BASIS OF ACCEPTANCE. Acceptance of this material will be based on the manufacturer’s name appearing on the Department’s Approved List and in accordance with the procedural directives of the Materials Bureau.

SECTION 717 - CONCRETE PROTECTIVE COATINGS

717-01 EPOXY RESIN PROTECTIVE COATING

SCOPE. This specification covers the material requirements of a two component, pigmented epoxy resin protective coating system used for the environmental protection of Portland cement concrete and other materials. This material should not be applied at temperatures above 35°C or below 5°C.

GENERAL. The epoxy resin protective coating system shall be a two component, flexibilized, solvent-free, thermosetting system consisting of a modified epoxy resin, Component A, and a curing agent, Component B.

MATERIAL REQUIREMENTS

Characteristics of Component A. Component A shall be based on a high grade epoxy resin such as obtained from the condensation of Bisphenol A and Epichlorohydrin having the following characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, Pas @ 23±2°C</td>
<td>Brookfield Model RV No. 5/20 RPM</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Density @ 23±2°C, kg/L</td>
<td>ASTM D1475</td>
<td>1.45</td>
<td>---</td>
</tr>
<tr>
<td>Filler and pigment, Percent</td>
<td>By Ignition</td>
<td>---</td>
<td>40</td>
</tr>
</tbody>
</table>

Pigment filler shall be light-fast, durable and resistant to alkali.

Characteristics of Component B. Component B shall have the following characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, Pas @ 23±2°C</td>
<td>Brookfield Model RV No. 1/20 RPM</td>
<td>0.05</td>
<td>---</td>
</tr>
<tr>
<td>Density @ 23±2°C, kg/L</td>
<td>ASTM D1475</td>
<td>0.83</td>
<td>---</td>
</tr>
</tbody>
</table>

Characteristics of the Mixture. The mixture of Components A & B shall have the characteristics as identified in Table 717-01-3.

PACKAGING. All materials furnished must be shipped in strong, substantial containers. The containers shall be identified as “Part A — contains epoxy resin,” and “Part B — contains curing agent,” and shall be plainly marked with the following:

- N.Y.S.D.O.T. materials specification number
- Name of product
- Mixing proportions and instructions
- Name and address of the manufacturer
- Lot number and batch number
- Date of manufacture
- Quantity
- Date of expiration of acceptance.
§717-01

<table>
<thead>
<tr>
<th>TABLE 717-01-3 EPOXY RESIN MIXTURE REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Viscosity, Pa*s @ 23±2°C</td>
</tr>
<tr>
<td>Pot Life, minutes @ 23±2°C</td>
</tr>
<tr>
<td>Initial Cure, hrs. @ 23±2°C</td>
</tr>
<tr>
<td>Shore D Hardness, @ 23±2°C after 7 days</td>
</tr>
<tr>
<td>Color—Gray</td>
</tr>
<tr>
<td>Color Fastness</td>
</tr>
<tr>
<td>Shelf Life in Months</td>
</tr>
</tbody>
</table>

**SAMPLING.** Material shall be sampled and inspected at the place of manufacture or in warehouse lots as determined by the Department. Samples submitted to the Materials Bureau shall be taken as directed by the Department.

**TESTING.**

**Viscosity.** The viscosity of the mixture of components A & B shall be taken 20 minutes after the components are mixed and within 15-20 seconds of the time the viscometer is started. This material shall then be used to fill the lid of a 355 ML ointment can approximately two-thirds full. This specimen shall be used to determine the tack-free time for initial cure requirement.

**Initial Cure.** The initial cure shall be considered that time at which a mixture of components A & B as prepared under viscosity above shall be tack-free to touch.

**Pot Life.** The pot life is determined as follows: Samples of each resinous cement component are conditioned at 23±2°C. When the samples have reached 23±2°C, 60±0.4 g total of components A and B in the proportions recommended by the manufacturer are weighed into an unwaxed paper cup. The time is recorded and they are immediately mixed, stirring for three minutes with a wooden tongue depressor, taking care to periodically scrape the walls and bottom of the cup and the mixer. The sample is then poured into an unwaxed paper cup, set on a bench top, and probed every two minutes with a small stick, starting twenty minutes from the time of mixing. The time at which a soft ball forms in the center of the container is recorded as the pot life. This specimen shall be retained and used for the determination of the Shore D hardness.

**Shore D Hardness.** The hardness test shall be performed on the specimen retained from Pot Life above.

**Color Fastness.** The test for color fastness of the cured epoxy shall be conducted as follows:

Cast two, 90 mm diameter, buttons following the manufacturer's instructions for mixing the epoxy components. Allow each button to cure for 72±2 hours at laboratory temperature in a dark chamber away from sources of ultraviolet light. Designate one button as the color control button and retain it in the dark chamber. Subject the other button to 16 hours total exposure time (20 minute cycle) in the Atlas Ci 35A.

**Weatherometer.** Each cycle, continuously repeating, starts with 17 minutes of light followed by 3 minutes of light and water spray. Remove the test button and compare the color of the exposed area to Federal Standard 595, colors 16314 through 16492, and to the color of the control button. The color of the test button shall not differ appreciably from the color of the control button and shall fall within the color range 16314 through 16492, inclusive, defined by Federal Standard 595.

**BASIS OF ACCEPTANCE.** This material will be considered for acceptance in stock lot quantities at manufacture or supply locations in accordance with procedural directives of the Materials Bureau. The expiration date of acceptance of this material shall be twelve months after the date of manufacture. Any
unauthorized tampering or breaking of the seals on the containers between the time of sampling and delivery to the jobsite will be cause for rejection of the material.

717-02 (VACANT)

717-03 PENETRATING TYPE PROTECTIVE SEALERS

SCOPE. This specification covers the material requirements of penetrating type protective sealers for use on portland cement concrete.

GENERAL. The material shall be a one component material consisting of a penetrating sealer which does not alter the color or texture of portland cement concrete.

MATERIAL REQUIREMENTS. Penetrating sealers shall be a one-part liquid, composed of a minimum of 40 percent (40%) silane or siloxane material, with no petroleum distillates. The Department will test the sealers as delivered, in accordance with Department written instructions, to ensure that the following properties are attainable. If the material attains these properties, the Department will place the material on its Approved List. The properties are:

Water Absorption. The final average percent water absorbed, for concrete coated with the protective sealer, shall not be greater than 20.0% of the final average percent water absorbed by the uncoated reference concrete.

Moisture Vapor Transmission. The final average percent moisture loss, for concrete coated with the protective sealer, shall not be less than 75.0% of its final average percent water absorption.

Chloride Ion Penetration. The final average absorbed chloride ion content, for concrete coated with the protective sealer, shall not be greater than 15.0% of the final average absorbed chloride ion content of the uncoated reference concrete.

Durability. The protective sealer shall not show any signs of weathering, discoloration, or deterioration after six (6) months of exposure to atmospheric conditions.

PACKAGING. All materials shall be packaged in strong, substantial containers. Each container shall be plainly marked with the following information: name of the product; name and address of Manufacturer; application instructions; lot/batch number; date of manufacture; quantity of material; and date of expiration or shelf life. The printed shelf life shall not exceed one year from the date of manufacture.

BASIS OF ACCEPTANCE. Acceptance of penetrating type sealers will be based upon the product appearing on the Department's Approved List, and the Manufacturer's certification that the material meets the requirements of this section. The shelf life of this material shall not exceed one year from the date of manufacture printed on the product label. The Department reserves the right to sample and test the material at its discretion.

717-04 COATING TYPE PROTECTIVE SEALERS

SCOPE. This specification covers the material requirements of coating type protective sealers for use on portland cement concrete.

GENERAL. The coating system shall be either a single coating material or a primer coat followed by a top coat. After application, the sealer shall be opaque and uniform in color.

MATERIAL REQUIREMENTS. The Department will test the sealers as delivered, in accordance with Department written instructions, to ensure that the following properties are attainable. If the material attains these properties, the Department will place the material on its Approved List. The properties are:
§717-04

Water Absorption. The final average percent water absorbed, for concrete coated with the protective sealer, shall not be greater than 25.0% of the final average percent water absorbed by the uncoated reference concrete.

Moisture Vapor Transmission. The final average percent moisture loss, for concrete coated with the protective sealer, shall not be less than 50.0% of its final average percent water absorption.

Chloride Ion Penetration. The final average absorbed chloride ion content, for concrete coated with the protective sealer, shall not be greater than 25.0% of the final average absorbed chloride ion content of the uncoated reference concrete.

Durability. The protective sealer shall not show any signs of weathering, discoloration, or deterioration after six (6) months of exposure to atmospheric conditions.

PACKAGING. All materials shall be packaged in strong, substantial containers. Each container shall be plainly marked with the following information: name of the product; name and address of Manufacturer; mix proportions (if applicable) and application instructions; lot/batch number; date of manufacture; quantity of material; and date of expiration or shelf life. The printed shelf life shall not exceed one year from the date of manufacture.

BASIS OF ACCEPTANCE. Acceptance of coating type sealers will be based upon the product appearing on the Department’s Approved List, and the Manufacturer’s certification that the material meets the requirements of this section. The shelf life of this material shall not exceed one year from the date of manufacture printed on the product label. The Department reserves the right to sample and test the material at its discretion.

SECTION 718 - PRESTRESSED CONCRETE UNITS

718-01 PRESTRESSED CONCRETE UNITS (STRUCTURAL)

SCOPE. This specification covers the material and fabrication requirements for prestressed concrete units.

GENERAL. Prestressed concrete units provided under this specification shall meet all design requirements for the structure for which they are being fabricated.

MATERIAL REQUIREMENTS

Concrete. The concrete shall meet the requirements of §501-2, under 501, Portland Cement Concrete, General, with the following modifications:

- Cement shall be either Type 1, Type 2 or Type 3. Only one type of cement shall be used to fabricate units for any one structure
- Coarse aggregate gradation shall be No. 1 Size or ASTM D448, No. 67
- Concrete requirements for Classes A and C concrete shall not apply
- Air content shall be 7 percent ± 2 percent
- The use of calcium chloride, or an admixture containing calcium chloride will not be permitted.

Steel

- Bar Reinforcement 709-01 or 709-03
- Wire Fabric 709-02
- Chairs or other devices to ensure proper placement of steel items 556-2.02
- Prestressing steel 709-06
- Bearing plates, if required 715-01
Epoxy. Epoxy shall meet the requirements of §721-01, Epoxy Resin System; §721-03, Epoxy Polysulfide Grout, or §721-05, Epoxy Repair Paste.

Fine Aggregate. Fine aggregate shall meet the requirements of §703-03, Mortar Sand or §703-04, Grout Sand. Fine aggregate shall be absolutely dry.

DRAWINGS

Contract Drawings. Drawings which accompany the contract proposal are designated as contract drawings. These drawings are not intended to be working drawings.

Working Drawings. Complete and accurate drawings shall be made by the Contractor, indicating how each prestressed concrete unit is to be fabricated. The Contractor shall be responsible for modifying the dimensions of units to compensate for elastic shortening, shrinkage, grade correction and other phenomena that make in-process fabricating dimensions different from those shown on the contract drawings. Approval of the working drawings by the D.C.E.S. shall not relieve the Contractor from the responsibility for the correctness of all dimensions shown on these drawings. These drawings shall be made as soon as possible after the award of contract and they shall be designated as working drawings.

A. Size and Type. Working Drawings shall be neatly drawn and clearly legible to produce microfilm negatives. The drawings shall be made in ink, or reproduced from the pencil drawings by a process subject to the approval of the D.C.E.S., on tracing cloth or mylar of acceptable quality. Working drawings shall be cut to a standard size of 560 mm x 860 mm (nominal) and arranged to conform to the contract drawings.

Failure to submit working drawings of the required size will be cause for their return without examination. The margin line shall be drawn 13 mm from the top, bottom, and right-hand edges and 50 mm from the left-hand edge to permit binding. A space 75 mm x 280 mm, and parallel to the length of the sheet shall be reserved in the lower right-hand corner for title and approval signature. Each working drawing shall have an identical (top right) corner box to the one shown on the contract drawings. The sheets shall be arranged so that, as far as possible, the notes will appear above each other near the right edge of the sheet.

B. Information Required on Working Drawings. The working drawings shall include the following information:

- Plan layout of superstructure indicating the piece mark assigned to each prestressed unit
- Fabricating plant production schedule
- Description of the fabricating plant, including any backup concrete mixing facilities, original design mix and proposed method of placement. Modifications or deviations from the original mix at any time after the working drawings have been approved, shall be submitted, in writing to the D.C.E.S.
- Proposed admixture to be added to the concrete mix
- Quality control tests and procedures
- Method and outline of unit and cylinder curing procedure, as required by “Curing"
- The name of the manufacturer of the prestressing steel, including any alternate source
- Material and manner of sealing the exposed portions of the prestressing steel
- Transfer of prestress procedure for all unit types to be fabricated
- Complete details, including anticipated camber, tensioning force (initial and final), concrete strength (transfer and 28 day), and type and location of lifting device for all prestressed concrete units to be fabricated.
- Proposed method of handling and transporting prestressed concrete units to the project site
- Working drawings shall clearly indicate any proposed deviations from the prestressed concrete unit shown on the contract drawings
- Winter concreting procedures, if need is anticipated.
§718-01

Submission of Working Drawings. When the working drawings, prepared by the Contractor, as specified, are completed, check prints shall be submitted to the D.C.E.S., who will indicate thereon such corrections as may be necessary to secure the completion of the contract in accordance with the requirements of the contract documents. The Contractor shall submit three sets of check prints for the D.C.E.S. and two additional sets of check prints for each Railroad or other Agency involved with the contract. All sets of check prints shall be submitted to the D.C.E.S., who will make the distribution to the Railroad and other Agencies involved. One set of check prints or sepias with desired corrections indicated thereon in colored crayon or pencil, will be returned to the Contractor. When the revisions have been completed to the satisfaction of the D.C.E.S., the original drawings shall be forwarded to the D.C.E.S. for written approval, after which a set of approved drawings will be returned. The original drawings shall remain the property of the State.

The D.C.E.S. shall be allowed two work days for the examination of each drawing in a set of working drawings, or ten work days minimum per set. A set of working drawings shall be considered to be all drawings received by the D.C.E.S. from any given Contractor for a particular contract on any calendar day. If the working drawings are detained for examination for a period longer than that previously stated, such detention will be taken into account when considering application by the Contractor for an extension of time for the completion of the contract. All working drawings are time and date stamped as they are received and recorded in a log at the office of the D.C.E.S. This log shall be the basis for determining when drawings must be returned without consideration for an adjustment of the completion date as described herein.

Approval of working drawings shall not constitute approval for the following information required on the working drawings 2B(3) and 2B(7). This data is required for information only.

FABRICATION

Approval of Working Drawings. No fabrication shall be started until after the working drawings have been approved and the Inspector has received prints made from the original drawings.

Data Required with Working Drawings. Data required by the D.C.E.S. prior to approval of the working drawings shall be as follows:

- Calculations of strand elongation for each unique casting length (grip-to-grip)
- A calibration certificate indicating the load calibration of each gage and hydraulic jack combination used for tensioning. The gage shall be calibrated from zero, throughout its entire load range. The gage shall have clearly marked divisions that are easily readable at the initial and final tensioning force. The calibration date of each combination gage and hydraulic jack shall be within the 12 month period immediately prior to the start of the work.
- A calibration certificate attesting to the fact that the concrete cylinder testing machine to be used has been calibrated within the 12 month period immediately prior to the first date of actual use of the machine.

Data for Inspector. Data required to be submitted to the Inspector for approval prior to the inclusion of the respective materials in the unit, shall be as follows:

A. Prestressing Steel Certification. A certificate from the prestressing steel manufacturer stating that the prestressing steel has been manufactured in accordance with §709-06.

B. Load-Strain Curves. Typical load-strain curves made during the processing of steel from which the elongation appropriate to the required prestressing force can be determined, including the following information:
- The breaking strength
- The elongation at rupture
- The load at one percent elongation
- The test dates

7-196 NEW YORK STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS of January 2, 2002
The aforesaid information shall be submitted to the Inspector, in triplicate, for each 20 metric ton lot, or fraction thereof, of prestressing steel.

**C. Other Certifications.** Certificates indicating acceptance of bar reinforcement, concrete materials and any other material used in the prestressed concrete unit.

**Inspection.** Fabrication of units shall be inspected by an Inspector designated by the State. The Contractor shall inform the State 72 hours prior to:
- Commencement of work
- Commencement of work after a work suspension of 48 hours or more
- Unit shipping

The Contractor shall keep the Inspector informed of the day-to-day scheduling of operations. The Inspector shall have free access throughout the fabrication plant to see that the work being done is in conformance with the contract documents. Work done while the Inspector has been refused access shall be automatically rejected. The Inspector shall be present when necessary tests are made on the prestressing steel at the place of manufacture.

**Concrete Forms**

**A. General.** Forms shall be well-constructed, carefully aligned, clean, substantial and firm, securely braced and fastened together and sufficiently tight to prevent leakage of mortar. They shall be strong enough to withstand the action of mechanical vibrators. All forms for each unit shall be approved by the Inspector prior to placing concrete.

All form surfaces that come in contact with the concrete shall be thoroughly treated with an approved form coating in the manner and at the rate specified by the manufacturer. Forms so treated shall be protected against damage and dirt prior to placing concrete.

Any form coating material that will stick to or discolor concrete shall not be used.

**B. Void-Producing Forms.** Void forms shall be coated with a waterproofing material on the outside and shall have a 20 mm (nominal) diameter drain placed at each end of each void.

When units are steam-cured, all voids shall be vented.

**Reinforcement and Prestressing Steel.** Prior to installation in the units, reinforcement and prestressing steel shall be free of frost, dirt, oil, paint, mill scale, corrosion, or any foreign material that may prevent bond between the steel and the concrete.

Tack welding of bar reinforcement shall not be allowed under any circumstances.

Welded wire fabric, smooth or deformed, may be substituted for the required bar reinforcement provided that:
- The required cover is maintained
- The design steel area of the fabric equals that of the bar reinforcement
- Splices to the fabric are made in accordance with the requirements of the N.Y.S.D.O.T. Standard Specifications for Highway Bridges, §1.5.22D and §1.5.22E as applicable.

If wire fabric is used, the details shall be indicated on the working drawings. Design computations shall also be included.

**Tensioning of Prestressing Strands.** A calibrated force of 13.0 kN shall be applied initially to each strand. Consideration will be given by the D.C.E.S. to a different initial force for special cases. This force shall be the starting point for additional tensioning by elongation.

For draped strands, the additional tensioning or prestressing force induced in the prestressing steel shall be measured by jacking gages and by elongation of the steel. The jacking gages shall read within 5 percent of the force theoretically calculated to be induced by elongation.
For straight strands, elongation only shall determine the prestressing force.

During tensioning of any one strand, the process shall be so conducted that the applied load and the elongation of the strand may be measured at all times.

Two copies of recorded gage pressures and measured elongations, as required for the tensioning of prestressing strands in each unit, shall be submitted to the Inspector.

The use of load cells or other tension measuring devices may be required. They shall be furnished by the Inspector and used in accordance with his/her instructions.

**Concrete Mix Design and Proportioning.** The Contractor shall be responsible for designing a concrete mix to produce the strength and other requirements specified on the contract plans. If no strength is indicated, the required minimum strength shall be 28 MPa at transfer and 35 MPa at 28 days. Maximum cement content for any proposed mix shall be 445 kg/m³. Proposed mixes shall be submitted in accordance with the requirements of Drawings, Paragraph 2B(3). Automatic proportioning equipment will not be required.

The Contractor may request permission from the D.C.E.S. to incorporate a High Range Water Reducing (HRWR) admixture into the concrete mix. The D.C.E.S. will grant such permission only if deemed to be in the best interests of the State and then only under such conditions as the D.C.E.S. requires.

**Placing Concrete.** No concrete shall be placed without the Inspector's approval. Compliance with the precasting tolerances is a prerequisite for casting approval by the Inspector.

When the atmospheric temperature is below 4°C, the fabrication of the units shall be in accordance with the winter concrete procedures as approved on the working drawings.

Suitable means shall be used for placing concrete without segregation. The concrete mixture shall not be dropped from a height greater than 300 mm above the top of the forms. Special care shall be taken to deposit the concrete in its final position in each part of the form.

The plastic concrete shall be consolidated in place by either external or internal vibration methods, or both, if necessary. The vibrators shall be of a type and design approved by the Inspector and the size of the vibrating head will be governed by the spacing of the prestressing steel and reinforcement. Vibrators shall be used only to consolidate the concrete after it has been properly placed.

The internal vibrator shall be slowly inserted and removed from the concrete.

The following quality control tests shall be performed, by the Contractor in the presence of the Inspector from the same concrete sample as that used for the Concrete Strength Requirements of this specification:

- Slump
- Air content
- Temperature
- Unit mass.

**Finishing.** To assure production of well-formed matching beams with overall pleasing appearance, all surfaces of concrete shall be true and even, free from rough, open or honeycombed areas, depressions or projections. After all the concrete has been placed and thoroughly compacted as required under Placing Concrete, the tops of units shall be magnesium-float finished, or finished as shown on the Working Drawings. If required, all exposed surfaces shall be finished by bagging.

All exposed reinforcement shall be coated with neat cement paste prior to placement in the storage area.

**Curing.** The Contractor shall indicate on the working drawings, for approval, the method of cure and complete outline of the proposed procedure under each of the phases of the curing cycle. The full curing cycle consists of an Initial Curing Phase and Final Curing Phase. The Contractor may choose any one of the following acceptable curing methods, however only one curing method will be allowed for the units of a single structure.

To ensure complete hydration of cement, and to prevent the formation of cracks, moisture must be retained within the concrete. Therefore, immediately upon the completion of concrete placement for each unit, an enclosure shall be placed over the casting bed. The Contractor shall submit all covers for inspection prior to the commencement of work.
§718-01

A. Accelerated Cures. Acceptable methods for accelerated cures are by application of low pressure steam or by application of radiant heat and moisture.

1. Initial Curing Phase. The initial curing phase for each unit shall be that period beginning from the time each unit is completely covered and continuing until the final curing phase commences. The Contractor shall indicate the duration of the initial curing phase for each unit. However, the initial curing phase shall not exceed eight hours. During this phase, the enclosure temperature shall be maintained at approximately the concrete placing temperature; artificial heat shall be applied if necessary.

2. Final Curing Phase. The final curing phase for each unit shall be that period required to raise the initial curing phase temperature to the selected temperature range at a rate not exceeding 30°C per hour and continuing until the concrete has attained the minimum transfer strength as noted on the contract plans or as noted in this specification, under the paragraph Concrete Mix Design and Proportioning, whichever is applicable.

The selected curing temperature range shall be as approved on the working drawings.

B. Non-Accelerated Cure. The acceptable method of non-accelerated cure is by the application of a saturated cover.

1. Initial Curing Phase. The requirements of A1 above, shall apply.

2. Final Curing Phase. The final curing phase may begin at anytime after commencement of the initial curing phase. Each unit shall be covered with heavy, water saturated burlap, or other material acceptable to the Inspector. The burlap shall be kept saturated, and the concrete surface temperature shall not drop below 20°C. These conditions shall be maintained until either of the following has occurred:

   a. Seventy-two hours have passed from the time of burlap placement; or

   b. Minimum transfer strength has been reached.

Record of Curing Time - Temperature. The Contractor shall provide one (1) automatic temperature recorder for every 30 m of casting bed. The recorder shall continuously record curing temperatures for the initial and final curing phases. Temperature sensors shall be carefully placed within the curing enclosure to ensure that ambient temperatures are measured at the designated locations. Recorder accuracy shall be certified once every 12 months and the certificate displayed with each recorder. In addition, random temperature checks of each recorder shall be made by the Inspector.

Each temperature chart shall indicate the casting bed, date of casting, time of commencing graphic plot and units represented by chart. The start of artificial heat and the transfer of prestress shall be indicated on each graphic record.

After completion of the final curing phase, the charts shall be properly marked and given to the Inspector. Temperatures recorded on the charts shall be considered as verification of whether the units have been cured in accordance with the approved working drawings.

Transfer of Prestress. Transfer of prestress shall be accomplished as soon as the final curing phase is complete.

Concrete Strength Requirements

A. Test Cylinders. The concrete strength shall be determined from concrete test cylinders made in conformance with ASTM C31, except that all cylinders shall be vibrated. All cylinders shall be tested in conformance with ASTM C39, on an approved testing machine. All cylinders shall be made and tested by the Contractor in the presence of the Inspector.

The cylinders shall be made from concrete actually placed in the units. The Inspector shall be the
§718-01

sole judge of which cylinders are defective or damaged and are not to be included in the determination of the strength class. Test cylinders used to determine required strengths for detensioning shall be cured as specified on the working drawings.

All cylinders used to test for concrete strength shall be cured in the same manner as the units they represent unless otherwise indicated on the working drawings.

The Contractor shall cast a sufficient number of concrete test cylinders to fulfill the concrete strength test requirements as stated in 2 below. This testing procedure may be altered by the D.C.E.S. If an alternate procedure is to be followed, it shall be indicated on the contract drawings. The number of test cylinders to be cast for each unit shall be shown on the working drawings.

B. Testing for Concrete Strength. The strength requirements for each unit shall be certified by the Contractor, as follows, before the unit is accepted for strength:

1. Transfer Strength. Two cylinders from each unit shall be tested in immediate succession to verify prestress transfer strength. One of the two cylinders tested to determine the strength of the last unit cast in any bed shall be taken from the last batch of concrete placed in that unit. The strength of each cylinder shall be at least 95 percent of the required prestress transfer strength. The average strength of the two cylinders shall be equal to or greater than the required prestress transfer strength.

2. 28 Day Strength

   a. Two cylinders from each unit shall be tested in immediate succession at 28 days of age to verify the required 28 day strength of the concrete. The average strength of the two cylinders shall be equal to or greater than the required 28 day strength. If this requirement is not met, any remaining cylinders representing the unit shall be tested at 28 days of age. The average strength of all cylinders representing the 28 day strength of any one unit shall be equal to or greater than the required 28 day strength.

   b. The Contractor may elect to test two cylinders from each unit in immediate succession, prior to the 28 day age limit. If this option is exercised sufficient cylinders shall be made to ensure that at least two cylinders are available for the 28 day test. Each cylinder shall have a strength of at least 95 percent of the required 28 day strength. The average of the two cylinders must be equal to or greater than the required 28 day strength. If these requirements are met, the cylinder test at 28 days of age shall be waived.

Rejection of Units. Any unit not fabricated in accordance with the contact documents or displaying any of the following defects shall be subject to rejection:

A. Strength Requirement. Any unit represented by cylinders not meeting the required strengths, as specified in Concrete Strength Requirements.

B. Exposed Prestressing Steel. Any unit that has one (1) prestress strand exposed in excess of 24 diameters, or two (2) or more exposed strands.

C. Honeycombing. Honeycombing of the unit to such an extent that chipping away from the honeycombed concrete results in the conditions described in the above paragraph 2, Exposed Prestressing Steel.

   All honeycombed areas in a unit must be chipped until sound concrete is detected. Sound concrete is defined as that point at which chipping causes fracture of the aggregates.

D. Stress Cracks. Any unit that has a stress crack in the area beginning 100 mm from the unit end to the center line of the unit that is greater than 13 mm in depth and 63 μm in width.

E. Injurious Materials. Materials used for the manufacture of concrete shall not contain, nor cause concentration of, chemicals, or other materials injurious to concrete.
§718-01

Concentrations of total chloride ions in excess of 0.05% by mass of cement are considered injurious. Other material and concentration injury potential will be determined by the D.C.E.T.S. according to Department written instructions.

**Damaged units.** The Inspector shall determine whether spalled, honeycombed, or otherwise defective concrete shall be repaired or be subject to rejection. The decision to repair a unit or reject a unit shall require the concurrence of the D.C.E.S.

**Removal of Unsuitable Material.** Prior to beginning the repair, all spalled, honeycombed or disintegrated concrete shall be removed by chipping the unsuitable material away until sound concrete is reached. Sound concrete shall be as defined under Rejection of Units, Subparagraph 3. Chipping tools shall be pneumatic. The type and size of tools and the depth at which sound concrete is reached shall be determined by the Inspector.

**Blast Cleaning Surfaces.** All surfaces to be repaired shall be thoroughly blast-cleaned with No. 40 boiler slag grit or No. 2 sandblast sand, or as ordered by the Inspector.

**REPAIR.** Repair shall be designated as “structural repair” or “nonstructural repair” by the Deputy Chief Engineer (Structures). Repair to a unit shall be done in accordance with the following:

**Structural Repair.** Repair, designated as “structural” by the D.C.E.S., shall be made with an epoxy grout comprised of an epoxy resin system (721-01), or an epoxy polysulfide grout (721-03), mixed with fine aggregate. The grout shall be mixed and placed in accordance with the following:

**A. Mixing.** No mixing shall be started until all preparations have been made to use the grout. The Contractor shall be familiar with the pot life limitations of the epoxy being used, and its operations shall be governed accordingly. Mixing shall be carried out in strict accordance with the manufacturer’s instructions and the following:

- Mixing shall be done as close as possible to the portion to be repaired.
- All necessary equipment for mixing and placing shall be present at the site, and in good working order, prior to the start of mixing.
- The grout shall be proportioned by volume in the approximate ratio of two (2) parts fine aggregate to one (1) part epoxy. The exact ratio of sand to epoxy resin system shall be determined on-site to produce a dense void-free grout.
- Dry, fine aggregate shall be placed in the mix container first. It shall be thoroughly agitated prior to the addition of the epoxy.
- The two components of the epoxy system shall be thoroughly mixed together before being added to the fine aggregate.
- The epoxy shall be added to the fine aggregate slowly, but mixing time shall not exceed three minutes.
- All grout, in any individual batch, shall be used within 25 minutes after the start of mixing of the two components to create the epoxy system. All grout not used within the time limit shall be discarded.
- The epoxy grout shall not be retempered.

**B. Placing.** The epoxy grout shall be placed against a clean, primed, receiving surface, in accordance with the following:

- The receiving surface shall be cleaned of all oil, grease, or other material which may prevent effective bond, immediately prior to priming the surface with neat epoxy (epoxy without aggregate).
- The priming of the receiving surface shall be done immediately prior to the placement of the epoxy grout.
- The epoxy grout shall be placed quickly and continuously. It shall not be overworked.
§718-01

- The temperature of the receiving surface shall be above 10°C at the time of grout placement.
- Grout placement shall not be permitted when ambient temperatures are 10°C or lower, unless methods of protection, acceptable to the Inspector, are employed. Methods of protection, if permitted, shall be continued for a period of 15 hours following grout placement. The 15 hour period may be shortened, at the discretion of the Inspector, but under no circumstances will it be less than 12 hours. Methods of protection, if permitted, are conveniences granted by the State. As such, they are not considered extra work, and therefore they are not entitled to extra compensation.
- Upon completion of grout placement, the new surface of the repaired area shall be flush with the adjacent surfaces, unless the design of the unit specifically requires otherwise.
- On surfaces which will be exposed to view after installation, the repaired area shall be color matched to the adjacent surfaces by use of cement dust, or other means acceptable to the Inspector.

Nonstructural Repair. Repair, designated as “nonstructural” by the D.C.E.S. shall be made with either of the following:
- Epoxy grout composed of §721-01 Epoxy Resin System or §721-03 Epoxy Polysulfide Grout, and fine aggregate; or,
- §721-05 Epoxy Repair Paste.

The Contractor has the choice of materials.

A. Mixing. Epoxy grout shall be mixed in accordance with the requirements of 1. Mixing as given under Structural Repair.

Epoxy repair paste shall be mixed in strict accordance with the manufacturer’s instructions.

B. Placing. Placing of either material shall be done in accordance with the requirements of 2. Placing as given under Structural Repair.

TOLERANCES. Tolerances of the Prestressed Concrete Units shall meet the requirements specified in the Contract Documents.

Units which fail to meet the tolerances shall be rejected with the concurrence of the D.C.E.S.

SHIPPING. Units shall not be shipped until the minimum 28 day strength has been attained, but in no case, before 72 hours’ storage time has elapsed following transfer of prestress.

BASIS OF ACCEPTANCE. The Inspector’s stamp of approval shall constitute the basis of acceptance for shipment to the job site. The Inspector’s stamp shall be placed on the unit after loading for shipment.

Application of the Inspector’s acceptance stamp indicates that at the time of shipment, it was the Inspector’s opinion that the unit was fabricated from accepted materials, by approved processes, and was properly loaded for shipment.

Such application does not imply that the material will not be rejected by the State if it is subsequently found to be defective.

718-02 THRU 718-04 (VACANT)

718-05 PRESTRESSED CONCRETE FORM UNITS

SCOPE. This specification contains the requirements for prestressed concrete form units. These units are used to from the lower portion of a structural slab. They act compositely with the cast-in-place portion of the slab and become an integral part of the structural slab.
GENERAL. §718-01 Prestressed Concrete Units (Structural) shall apply except for the following modifications to the FABRICATION, REPAIR and TOLERANCES:

FABRICATION. §718-01 shall apply except as follows:

Reinforcement and Prestressing Steel. §718-01 shall apply. In addition, devices which will be used as hold-down points for outside reinforcing steel shall be placed prior to concrete placement in the forms. Devices used to lift the units are acceptable for this purpose. The maximum spacing between hold-down devices shall be 1.2 meters center-to-center of device.

Finishing. §718-01 shall apply except the tops of units do not have to be magnesium float finished.

Concrete Strength Requirements. §718-01 shall apply except the testing shall be as follows:

Testing for Concrete Strength. The strength requirements for each day's production shall be certified by the Contractor before that day's production is accepted for strength. Certification shall be done in accordance with the terms of this subsection. All cylinders cast shall be cast in sets of three. One set shall be cast from the first concrete placement of the day. One set shall be cast from the last concrete placement of the day. In addition to those, there shall be a set cast for each 10 m³ of concrete, or major fraction thereof, placed in any one day.

1. Transfer Strength. Three cylinders from each day's production shall be tested in immediate succession to verify prestress transfer strength. One cylinder shall be taken from the first set cast; one cylinder shall be taken from the last set cast. The strength of each cylinder shall be at least 95 percent of the required prestress transfer strength. The average strength of the three cylinders shall be equal to, or greater than, the required prestress transfer strength.

2. 28-Day Strength. Three (3) cylinders representing each day's production shall be tested in immediate succession at twenty-eight (28) days of age to verify the required 28-day strength. The strength of each cylinder shall be at least ninety-five (95) percent of the required 28-day strength. The average strength of the three cylinders shall be equal to, or greater than, the required 28-day strength. If these requirements are not met, any remaining cylinders representing the day's production shall also be tested at 28 days of age. The average strength of all cylinders representing the 28-day strength of any one day's production shall be equal to, or greater than, the required 28-day strength.

3. Option. The Contractor may test three (3) cylinders, representing each day's production in immediate succession, prior to the 28-day age limit. Each cylinder shall have a strength of at least ninety-five (95) percent of the required 28-day strength. The average strength of the three cylinders shall be equal to, or greater than, the required 28-day strength. If these requirements are met, the cylinder test at 28 days of age shall be waived. If this option is exercised, sufficient cylinders shall be made to ensure that at least 3 cylinders are available for the 28-day test.

Rejection of Units. Any unit not fabricated in accordance with the Contract Documents, or displaying any of the following defects, shall be subject to rejection:

A. Strength Requirements. Any unit represented by cylinders not meeting the required strengths, as specified in Concrete Strength Requirements, of this specification.

B. Exposed Prestressing Steel. Any unit which exhibits one or more exposed prestressing strand(s) on a top or bottom surface.

C. Honeycombing. Honeycombing of the unit to such an extent that chipping away from the honeycombed concrete results in the exposure of one, or more, prestressing strands on a top, or bottom, surface.

All honeycombed areas shall be chipped until sound concrete is reached. Sound concrete is defined
§718-05

as that point at which chipping causes fracture of the aggregates. If chipping of the honeycombed portion results in a hole more than one-half the thickness of the unit, the unit will be rejected.

D. Cracks. Any unit which exhibits a crack that is greater than 13 mm in depth, and 64 μm in width.

REPAIR. Repair, if allowed by the DCES, shall be made with §721-05 Epoxy Repair Paste. Epoxy repair paste shall be mixed and placed in strict accordance with the manufacturer's instructions.

Form Supports. Form supports for installation of the units shall be supplied as part of this work. They shall conform to the latest specification for ASTM A446, Grades A through E. Fabrication shall be in conformance with ASTM A653/A653M, Coating Class G165.

The Contractor shall supply the Engineer with certification that the form supports meet the foregoing requirements.

TOLERANCES. All units shall be checked for compliance with the tolerances listed below, after the units have completed the final curing phase and within three (3) days prior to shipping. The Inspector shall document to the DCES any unit with dimensions out of tolerance. Any unit which fails to meet these tolerances shall be rejected with the concurrence of the DCES.

<table>
<thead>
<tr>
<th>Finished Dimensions</th>
<th>Position of Strands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width ± 6 mm</td>
<td>Vertical ± 6 mm</td>
</tr>
<tr>
<td>Length ± 13 mm</td>
<td>Horizontal ± 13 mm</td>
</tr>
<tr>
<td>Depth ± 6 mm</td>
<td></td>
</tr>
</tbody>
</table>

*Width is defined as the dimension measured parallel to the prestressing strands.

718-06 THRU 718-29 (VACANT)

SECTION 719 METAL COATINGS

719-01 GALVANIZED COATINGS AND REPAIR METHODS

SCOPE. These specifications cover the galvanized coatings applied to various materials and the repair thereto.

MATERIAL REQUIREMENTS. Materials shall be galvanized in accordance with the specification indicated by Type on the plans or in the specifications.

Type I. ASTM A123 Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.

Type II. ASTM A153, Zinc Coating (Hot Dip) on Iron and Steel Hardware. As an alternate to the hot dip method of ASTM A153, nuts, bolts, washers and other miscellaneous hardware, approved by the Engineer, may be mechanically galvanized. The mechanically zinc-coated product(s) shall conform to the applicable coating thickness, adherence and quality requirements of ASTM A153. Mechanically zinc-coated nuts for assembly with mechanically zinc-coated bolts shall be tapped oversize prior to coating and need not be re-tapped afterwards.

Type III. ASTM A123 Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products, except as modified herein. A minimum weight of coating (g/m² of surface) for base metal less than 1.6 mm thickness shall be as follows:

<table>
<thead>
<tr>
<th>Average of Specimen</th>
<th>Any Individual Specimen or Computed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>460</td>
<td>380</td>
</tr>
</tbody>
</table>
Type IV. ASTM A653/A653M, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Coating Designation G 210 unless otherwise specified.

Type V. Flame Sprayed Coating System.

A. Preparation of Base. Those areas to be coated shall be sand blasted with silica sand or crushed garnet of such gradation that sand shall be mesh size 20 to 40 with a minimum of 40% retained on a 600 µm mesh screen (U.S. Standard Sieve series). Pressure of not less than 520 kPa shall be maintained at the blast generator. A sample steel plate shall be blasted until the surface cannot be further cleaned or roughened. This plate shall be used for visual comparison and any areas that do not meet this standard as to roughness or cleanliness shall be reblasted.

B. Zinc Application. The wire used in spraying shall be 15 ga., 3.2 mm or 4.8 mm diameter, zinc 99.0% purity. Air pressure at the Air Control Unit shall be 410 kPa and there shall be no more than 11 m of 9.5 mm I.D. hose between the Air Control Unit and the gun.

The metal coating shall be applied at a minimum thickness of 0.076 mm. At least one coating shall be applied within 4 hours of blasting and the surface must be completely coated within 8 hours of blasting. The specified thickness of coating shall be applied in multiple layers and in no case shall less than two passes be made over every part of the surface.

C. Finish Coat. The zinc coating shall be given a finish coating consisting of two coats of Aluminum Vinyl sealer. This sealer shall consist of a volatile vehicle containing a minimum of 20% Vinyl Copolymer and plasticizer and a minimum of 10% Non-Leaking Aluminum Flake.

REPAIR. The Contractor shall be required to repair damaged areas of galvanized zinc coating. Damage may result from wet storage (white rust), welding or cutting (flame), or from excessive rough handling during shipping or erection. In general, only field repairs will be allowed. Shop repairs shall only be permitted when the total area of damage on any single piece is less than 2% of the coated surface or 10,000 mm², whichever is less. Any coated piece on which the total area of damage exceeds these amounts in the shop shall be rejected.

Materials for field repair shall be selected from Department's Approved List of Galvanized Repair Materials. Zinc solders shall be zinc-cadmium and zinc-tin-lead alloys supplied in stick or paste form, and that liquidize for application at temperature ranges of from 270 to 275°C and 230 to 260°C, respectively. Zinc paints shall contain not less than 65% zinc dust (by weight) in the dried paint film and shall meet current standards for the emission of volatile organic compounds. Detailed requirements for the approval of galvanized repair materials are available from the Materials Bureau.

Corrosion deposits shall be removed in a manner satisfactory to the Department prior to incorporation of the material in the work. After removal of these deposits, the coating shall have a uniform appearance free from uncoated spots, lumps, blisters, gritty areas, acid, flux and black spots. Materials with these defects will be rejected and shall be immediately removed from the worksite. Acceptable material shall be provided to replace rejected material at no additional expense to the State.

Damaged areas of loose and deteriorated galvanized zinc coating shall be cleaned by power sanding, power grinding, or abrasive blast cleaning to bright metal.

If zinc solder is used for repairs the cleaned area shall be preheated in accordance with the manufacturer's instructions for use. The heated surface shall then be rubbed with a repair stick to evenly distribute a layer of zinc alloy, or if zinc paste is used it shall be spread evenly using a spatula or similar tool. Zinc solder shall be deposited in a uniform layer at a minimum dry film thickness of 75 µm.

If zinc paint is used for repairs it shall be applied in accordance with the manufacturers instructions for use, using a brush or by spray methods. Zinc paint shall be applied in such quantity as to produce a minimum dry film thickness of 75 µm.

BASIS OF ACCEPTANCE. The acceptance of galvanized coating and repairs is included in the acceptance of the materials receiving the coating.
§719-02

719-02 ALUMINUM ANODIC COATINGS

SCOPE. This specification covers the material requirements for Anodic Coatings for Aluminum and Aluminum Alloys.

<table>
<thead>
<tr>
<th>Coating Designation</th>
<th>Sealed with</th>
<th>Minimum Coating Thickness, µm</th>
<th>Minimum Coating Weight (mg/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alloys 1100, 3003, 5052, 5005, 5357, 5457, 6463, 6563, 6061, 6063</td>
</tr>
<tr>
<td>Type 202</td>
<td>Boiling water</td>
<td>7.62</td>
<td>0.0217</td>
</tr>
<tr>
<td>Type 302</td>
<td>Nickel Acetate</td>
<td>7.62</td>
<td>0.0217</td>
</tr>
<tr>
<td>Type 204</td>
<td>Boiling water</td>
<td>10.16</td>
<td>0.0326</td>
</tr>
<tr>
<td>Type 205</td>
<td>Chromate</td>
<td>5.08</td>
<td>---</td>
</tr>
<tr>
<td>Type 210</td>
<td>Chromate</td>
<td>10.16</td>
<td>---</td>
</tr>
<tr>
<td>Type 215</td>
<td>Boiling water</td>
<td>20.32</td>
<td>0.062</td>
</tr>
<tr>
<td>Type 226</td>
<td>None required</td>
<td>50.8</td>
<td>0.1333</td>
</tr>
</tbody>
</table>

MATERIAL REQUIREMENTS. Anodic coatings for Aluminum and its alloys shall conform to the requirements of Table 719-02-1 for the coating designation shown on the plans or in the proposal:

719-03 ALUMINUM COATING (HOT DIP)

SCOPE. This specification covers the material requirements for hot dip aluminum coatings applied to steel appurtenances in contact with aluminum surfaces, or where applied as shown on the contract plans.

MATERIAL REQUIREMENTS. The material used shall be 99 percent pure aluminum conforming to the specifications for Aluminum Alloy Number 1100 according to ANSI H 35.1.

The thickness of the coating shall not be less than 51 µm on any individual specimen and the average of the specimens tested shall not be less than 58 µm. The thickness of coating may be determined by the use of a Magna-Gage.

The aluminum coating on threads, except on topped threads, shall not be subjected to a cutting, rolling, or finishing tool operation, unless specifically authorized by the Engineer.

The coating shall be continuous and uniform in thickness. The coating shall adhere tenaciously to the surface of the base metal. When the coating is cut or pried into, such as with a stout knife applied with considerable pressure in a manner tending to remove a portion of the coating, it shall only be possible to remove small particles of the coating by paring or whittling, and it shall not be possible to peel any portion of the coating so as to expose the steel.

The aluminum coated articles shall be free from uncoated spots and other defects not consistent with good aluminum coating practice.
SECTION 720 - PILES

720-01 UNTREATED TIMBER PILES

SCOPE. This specification covers the material requirements for untreated timber piles.

GENERAL. Timber piling shall consist of any species of wood that will withstand driving, except white or gray birch, poplar or basswood.

Piles shall be clean-peeled and shall conform to the requirements of ASTM D25.

BASIS OF ACCEPTANCE. The inspector's indelible stamp of approval shall constitute sufficient basis of acceptance at the job site.

720-02 TREATED TIMBER PILES

SCOPE. This specification covers the material requirements for treated timber piles.

GENERAL. The requirements for treated timber piles shall conform to the applicable provisions of §720-01 Untreated Timber Piles with the following additions and modifications:

Piles shall be Southern Yellow Pine or Douglas Fir containing a minimum thickness of sapwood of not less than 40 mm in Southern Yellow Pine and not less than 25 mm of Douglas Fir at the butt ends.

Piles shall be peeled clean of bark, including the inner bark, soon after cutting, so that the piles are smooth and clean. Care shall be taken to remove as little sapwood as possible in the bark peeling operation.

The preservative used in the treatment of piles shall conform to the requirements of §708-30, Wood Preservative Creosote Oil, American Wood Preservers' Association Standard P-1 for land and fresh water use; P-13 for Marine (Coastal Waters) or §708-31 Wood Preservative-Water Borne.

Conditioning and treatment. The conditioning before treatment and the preservative treatment shall conform to the requirements of American Wood Preservers' Association Standards C-1, C-3, C-12, C-14, or C-18.

Inspection of piles. The Contractor shall give the Department ample notice relative to the location of, and time when treating operations will take place. Inspection of piles will be made by inspectors designated by the Department, before, during and after the piles are treated at the treatment plant. No piles shall be shipped which do not bear, in legible form, the inspector's stamp of approval.

The piles shall be subject to inspection by the Engineer after arrival at the site and no previous approval at the plant shall bar rejection in the field for injury, breakage, or defects discovered after the piles have left the treatment plant.

Piles shall be free from damage or defects which would impair their usefulness or durability for the purpose intended. The use of "S" irons or other devices for repairing or preventing checks, splits, or other defects will not be permitted.

STORAGE AND HANDLING. All treated timber piles shall be carefully handled and properly stored. Any surface breaks which do not warrant the rejection of the pile shall be treated in accordance with AWPA M4 with the addition that at least three coats of preservative shall be applied.

Treatment of Pile Heads and Bolt Holes. The heads of piles shall be treated as follows: The sawed surface shall be treated in accordance with AWPA M4 with the addition that at least three coats of preservative shall be applied followed by a thick application of a mixture of 30% creosote and 70% pitch. The application of the pitch coat shall not apply to pile heads encased in concrete. All bolt holes bored subsequent to treatment shall be treated with preservative by means of an approved pressure bolt hole treater.

Any unfilled holes, after being treated with preservative shall be plugged with preservative treated plugs.

The Contractor shall obtain all necessary permits pertaining to the purchase and field application of wood preservatives from the U.S. Environmental Protection Agency (EPA) and the New York State Department of Transportation.
§720-02

of Environmental Conservation.

**BASIS OF ACCEPTANCE.** The Inspector's indelible stamp of approval shall constitute basis of acceptance at the job site.

---

**720-03 CASINGS FOR CAST-IN-PLACE CONCRETE PILES**

**SCOPE.** This specification covers the material requirements for casings used for cast-in-place concrete piles.

**GENERAL.** When the diameter and thickness of pipes are shown on the plans, the material used shall conform to the requirements of ASTM A252, Grade 2, unless otherwise specified. The Contractor will be required to furnish the Engineer with two certified copies of the records of the physical tests performed on the newly manufactured pipe in accordance with the above ASTM requirements. In addition, a manufacturer's statement of certification, which explicitly verifies that the material and workmanship comply with the current ASTM standards for ASTM A252, Grade 2, must accompany each heat.

**Thickness Requirements.** The metal of shells which are directly driven shall have a thickness sufficient to withstand the driving without fracture or failure, but in no case shall the thickness be less than 2.67 mm. Shells driven with a mandrel shall have a thickness not less than 1.37 mm.

Pipes shall have a thickness sufficient to withstand driving without fracture or failure but in no case shall the thickness of pipes be less than 4.76 mm unless otherwise shown on the plans.

**BASIS OF ACCEPTANCE.** The manufacturer's certification shall constitute sufficient basis of acceptance at the job site.

---

**720-04 STEEL BEARING PILES**

**SCOPE.** This specification covers the material requirements for steel bearing piles.

**GENERAL.** All steel bearing piles shall be rolled HP sections of standard dimensions. Steel for bearing piles shall be new and unused and shall conform to the requirements of §715-01, Structural Steel. Stock steel may be used.

**BASIS OF ACCEPTANCE.** Material acceptance will be by manufacturer's certification. The certifying statement must accompany each heat and must verify that the material and workmanship comply with the current ASTM standards for ASTM A36. Two copies shall be furnished to the Engineer.

---

**720-05 PILE SHOES**

**SCOPE.** This specification covers the material requirements for pile shoes.

**GENERAL.** The pile shoes shall consist of ASTM A36 steel or equivalent material capable of withstanding driving without excessive deformation.

**BASIS OF ACCEPTANCE.** Approval by the D.C.E.S. shall constitute acceptance.

---

**720-06 STEEL SPLICES**

**SCOPE.** This specification covers the material requirements for steel splices for steel piles.

**GENERAL.** The material requirements for §720-04, Steel Bearing Piles, shall govern.

**BASIS OF ACCEPTANCE.** The provisions for §720-04, Steel Bearing Piles, shall apply.
SECTION 721 - CONCRETE ADHESIVES AND REPAIR MATERIALS

721-01 EPOXY RESIN SYSTEM

SCOPE. This specification covers the material requirements of a two-component, rapid setting, high strength epoxy resin system for use as an adhesive and for making epoxy mortar for the repair of minor damaged areas of hardened concrete. This material should not be used when the temperature is below 5°C or when there is moisture present in any of the materials or surfaces it will be in contact with while in the uncured state.

MATERIAL REQUIREMENTS

Component A. Component A shall consist of a blend of epoxy resin, plasticizer and fillers so that when mixed with component B the mix will have the characteristics described under “Characteristics of the Mixture”.

Component B. Component B shall consist of an amine adduct curing agent capable of curing the epoxy system from 5°C and above when mixed according to the manufacturer's recommendations.

<table>
<thead>
<tr>
<th>TABLE 721-01-1 EPOXY RESIN MIXTURE REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Pot life for 0.5 liter unit, minutes</td>
</tr>
<tr>
<td>Viscosity, Pa•s @ 23±2°C</td>
</tr>
</tbody>
</table>

Characteristics of the Mixture. Mixture shall meet the requirements of Table 721-01-1.

Cured Materials. Mixed with three (3) parts by volume of Ottawa silica sand conforming to the requirements for graded standard sand in ASTM C778, the resulting mortar shall have the following characteristics after being cured at 23°C±2°C for 24 hours:

<table>
<thead>
<tr>
<th>TABLE 721-01-2 COMPRSSIVE AND TENSILE STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Compressive Strength, MPa</td>
</tr>
<tr>
<td>Tensile Splitting Strength, MPa</td>
</tr>
</tbody>
</table>

PACKAGING. All material furnished must be shipped in strong, substantial containers. The containers shall be identified as “Part A - contains epoxy resin” and “Part B - contains curing agent” and shall be plainly marked with the following information:

- N.Y.S.D.O.T. materials specification number
- Name of product
- Mixing proportions and instructions
- Name and address of the manufacturer
- Lot number and batch number
- Date of manufacture
- Quantity
- Date of expiration of acceptance
§721-01

SAMPLING. Material shall be sampled and inspected at the place of manufacture or in warehouse lots as determined by the Department. Samples submitted to the Materials Bureau shall be taken as directed by the Department.

TESTING

Pot Life. The pot life shall be determined as follows: The mixed components shall be set on a bench top and probed with a small flat stick every two (2) minutes. The time at which a soft ball forms in the center of the container is the pot life.

Initial Viscosity. Components A and B shall be conditioned at 23°C±2°C prior to mixing and the reading taken two (2) minutes after mixing. The viscosity shall be measured with a Brookfield Model RVT viscometer, spindle No. 3 at 20 RPM.

BASIS OF ACCEPTANCE. This material will be considered for acceptance in stock lot quantities at manufacture or supply locations in accordance with procedural directives of the Materials Bureau. The expiration date of acceptance of this material shall be one year after the date of manufacture. Any unauthorized tampering or breaking of the seals on the containers between the time of sampling and delivery to the job site will be cause for rejection of the material.

721-02 (VACANT)

721-03 EPOXY POLYSULFIDE GROUT

SCOPE. This specification covers the material requirements of a two-component, flexible, polysulfide modified epoxy grout containing an inert mineral filler. This material is used for bonding fresh concrete to hardened concrete in both vertical and horizontal planes; grouting studs, etc. into hardened concrete; and making epoxy mortar for the repair of minor damaged areas on hardened concrete. This material should not be used when the temperature is below 10°C.

GENERAL. The two-component epoxy system shall have a maximum ratio of epoxy resin to polysulfide polymer of 2:1 by weight (Min. 1 3/4:1). In addition, the ratio of epoxy resin to curing agent shall be 11:1 by weight (Max. 12:1, Min. 10:1). The fine inert mineral filler when incorporated into the carrying component(s) shall be nonsettling.

MATERIAL REQUIREMENTS

Component A. This component shall consist of an unmodified epoxy resin and may contain a portion of fine inert mineral filler. It shall not contain solvents or reactive diluents. The epoxy resin shall be the condensation product of the reaction of bisphenol A with epichlorohydrin, shall be translucent, and shall have the following physical characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color, Hellige</td>
<td>ASTM D1544</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Epoxide equivalent</td>
<td>ASTM D1652</td>
<td>180</td>
<td>200</td>
</tr>
</tbody>
</table>

Component B. This material shall consist of a blend of a low viscosity polysulfide polymer and a tertiary amine catalyst. The “B” component shall include a fine inert mineral filler. The component shall not contain solvents or diluents. When mixed with Component “A” as directed by the manufacturer, the resulting characteristics shall be as specified in “Characteristics of the Mixture.”
§721-03

The polysulfide polymer flexibilizer shall be a dichloroethyl formal polysulfide in the 1000-molecular weight range having the following characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color, Hellige</td>
<td>ASTM D1544</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Sulphur Content, percent</td>
<td>ASTM D129</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Shelf Life</td>
<td>---</td>
<td>1 year</td>
<td>---</td>
</tr>
</tbody>
</table>

**Characteristics of the Mixture.** When the two components are mixed in accordance with the manufacturer's instructions, the mixture shall have the physical characteristics in Table 721-03-3.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pot Life at 25°C, minutes</td>
<td>See TESTING</td>
<td>30</td>
<td>---</td>
</tr>
<tr>
<td>Initial Viscosity at 25°C, Pa·s</td>
<td>See TESTING</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Spray applications</td>
<td></td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Other applications</td>
<td></td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Tack free time at 25°C, hrs</td>
<td>---</td>
<td>2</td>
<td>---</td>
</tr>
<tr>
<td>Degree of temporary gelation, depth, mm</td>
<td>See TESTING</td>
<td>3.5</td>
<td>---</td>
</tr>
<tr>
<td>Ash content, percent</td>
<td>ASTM D482</td>
<td>---</td>
<td>50</td>
</tr>
<tr>
<td>Volatiles, percent</td>
<td>ASTM D1259</td>
<td>0.83</td>
<td>---</td>
</tr>
</tbody>
</table>

**Properties of Cured Materials.** The grout, when mixed according to the manufacturer's instructions, shall harden into a solid having the physical characteristics in Table 721-03-4.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Shear</td>
<td>Federal Specification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double Strength, MPa</td>
<td>MMM-B-350 Paragraph 4.4.3</td>
<td>2.75</td>
<td>---</td>
</tr>
<tr>
<td>Beam Break Test, MPa</td>
<td>Described under &quot;Test&quot;</td>
<td>5.5</td>
<td>---</td>
</tr>
</tbody>
</table>

**PACKAGING.** All material furnished must be shipped in strong substantial containers. The containers shall be identified as “Part A - contains epoxy resin” and “Part B - contains curing agent” and shall be plainly marked with the following information:

- N.Y.S.D.O.T. materials specification number
- Name of product
- Mixing proportions and instructions
- Name and address of the manufacturer
- Lot number and batch number
- Date of manufacture
- Quantity
- Date of expiration of acceptance
§721-03

SAMPLING. Material shall be sampled and inspected at the place of manufacture or in warehouse lots as determined by the Department. Samples submitted to the Materials Bureau shall be taken as directed by the Department.

TESTING

Pot Life. The pot life shall be determined as follows: The two components are conditioned to 25°C and mixed in accordance with the manufacturer's instructions. The pot life of the material shall be considered to have ended when the viscosity reaches 85 Pa·s (Brookfield Model MBT with Helipath Attachment) at 25°C ambient. The time from initial mixing of the components until the mixture reaches 85 Pa·s shall be recorded as the pot life.

Initial Viscosity. The initial viscosity shall be measured with a Brookfield Model HBT, Spindle No. 3 at 20 RPM.

Tack Free Time. The epoxy mixture shall remain tacky and capable of bonding during a contact period of at least two hours at 25°C ambient measured from the time of spreading.

Degree of Temporary Gelation. The epoxy grout mixture shall have a degree of temporary gelation such that a 3.5 mm film can be maintained on the surface of a standard 50 mm x 125 mm paint panel after dripping ceases.

Compressive Shear Test. The test shall be performed in accordance with Federal Specification MMM-B-350 Paragraph 4.4.3 except that hand mixing of the epoxy will be permitted.

Beam Break Test. The specimen shall be tested for flexural strength using a simple beam with third point loading. The specimen shall be prepared and tested in accordance with ASTM Methods C192 and C78 except that the concrete shall be designed for 5.50 to 6.25 MPa flexural strength and shall be cast in 75 mm x 100 mm x 405 mm molds using a well-graded coarse aggregate all of which passes a 25 mm square sieve. Each beam to be tested shall be sawed transversely at midpoint, the sawed faces etched with a 10 percent aqueous solution of HCl and then thoroughly washed, and bonded with a 0.25 mm thickness of the epoxy adhesive under test. The surface to be bonded shall be maintained in a vertical position during application and cure of epoxy adhesive and plastic concrete. The hardened specimens shall be cured for a total time of at least 96 hours. During the last 24 hours of the curing period, they shall be immersed in water.

The result reported shall be the average of two tests. Any result below 2.75 MPa which fails outside the plane of adhesion will be disregarded and a retest performed. Any result below 5.50 MPa and above 2.75 MPa, of which 80% of the failure occurs outside the plane of adhesion, shall be considered acceptable. Any result above 5.50 MPa will be considered acceptable regardless of where the failure occurs.

BASIS OF ACCEPTANCE. This material will be considered for acceptance in stock lot quantities at manufacture or supply locations in accordance with procedural directives of the Materials Bureau. The expiration date of acceptance of this material shall be one year after the date of manufacture. Any unauthorized tampering or breaking of the seals on the containers between the time of sampling and delivery to the job site will be cause for rejection of the material.

721-04 (VACANT)

721-05 EPOXY REPAIR PASTE

SCOPE. This specification covers the material requirements of a two-component, flexible, rapid-hardening epoxy resin paste for making epoxy mortar. This material is used for the repair and sealing of cracks and other minor damaged areas in hardened concrete. It is suitable for patching on horizontal, vertical, and overhead applications. It develops high early strengths and achieves final cure in seven (7) days. This material shall not be used when the concrete or ambient temperature is below 10°C or above 40°C. It is suitable for damp, moist, and underwater applications.
MATERIAL REQUIREMENTS

Component A. Component A shall be the condensation product of the reaction of bisphenol A with epichlorohydrin. It may contain fillers but shall not contain non-reactive diluents. When mixed with Component B the mixture shall have the characteristics described under Characteristics of the Mixture.

Component B. Component B shall be the curing agent for the system and shall be capable of curing the system from 5°C and above when mixed according to the manufacturer’s instructions. It shall contain no non-reactive diluents but may contain flexibilizers or fillers. Component B shall be completely reactive with Component A.

Components A and B shall each have a shelf life of one (1) year.

Characteristics of the Mixture. When Components A and B are mixed according to the manufacturer’s instructions, the mixture will have a paste or gel consistency such that a 12.5 mm thick layer of the mixture will not sag or drip from an overhead surface throughout the temperature range from 10°C to 40°C. It shall also have the following characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pot Life @ 25°C, minutes</td>
<td>10 min. - 60 max.</td>
</tr>
</tbody>
</table>

Properties of Cured Material. For testing purposes the Components A and B shall be mixed with ASTM C109 Ottawa Silica Sand in the ratio of 1 part sand to 1 part epoxy by volume. This paste shall also be non-sagging and non-dripping as stated under Characteristics of the Mixture. The cured material shall have the following physical properties:

<table>
<thead>
<tr>
<th>TABLE 721-05-1 CURED MATERIAL REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>Compressive Strength¹, MPa</td>
</tr>
<tr>
<td>Bond Test Modulus of Rupture, MPa</td>
</tr>
<tr>
<td>Freeze-Thaw</td>
</tr>
</tbody>
</table>

NOTE: 1. 50 mm cubic samples conditioned 24 hrs.

PACKAGING. All materials furnished shall be shipped in strong, substantial containers. The containers shall be identified as “Part A contains epoxy resin” and “Part B contains curing agent.” It shall also be plainly marked with the following information:

- N.Y.S.D.O.T. materials specification number
- Name of product
- Mixing proportions and instructions
- Name and address of manufacturer
- Lot number and batch number
- Date of manufacturer
- Quantity
- Date of expiration of acceptance.

TESTING

Pot Life. The components will be conditioned to 25°C and mixed according to the manufacturer’s instructions. A 60±0.4 g. total mass will be placed in an unwaxed paper cup and placed on a work bench. The mixture will be probed every 2 minutes with a small stick starting 8 minutes from the time of mixing. The time at which a small ball forms in the center of the container is recorded as the pot life.
§721-05

Bond Test. The epoxy will be tested for flexural strength using a simple beam with third point loading. The concrete will be designed for 5.50 to 6.25 MPa flexural strength and will be cast in 75 mm × 100 mm × 405 mm molds using a well-graded coarse aggregate all of which passes a 25 mm square sieve. Each beam to be tested will be sawed transversely at midpoint, the sawed faces etched with a 10% aqueous solution of HCL and then thoroughly washed. A 0.25 mm thickness of the epoxy adhesive under test will be applied to both wet etched surfaces while in a vertical position and worked into the surface. One of the prism halves will be inverted and placed on the matching half and allowed to cure for 72 hours.

The result reported will be the average of two tests. Any result below 2.75 MPa which fails outside the plane of adhesion will be disregarded and a retest performed. Any result below 5.50 MPa and above 2.75 MPa, of which 80% of the failure occurs outside the plane of adhesion, will be considered acceptable. Any result above 5.50 MPa will be considered acceptable regardless of where the failure occurs.

Freeze-Thaw. Testing will be conducted in accordance with New York Test Method 216. In addition bond test specimens will be subjected to 25 freeze-thaw cycles before breaking in third point loading. A bond strength of 80% of the original average bond strength will be considered acceptable.

Basis of Acceptance. This material will be considered for acceptance in stock lot quantities at the manufacture or supply locations in accordance with procedural directives of the Materials Bureau. The expiration date of acceptance of this material shall be one year after the date of manufacture. Any unauthorized tampering or breaking of the seals on the containers between the time of sampling and delivery to the job site will be cause for rejection of the material.

721-06 THRU 721-19 (VACANT)

721-20 RAPID SETTING POLYMER CONCRETE

Scope. This specification covers the material requirements of a two component, rapid setting, methyl methacrylate based polymer concrete repair material. The material is used with a primer to repair hardened concrete.

Materials Requirements

Polymer Concrete Mortar. The polymer concrete mortar shall be a two component methyl methacrylate based system. One component shall be a premixed powder consisting of catalyst, fine fillers, and fine aggregate not to exceed 1.5 mm in size. The other component shall be a methyl methacrylate monomer liquid capable of chemically reacting with the powder component such that the mixture hardens to a completely cured condition within three (3) hours at temperature between 2°C and 40°C inclusive. The working life of the mixture shall be a minimum of 10 minutes and its workability shall be consistent throughout the above temperature range. The shelf life of the unopened components, stored at room temperature and in a dry atmosphere, shall be 6 months, minimum. Material older than 12 months from the date of manufacturer shall not be used.

Properties of Cured Polymer Concrete. Polymer Concrete Mortar specimens, when prepared in accordance with the manufacturer's mixing instructions, shall exhibit the following properties when cured 168±2 hours at 23°C±3°C:

| TABLE 721-20-1 CURED POLYMER CONCRETE REQUIREMENTS |
|-----------------------------------------------|------------------|--------|--------|
| Property              | Test Method | Min.   | Max.   |
| Modulus of Rupture,   | ASTM C580    | 10     | ---    |
| Elastic Modulus,      | ASTM C580    | 3450   | 6900   |
| Thermal Expansion Coefficient, | ASTM C531 | (1.8 to 3.6) x 10⁻⁵ | ---    |

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATIONS of January 2, 2002
The material shall also exhibit the following properties when tested under NYSDOT Test Method 701-13F:

- A minimum one hour compressive strength of 17 MPa, a 24 hour strength of 24 MPa, and a 28 day strength of 35 MPa.
- Be able to withstand 50 cycles of freeze-thaw (10% NaCl solution) with a maximum loss of 4%.

**Primer.** The primer shall be a two component methyl methacrylate resin system capable of enhancing the bond between the polymer concrete and the substrate. It shall have a curing time of 20 to 60 minutes at temperatures between 2°C and 40°C inclusive.

**Flammability.** The polymer concrete shall not support or sustain combustion within five (5) minutes after mixing.

**PACKAGING.** The material delivered from the manufacturer shall be in moisture proof bags and the contents shall weigh within ±3% of the labeled bag weight. The manufacturer's name, address, date of manufacture and mixing instructions shall be printed on each bag.

**BASIS OF ACCEPTANCE.** Application for material approval shall be submitted to the Director of the Materials Bureau accompanied by at least a 25 kg, production run, sample of material. Upon approval, the name of the product will be placed on the Department's Approved List. Products so listed will be acceptable at the work site on the basis of the brand name labeled on the container. The Department reserves the right to sample and test the material at any time.

### SECTION 722 - WATER SUPPLY

#### 722-01 DUCTILE IRON WATER PIPE, FITTINGS AND ENCASEMENT

**SCOPE.** This specification covers the material and quality requirements for ductile iron water pipe, miscellaneous fittings, coatings and encasement.

**GENERAL.** Ductile iron water pipe, fittings and encasement shall conform to the requirements of the following:

- Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water: AWWA C104 / ANSI A21.4
- Ductile Iron and Gray Iron Fittings, 3 NPS through 48 NPS for Water: AWWA C110 / ANSI A21.10
- Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings: AWWA C111 / ANSI A21.11
- Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges: AWWA C115 / ANSI A21.15
- Ductile-Iron Pipe, Centrifugally Cast, for Water: AWWA C151 / ANSI A21.51
- Ductile-Iron Compact Fittings, 3 NPS through 24 NPS and 54 NPS through 64 NPS, for Water Service: AWWA C153 / ANSI A21.53

**BASIS OF ACCEPTANCE.** Ductile iron water pipe and fittings will be accepted on the basis of the manufacturer's certification that the material conforms to this specification. The certification for iron fittings shall list a fitting description, quantity, bare fitting weight and source, (AWWA Standard C110, C153 or Manufacturer, if fitting is not listed in either standard). The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.