

City of West Linn
Public Works Standard Construction Specifications

Table of Contents

DIVISION SEVEN – CONCRETE STRUCTURES TECHNICAL REQUIREMENTS	1
701 CONCRETE STRUCTURES.....	1
701.01 Description.....	1
701.02 Materials.....	1
701.02.01 Portland Cement	1
701.02.02 Aggregates.....	1
701.02.02.01 General	1
701.02.02.02 Sand for Mortar	1
701.02.03 Water.....	1
701.02.04 Admixtures	1
701.02.04.01 Air-Entraining Admixtures	1
701.02.04.02 Water-Reducing, Retarding, and Accelerating Admixtures	1
701.02.05 Curing Materials	1
701.02.06 Joint Materials.....	2
701.02.07 Water Stop	2
701.02.07.01 Plastic.....	2
701.02.07.02 Rubber	2
701.02.07.03 Copper	3
701.03 Construction	3
701.03.01 Mix Design	3
701.03.01.01 Classes of Concrete.....	3
701.03.01.02 Sampling and Testing.....	3
701.03.02 Falsework	3
701.03.03 Forms.....	3
701.03.04 Removal of Falsework and Forms	4
701.03.05 Adverse Weather.....	4
701.03.05.01 Hot Weather	4
701.03.05.02 Cold Weather.....	4
701.03.06 Handling and Placing.....	5
701.03.06.01 General	5
701.03.06.02 Culverts.....	5
701.03.06.03 Girders, Slabs and Columns	5
701.03.06.04 Pumping.....	6
701.03.06.05 Placing Concrete Under Water	6
701.03.07 Construction Joints.....	7
701.03.07.01 General	7
701.03.07.02 Bonding.....	7
701.03.08 Expansion and Fixed Joints and Bearings	7
701.03.08.01 Open Joints	7
701.03.08.02 Filled Joints	7

701.03.08.03	Steel Joints.....	7
701.03.08.04	Water Stops.....	7
701.03.08.05	Bearing Devices.....	7
701.03.08.06	Preformed Elastomeric Joint Seals.....	8
701.03.09	Surface Finishing.....	8
701.03.09.01	Formed Surfaces.....	8
701.03.09.02	Unformed Surfaces.....	9
701.03.10	Curing.....	9
702	REINFORCEMENT	9
702.01	Description.....	9
702.02	Materials.....	9
702.02.01	Bars.....	9
702.02.02	Mats	9
702.02.03	Welded Wire Fabric.....	9
702.02.04	Dowels.....	9
702.02.05	Wire	9
702.02.06	Epoxy Coated Reinforcement.....	9
702.02.07	Supports	10
702.02.08	Certification	10
702.02.09	Identification	10
702.03	Construction	10
702.03.01	Shop Drawings.....	10
702.03.02	Fabrication.....	10
702.03.03	Placing	10
702.03.04	Splicing	11

DIVISION SEVEN – CONCRETE STRUCTURES TECHNICAL REQUIREMENTS

701 CONCRETE STRUCTURES

701.01 DESCRIPTION

This work consists of construction of Portland Cement Concrete (PCC), reinforced or unreinforced, precast, or cast-in-place, which is used in bridges, box culverts, retaining walls and other concrete structures.

Process control sampling and testing shall be the responsibility of the contractor. Testing shall be by a laboratory approved by the Design Engineer. The contractor will provide certification of all test results to the City Engineer.

701.02 MATERIALS

701.02.01 Portland Cement

Portland Cement shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.02.02 Aggregates

701.02.02.01 General

Crushed aggregate shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.02.02.02 Sand for Mortar

Sand for mortar shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.02.03 Water

Water used in mixing PCC shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.02.04 Admixtures

701.02.04.01 Air-Entraining Admixtures

- A. Air-entraining admixtures shall conform to AASHTO M-154.
- B. Chloride content of admixtures used in concrete in contact with embedded metals shall not exceed 0.5%, by weight, of the weight of the admixture.
- C. The admixture shall be able to produce 16% air in a Portland Cement mortar when tested in accordance with AASHTO T-137.

701.02.04.02 Water-Reducing, Retarding, and Accelerating Admixtures

- A. Water reducing, retarding, and accelerating admixtures shall conform to AASHTO M-194.
- B. Chloride content of admixtures used in concrete in contact with embedded details shall not exceed 0.5%, by weight, of the weight of the admixture.

701.02.05 Curing Materials

Curing materials shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.02.06 Joint Materials

All joint materials shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.02.07 Water Stop

701.02.07.01 Plastic

- A. Plastic water stops shall be fabricated with a uniform cross section, free from porosity or other defects, to the nominal dimensions shown on the plans. An equivalent standard shape may be furnished if approved by the Design Engineer.
- B. The material from which the water stop is fabricated shall be a homogeneous, elastomeric, plastic compound of basic polyvinyl chloride and other material. No reclaimed material shall be used. The contractor shall furnish a certificate from the producer showing values for the designated properties. The contractor shall furnish samples, in lengths adequate for testing, as ordered by the City Engineer.
- C. The water stop shall have the properties indicated in the table below.

	ASTM Test Method	Specification
Tensile Strength (psi)	D 412	1800
Elongation %	D 412	350
100% Modulus (psi)	D 412	760
Low Brittle Temperature	D 746	-50°F
Cold Bend Test*		No Failures

*Samples maintained at -70°F for two hours, then bent quickly around a 1/4 in. mandrel to 180°.

701.02.07.02 Rubber

Rubber water stop shall be manufactured to the dimensions shown on the plans in such a manner that the finished product shall have an integral cross section which will be dense, homogeneous, and free from porosity and other imperfections. The water stop shall have the following properties.

- 1. Hardness: The Shore A Durometer hardness shall be 60 to 70 when tested in accordance with ASTM D 2240.
- 2. Elongation: Minimum of 450%
- 3. Tensile strength: Minimum of 3000 psi
- 4. Water absorption: Maximum of 5% by weight after immersion in water for two days at 158°F.
- 5. Tensile strength after aging: The test specimen, after accelerated aging of seven days at 158°F, shall retain not less than 80% of the original tensile strength. The tensile strength of the test specimen, after accelerated aging of 48 hours in oxygen at 158°F and tensile stress of 300 psi, shall be not less than 80% of the original tensile strength.
- 6. Compression set: After 22 hours at 158°F, compression set shall be not more than 30% when tested in accordance with ASTM D 395, Method B.
- 7. Specific gravity: 1.17±0.03.
- 8. Defects: Minor surface defects such as surface peel covering less than 1 sq. in., surface cavities or bumps less than 1/4 in. in longest lateral dimensions and less than 1/16 in. deep will be acceptable.

701.02.07.03 Copper

Sheet copper for water stops or flashings shall meet the requirements of ASTM B 152 for type ETP light cold-rolled, soft-anneal.

701.03 CONSTRUCTION

701.03.01 Mix Design

The contractor shall provide an approved mix design in conformance with the requirements of **Section 205, TYPES AND USE OF MATERIALS**.

701.03.01.01 Classes of Concrete

If the maximum size of aggregate is not included as a part of the class of concrete shown, the contractor shall use 1 in. maximum size aggregate in all precast pre-stressed concrete members, in the stems of post-tensioned box girders and in members where reinforcement spacing is closer than 2 in.

701.03.01.02 Sampling and Testing

The sampling and testing of PCC shall conform to the requirements of **Section 205, TYPES AND USE OF MATERIALS**. Field-cured cylinders shall be cured under the same conditions as the most unfavorable conditions for the portions of the concrete which the cylinders represent.

701.03.02 Falsework

Working drawings and calculations for falsework shall be prepared and submitted in accordance with **Section 104, SCOPE OF WORK** and shall be stamped by an engineer registered to practice in the State of Oregon.

701.03.03 Forms

- A. Forms shall be set and maintained until the concrete is sufficiently hardened. Forms shall be mortar-tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incidental to the construction operations. Forms shall be designed and constructed to prevent warping and the opening of joints and so the finished concrete will conform to the proper final dimensions and contours.
- B. Deck forms for concrete box girder spans shall be supported by the girder stems. Posts or other supports for deck forms will not be permitted to come in contact with the bottom slab of the box girder.
- C. Wood forms for concrete surfaces not subject to backfill shall be made of dressed lumber of uniform thickness, with a form liner of an approved type, and mortar-tight. Wood forms for the interior of cells of box girders may be made with or without a form liner. Shiplap or S4S boards are acceptable provided the forms are mortar-tight. Plywood will be acceptable as a form liner if supported in an approved manner.
- D. Metal ties or anchorages within the forms shall be constructed to permit their removal to a depth of at least 1 in. from the face without injury to the concrete. When ordinary wire ties are permitted, all wires shall be cut back at least 1/4 in. from the face of the concrete upon removal of the form. The cavities shall be filled with cement mortar and the surface left sound, smooth, even, and uniform in color.
- E. For narrow walls and columns, where the bottom of the form is inaccessible, openings near the bottom shall be provided for cleaning out extraneous material before placing the concrete.
- F. All forms shall be treated with an approved release agent before placing the concrete. Material which will adhere to or discolor the concrete shall not be used.

701.03.04 Removal of Falsework and Forms

- A. When field operations are controlled by cylinder tests, forms and shoring for structural slabs or beams shall remain in place until the concrete has reached 75% of the specified 28-day compressive strength. Until that time, the contractor shall not place earth backfill against walls below grade.
- B. When field operations are not controlled by cylinder tests, the following intervals, exclusive of days when the temperature is below 40°F, may be used as a guide for removal of forms and supports.

Part of Structures	Interval
Supports under beams	14 days
Floor slabs	7-14 days
Walls	12-24 hours
Columns	1-7 days
Sides of beams and all other parts	12-24 hours

- C. Methods of form removal likely to cause over-stressing of the concrete shall not be used. Supports shall be removed in a manner that will permit the concrete to uniformly and gradually carry the stresses due to the structure's own weight.
- D. All formwork shall be removed from the cells of concrete box girders to which access is provided, and all formwork except that necessary to support the deck slab shall be removed from the remaining cells of the box girder. All wood formwork and all form supports and braces shall be removed from the interior of structural steel box girders.
- E. The design of the post-tensioned structures is such that the structure is not self-supporting until post-tensioning is complete. The contractor shall consider this in the design, maintenance, and protection of falsework.

701.03.05 Adverse Weather

701.03.05.01 Hot Weather

During hot weather, the contractor shall make all reasonable efforts to maintain the temperature of the concrete below the specified minimum temperature. When concrete temperatures approach 90°F, the City Engineer may require the use of ice or ice water for mixing the concrete and/or require pre-cooling aggregate stockpiles by sprinkling. Mix proportions shall be adjusted so cooling ice or water does not adversely affect the water/cement ratio of the concrete. No concrete with temperatures over 90°F shall be placed.

701.03.05.02 Cold Weather

- A. No concrete shall be placed when the ambient temperature is below 35°F. When directed, the contractor shall enclose the structure in such a way that the concrete and air within the enclosure can be kept above 60°F for a period of seven days after placing the concrete. When enclosures are used to maintain specified temperatures, the contractor shall furnish a 24-hour temperature-recording thermometer to record air temperature within the enclosure.
- B. The contractor shall supply heating equipment and the necessary fuel. When dry heat is used, the contractor shall provide means to maintain the appropriate atmospheric moisture content.
- C. The temperature of the concrete shall be not less than 60°F at the time of placing in the forms. In case of extremely low temperatures, the City Engineer may raise the minimum limiting temperatures for water, aggregates and mixed concrete.

- D. Insulated forms, capable of maintaining the surface of the concrete at no less than 50°F, may be used in lieu of other protection of concrete involving housing and heating. Exposed horizontal surfaces shall be protected and insulated. If the forms do not maintain the proper temperature at the surface of the concrete, auxiliary protection and heat shall be used.

701.03.06 Handling and Placing

701.03.06.01 General

- A. The interior of forms shall be cleaned of all sawdust, chips, and other debris. Struts, stays and braces, serving temporarily to hold the forms in correct shape and alignment prior to the placing of concrete, shall be removed when the concrete placing has reached that elevation.
- B. Concrete shall be placed in horizontal layers not more than 12 in. thick. When less than a complete layer is placed in one operation the pour shall be terminated in a vertical bulkhead. Each layer shall be placed and consolidated before the preceding layer has taken initial set to avoid surfaces of separation between the layers. Concrete shall not be permitted to free-fall through reinforcing steel or from a height of more than 5 ft.
- C. When the placing of concrete is temporarily discontinued, the top surface of the concrete adjacent to forms shall be smoothed with a trowel. After becoming firm enough to retain its form, the concrete shall be cleaned of laitance and other objectionable material to expose sound concrete. Where a feathered edge might be produced at a construction joint, as in the sloped top surface of a wing wall, inset formwork shall be used to produce a blocked out portion in the preceding layer which shall produce an edge thickness of not less than 6 in. in the succeeding layer. Work shall not be discontinued within 18 in. of the top of any face, unless provision has been made for a coping, in which case a construction joint shall be made at the underside of the coping.

701.03.06.02 Culverts

- A. The base slab or footings of box culverts shall be placed and allowed to set before the remainder of the culvert is constructed. Suitable provision shall be made for bonding the sidewalls to the culvert base.
- B. Before concrete is placed in the sidewalls, the culvert footings shall be thoroughly cleaned of all laitance, shavings, sticks, sawdust, or other extraneous material and the surface carefully chipped and roughened.
- C. In the construction of box culverts 4 ft. or less in height, the sidewalls and top slab may be constructed monolithically. When this method of construction is used, construction joints shall be vertical and at right angles to the axis of the culvert.
- D. In the construction of box culverts more than 4 ft. in height, the concrete in the walls shall be placed and allowed to set before the top slab is placed. Keys shall be constructed in the sidewalls for anchoring the cover slab.
- E. Each wing wall shall be constructed monolithically.

701.03.06.03 Girders, Slabs and Columns

- A. Concrete in girders shall be deposited uniformly for the full length of the girder and brought up evenly in horizontal layers, with no lift lines or cold joints.
- B. Concrete pours in columns and abutments or walls shall be stopped at the bottoms of caps, cross beams, girders or any widened portion of the column or wall, and the concrete allowed to obtain its initial shrinkage and settlement before the pour is continued. This delay shall not be less than 12 hours for pours over 4 ft. in height.

- C. Mechanical shear keys shall be formed in all construction joints in columns. Shear keys shall be approximately 2in. in depth, and shall be approximately 1/3 the width of the column in both directions, centered in the column.
- D. Concrete pours in T-beams and box girders shall be stopped at the bottom of the deck or deck fillet and the concrete allowed to obtain full shrinkage and settlement before the pour is continued. The delay shall be not less than 12 hours when the beams or girders are over 4 ft. in height. Similar delays shall be incorporated into concrete pours at the intersection of any structural members where concrete settlement could cause cracking at the intersection. Mechanical shear keys shall be formed between girder stems and slabs, and in vertical construction joints where permitted. The keys shall be spaced along the girder stem as required, but the spacing shall not exceed 1 ft. center to center.
- E. Concrete in the bottom slab of box girder structures shall be poured to the bottoms of beam stems or stem fillets. Before the stems are poured, the bottom slab concrete shall be allowed to cure a minimum of three days at ambient temperatures of 40°F or above, or for at least five days at ambient temperatures below 40°F.
- F. No concrete shall be placed in the superstructure until the column forms have been stripped sufficiently to determine the character of the concrete in the columns. The load of the superstructure shall not be allowed to come upon the bents until they have achieved specified strength.

701.03.06.04 Pumping

- A. Concrete may be placed by pumping provided the contractor and uses equipment capable of placing the concrete as specified. The operation of the pump shall produce a continuous stream of concrete without air pockets. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in a manner that will not cause contamination of the concrete or segregation of the ingredients.
- B. Any additional costs involved in placing concrete by these methods shall be at no expense to the owner.

701.03.06.05 Placing Concrete Under Water

- A. Concrete shall be placed under water only with the approval of the City Engineer.
- B. Concrete placed under water shall be carefully placed in a consolidated mass, in its final position, by means of a tremie or by pumping and shall not be disturbed after being deposited. Still water shall be maintained at the point of placement.
- C. Concrete seals shall be maintained continuously from start to finish and the surface of the concrete shall be kept horizontal at all times. To ensure thorough bonding, each succeeding layer of a seal shall be placed before the preceding layer has taken initial set. The concrete in seals shall be poured at a minimum rate of 50 cu. yd. per hour.
- D. A tremie shall consist of a tube, having a minimum diameter of 10 in., of sufficient length to reach from the bottom of the excavation to the concrete placing elevation above the water line. The tremie shall have an attached receptacle or hopper for receiving concrete. A jointed tremie will be permitted, provided the joints are flanged and gasketed and are watertight. The tremie shall be supported to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete.
- E. At the start of the work and on any withdrawal of the pipe for moving to a new location, the discharge end shall be closed to prevent water from entering the pipe. During the progress of the work the pipe shall be entirely sealed at all times and kept full of concrete to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly

raising the discharge end, always keeping it in the deposited concrete. The placing of concrete shall be continuous until the work is completed.

701.03.07 Construction Joints

701.03.07.01 General

At construction joints, shear keys or inclined reinforcement shall be used where necessary to transmit shear or to bond the two sections together.

701.03.07.02 Bonding

A. Before depositing new concrete on or against concrete which has hardened, the forms shall be retightened. The surface of the hardened concrete shall be roughened in a manner that will not leave loosened particles or aggregate or damaged concrete at the surface. The surface shall be thoroughly cleaned of foreign matter and laitance and saturated with water. The cleaned and saturated surfaces shall be thoroughly covered with a coating of mortar or cement grout. The new concrete shall be placed before the grout coating has attained an initial set.

B. The placing of concrete shall be continuous from joint to joint.

701.03.08 Expansion and Fixed Joints and Bearings

701.03.08.01 Open Joints

Open joints shall be constructed with the use of a removable template of approved material. The template shall be removed without chipping or breaking the corners of the concrete. Reinforcement shall not extend across an open joint.

701.03.08.02 Filled Joints

Poured expansion joints shall be constructed similar to open joints. Pre-molded filler shall be placed in position inside the form as the concrete on the first side of the joint is placed. When the form is removed, the concrete on the other side of the pre-molded filler shall be placed. Expansion joints with wood, impregnated tar, or any other material filler are not allowed in sidewalks, approaches, or curb in the right-of-way.

701.03.08.03 Steel Joints

The plates, angles or other structural shapes shall be shop fabricated to conform to the section of the concrete deck. Care shall be taken to ensure that the surface of the steel joint in the finished plane is true and free of warping. The joints shall be secured in a manner to keep them in the correct position during the placing of the concrete. The opening at expansion joints at normal temperature shall be as shown, and care shall be taken to avoid impairment of the clearance in any manner.

701.03.08.04 Water Stops

Water stops shall be spliced, welded or soldered to form continuous watertight joints. Where movement at the joint is provided for, the water stops shall be designed to permit such movement without damage to the water stop or the joint.

701.03.08.05 Bearing Devices

Bearing devices shall be set in plastic concrete or grout to ensure uniform bearing. Rockers and other expansion devices shall be set in the proper position for the temperature at the time of erection.

701.03.08.06 *Preformed Elastomeric Joint Seals*

- A. Preformed elastomeric joint seals shall be in the longest practicable lengths for longitudinal joints. In transverse joints, one factory splice will be permitted where the required length of material in any one joint exceeds manufactures' standard lengths. Splices shall be true and smooth on the outside surfaces with no offsets of abutting sections and with complete bond on all abutting surfaces. Joints shall be clean, dry and free of spalls and irregularities which would impair a tight seal in service. Seals shall be placed in the joint under compression, as recommended by the manufacturer, using a lubricant-adhesive applied to both sides of the seal just prior to installation.
- B. The seal shall contact the walls of the joint throughout the length of the seal. The seal shall be removed and reinstalled when the longitudinal elongation of the seal is 3% or more from the original length.
- C. All lubricant-adhesive which comes upon the top of an installed seal shall be removed before it dries. Seals with twist, curls, nicks or other malformations shall be removed and replaced. Prior to installation, the ends of seals shall be plugged with a watertight plug. The plug shall be foam rubber or other acceptable closed cell cellular material that is compressible to 15% of the uncompressed thickness. The plug shall be a minimum of 2 in. in length and shall be secured in the elastomeric joint seal with an adhesive that will ensure a watertight plug.

701.03.09 *Surface Finishing*

701.03.09.01 *Formed Surfaces*

- A. All concrete surfaces, except for roadways and sidewalks, shall receive a general surface finish. The finish shall extend to a point 1 ft. below any adjoining ground surface. Class 1, 2, or 3 finishes, if required, shall be applied to all exposed concrete surfaces except the underside of decks and between girders.
- B. Surface finishes shall meet the following requirements:
 - 1. General surface finish - General surface finish shall consist of filling all depressions resulting from removal of form ties and repairing all rock pockets. All form bolts and any metal placed for the convenience of the contractor shall be removed to a depth of 1 in. below the surface of the concrete. All rock pockets and other unsound concrete shall be removed and the resulting holes or depressions filled with mortar. When rock pockets affect the strength of the structure or endanger the life of the reinforcement, the concrete shall be removed and replaced. For exterior surfaces where only a Class 1 finish is required, white cement shall be added to the mortar to tint the mortar to match the concrete being repaired.
 - 2. Class 1 surface finish (unpainted) - Class 1 surface finish shall consist of all work required for general surface finish, plus removal of bulges, fins, depressions, stains, discolorations, and other imperfections to produce a smooth, even surface of uniform texture and appearance.
 - 3. Class 2 surface finish (ground and painted) - After completion of the General and Class 1 surface finish the surface shall be ground with a power grinder, or other approved method, to remove laitance and surface film which may impair adherence of the paint. The unpainted surface shall then be thoroughly saturated with water and painted while damp with a latex emulsion paint. A minimum of two coats of paint shall be applied, with additional coat as necessary to provide uniformity in coverage and appearance.
 - 4. Class 3 surface finish (ground, floated, and painted) - After completion of the General and Class 1 surface finish, the surface shall be thoroughly ground with a power grinder or other approved method to remove all laitance and surface film resulting from form treatment. The surface shall then be finished by floating with a suitable float using a paste of fine sand and cement to fill all air holes and voids and bring the surface to a smooth and uniform texture. The surface shall be kept damp until the finish has set so that dusting will not occur when the surface is rubbed. After

the paste has set for a least 24 hours, the surface shall be thoroughly saturated with water and, while damp, painted with a latex emulsion paint. A minimum of two coats of paint shall be applied with additional coats as necessary to provide uniform coverage and appearance.

701.03.09.02 *Unformed Surfaces*

Unformed surfaces shall be finished in conformance with **Section 505, ASPHALT CONCRETE PAVEMENT** and **Section 506, PORTLAND CEMENT CONCRETE PAVEMENT**.

701.03.10 *Curing*

- A. Concrete surfaces shall be cured by covering with burlap, canvas, sand, or other satisfactory material. The covering shall be placed as soon as the concrete has hardened sufficiently to support the covering without damage to the concrete surface. The cover shall be kept continuously moist for a minimum of seven days. The type of covering provided shall be that which is best suited to the conditions.
- B. When coverings are not necessary, the surfaces shall be kept continuously moist by flushing or sprinkling. The sprinkling system shall be arranged to keep the outside of all forms damp for a period of seven days after the placing of concrete.
- C. Slab concrete exposed to conditions causing premature drying during pouring operations shall be protected by providing wind breaks, fog spray, or by other methods approved by the City Engineer.

702 REINFORCEMENT

702.01 *DESCRIPTION*

This work consists of furnishing and placing of metal reinforcement and accessories.

702.02 *MATERIALS*

702.02.01 *Bars*

Bars shall be deformed and fabricated from billet steel conforming to the requirements of ASTM A 615, rail steel conforming to the requirements of ASTM A 616, or axle steel conforming to the requirements of ASTM A 617. All bars in reinforced concrete pavement shall be Grade 60.

702.02.02 *Mats*

Steel for bar or rod mats shall conform to the requirements of ASTM A 184.

702.02.03 *Welded Wire Fabric*

Welded wire fabric shall conform to the requirements of AASHTO M-55.

702.02.04 *Dowels*

Dowels shall conform to the requirements of AASHTO M-227, Grade 70.

702.02.05 *Wire*

Wire shall conform to the requirements of AASHTO M-32.

702.02.06 *Epoxy Coated Reinforcement*

Epoxy coated reinforcement shall conform to the requirements of AASHTO M-284 and the following:

1. Visible voids in the coating, regardless of cause, shall be patched if the total area of voids exceeds 0.25% of the surface area of the bar. Bars which require patching in excess of 5% of the total surface area of the bar will be rejected.
2. Systems for handling coated bars shall have padded contact area for the bars. All bundling bands shall be padded and all bundles shall be lifted with strong back multiple supports or a platform bridge to prevent bar-to-bar abrasion from sags in the bar bundle.
3. Coated steel shall be tied and supported with nonmetallic coated ties and supports.

702.02.07 Supports

Bar supports and their placement shall conform to Chapter 3 of the CRSI "Manual of Standard Practice". Bar supports in areas exposed to view after stripping shall be of galvanized or plastic coated steel, or of concrete, as approved by the City Engineer.

702.02.08 Certification

Certification of bar reinforcement will identify the reinforcement by heat number.

The certification shall also contain the weight, number of pieces and dimensions of each size of material of each heat number shipped, the project identification, and the date of shipment. If a color code is used for identification, the heat number and color combinations shall also be shown.

702.02.09 Identification

Each piece of bar reinforcement shall be identified so the City Engineer can determine the heat number prior to use in the work. Reinforcement shall be tagged and marked in accordance with the CRSI "Manual of Standard Practice".

702.03 CONSTRUCTION

702.03.01 Shop Drawings

Shop drawings shall be submitted in accordance with the requirements of **Section 104, SCOPE OF WORK**. Shop drawings details for bar reinforcement shall conform to Chapter 6 of the CRSI "Manual of Standard Practice". Shop drawing details for welded wire fabric shall conform to Chapter 2 of the same manual.

702.03.02 Fabrication

Fabrication shall conform to Chapter 7 of the CRSI "Manual of Standard Practice".

702.03.03 Placing

- A. Reinforcement shall be accurately placed in the positions shown on the plans and maintained in position during the placing of concrete. Bars in top mats of footings and deck slabs shall be tied at all intersections. All other bars shall be tied at all intersections except where spacing is less than 1 ft. in each direction when alternate intersections shall be tied.
- B. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers, or other approved supports. Blocks for holding reinforcement from contact with the forms shall be precast mortar blocks of approved shape and dimensions and shall have the same compressive strength as the concrete in which they are placed.
- C. Layers of bars shall be separated by precast mortar blocks or by other approved devices. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks will not be permitted.
- D. The placing of bar reinforcement shall conform to the requirements of Chapter 8 of the CRSI "Manual of Standard Practice".

- E. Reinforcement in any member shall be inspected and approved by the City Engineer before the placing of concrete begins. Concrete placed in violation of this provision may be rejected.

702.03.04 *Splicing*

Splicing shall conform to the requirements of the CRSI “Manual of Standard Practice”.