                         |                       |                          |                          | QM                  | 2 x 8                | 8.5 x 3.5              | 7'-4"                   | 14.01  | 2 x 8               | 5.0 x 3.0            | 8'-8"                  | 10.15                   |                               |   |  |  |  |   |

Key

QC - 450° Quadrant Cage

QM - 90° Quadrant Mat

FC - 360° Full Circular Cage

Note: Where quadrant designs appear below an alternate design identified by a ♦, the quadrant design represents the alternate design.

**APPENDIX A**

**METRIC CONVERSIONS FOR WELDED WIRE REINFORCEMENT**

| CIRCUMFERENTIAL SPACING |        |
|-------------------------|--------|
| English                 | Metric |
| 2"                      | 51 mm  |
| 3"                      | 76 mm  |
| 4"                      | 102 mm |

| TRANSVERSE SPACING |        |
|--------------------|--------|
| English            | Metric |
| 4"                 | 102 mm |
| 6"                 | 152 mm |
| 8"                 | 203 mm |
| 12"                | 305 mm |
| 16"                | 406 mm |

| CIRCUMFERENTIAL WIDTHS |         |
|------------------------|---------|
| English                | Metric  |
| 68"                    | 1727 mm |
| 70"                    | 1778 mm |
| 87"                    | 2210 mm |
| 88"                    | 2235 mm |
| 90"                    | 2286 mm |
| 92"                    | 2337 mm |
| 93"                    | 2362 mm |
| 94"                    | 2388 mm |
| 95"                    | 2413 mm |
| 96"                    | 2438 mm |
| 97"                    | 2464 mm |
| 98"                    | 2489 mm |
| 108"                   | 2743 mm |
| 141"                   | 3581 mm |
| 142"                   | 3607 mm |

**WIRE SIZE DESIGNATION**

| English<br>(sq. in. x 100) | Metric<br>(sq. mm) |
|----------------------------|--------------------|
| W2.0                       | MW13               |
| W2.5                       | MW16               |
| W3.0                       | MW19               |
| W3.5                       | MW23               |
| W4.0                       | MW26               |
| W4.5                       | MW29               |
| W5.0                       | MW32               |
| W5.5                       | MW35               |
| W6.0                       | MW39               |
| W6.5                       | MW42               |
| W7.0                       | MW45               |
| W7.5                       | MW48               |
| W8.0                       | MW52               |
| W8.5                       | MW55               |
| W9.0                       | MW58               |
| W9.5                       | MW61               |
| W10.0                      | MW65               |
| W10.5                      | MW68               |
| W11.0                      | MW71               |
| W11.5                      | MW74               |
| W12.0                      | MW77               |

**ROLL LENGTHS**

| English | Metric  |
|---------|---------|
| 300'    | 91.4 m  |
| 325'    | 99.1 m  |
| 350'    | 106.7 m |
| 375'    | 114.3 m |
| 400'    | 121.9 m |
| 450'    | 137.2 m |
| 500'    | 152.4 m |
| 600'    | 182.9 m |

**CONVERSION FACTORS**

|             |           |               |
|-------------|-----------|---------------|
| inches      | X 25.4    | = mm          |
| W - Number  | X 6.45    | = MW - Number |
| feet        | X 0.3048  | = meters      |
| mm          | X 0.03937 | = inches      |
| MW - Number | X 0.155   | = W - Number  |
| meters      | X 3.28    | = feet        |

EXAMPLE: 2 X 8 - W8.5 X W3.5 94" (+1,+0) X 375' ROLL

... metric conversion using tables above ...

51 X 203 - MW55 X MW23 2388mm (+25,+0) X 114.3 m ROLL

**APPENDIX B**

**WIRE PROPERTIES**

| W or D Number | Nominal Diameter (in.) | Area (sq. in.) | Weight (lb./ft.) |
|---------------|------------------------|----------------|------------------|
| 2.0           | 0.160                  | 0.020          | 0.068            |
| 2.5           | 0.178                  | 0.025          | 0.085            |
| 3.0           | 0.195                  | 0.030          | 0.102            |
| 3.5           | 0.211                  | 0.035          | 0.119            |
| 4.0           | 0.226                  | 0.040          | 0.136            |
| 4.5           | 0.239                  | 0.045          | 0.153            |
| 5.0           | 0.252                  | 0.050          | 0.170            |
| 5.5           | 0.265                  | 0.055          | 0.187            |
| 6.0           | 0.276                  | 0.060          | 0.204            |
| 6.5           | 0.288                  | 0.065          | 0.221            |
| 7.0           | 0.299                  | 0.070          | 0.238            |
| 7.5           | 0.309                  | 0.075          | 0.255            |
| 8.0           | 0.319                  | 0.080          | 0.272            |
| 8.5           | 0.329                  | 0.085          | 0.289            |
| 9.0           | 0.339                  | 0.090          | 0.306            |
| 9.5           | 0.348                  | 0.095          | 0.323            |
| 10.0          | 0.357                  | 0.100          | 0.340            |
| 10.5          | 0.366                  | 0.105          | 0.357            |
| 11.0          | 0.374                  | 0.110          | 0.374            |
| 11.5          | 0.383                  | 0.115          | 0.391            |
| 12.0          | 0.391                  | 0.120          | 0.408            |
| 12.5          | 0.399                  | 0.125          | 0.425            |
| 13.0          | 0.407                  | 0.130          | 0.442            |
| 13.5          | 0.415                  | 0.135          | 0.459            |
| 14.0          | 0.422                  | 0.140          | 0.476            |
| 14.5          | 0.430                  | 0.145          | 0.493            |
| 15.0          | 0.437                  | 0.150          | 0.510            |
| 15.5          | 0.444                  | 0.155          | 0.527            |
| 16.0          | 0.451                  | 0.160          | 0.544            |
| 16.5          | 0.458                  | 0.165          | 0.561            |
| 17.0          | 0.465                  | 0.170          | 0.578            |
| 17.5          | 0.472                  | 0.175          | 0.595            |
| 18.0          | 0.479                  | 0.180          | 0.612            |
| 18.5          | 0.485                  | 0.185          | 0.629            |
| 19.0          | 0.492                  | 0.190          | 0.646            |
| 19.5          | 0.498                  | 0.195          | 0.663            |
| 20.0          | 0.505                  | 0.200          | 0.680            |