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**DIVISION 1700
MISCELLANEOUS MATERIALS**

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1701 - BEARINGS AND PADS FOR STRUCTURES

SECTION 1701

BEARINGS AND PADS FOR STRUCTURES

1701.1 DESCRIPTION

This specification covers the following types of pads and bearings for use on bridge seats:

- Plain Elastomeric bearing pads are non-reinforced pads consisting of elastomer only.
- Steel reinforced elastomeric bearings consist of layers of elastomer restrained at their interfaces by bonded, non-elastic laminates. Provide bearings with the dimensions, material properties, elastomer grade and type of laminates shown in the Contract Documents.
- Polytetrafluoroethylene (PTFE)/elastomeric bearings consist of a stainless steel sliding plate and a steel reinforced elastomeric bearing. Bond a stainless steel or structural steel back-up plate to the top of the steel reinforced elastomeric bearing. Bond the other side of the back-up plate with a layer of teflon.
- Steel bearings consist of rocker, roller and sliding bearings.
- Pot and disc bearings consist of a circular, non-reinforced neoprene, elastomer, or rubber pad, of relatively thin section. For a pot bearing, this pad is confined and sealed in a steel pot or hydraulic cylinder. For a disc bearing, this pad is not confined.
- Spherical bearings consist of bearing with spherical elements for unidirectional deflection rotation.

1701.2 REQUIREMENTS

a. General. Use only one type of pad throughout any one structure, unless otherwise noted in the Contract Documents.

Provide the type(s) of bearings shown in the Contract Documents.

Provide pads or bearings that comply with the Bearings section requirements of AASHTO's LRFD Bridge Design Specifications and LRFD Bridge Construction Specifications.

b. Plain Elastomeric Pads. Provide a virgin neoprene (Polychloroprene) pad. A Shore A Durometer hardness of 60 ± 5 and an AASHTO low temperature grade 3 elastomer is required, unless shown otherwise in the Contract Documents. Leveling pads used in Continuous Prestressed Beam Bridges are exempt from the low temperature grade requirements.

c. Steel Reinforced Elastomeric Bearings. Except as modified by the material, testing and acceptance requirements of this specification, provide steel reinforced elastomeric bearings that satisfy the requirements of AASHTO M 251.

Provide a virgin neoprene (polychloroprene) elastomer. A Shore A Durometer hardness of 60 ± 5 and an AASHTO low temperature Grade 3 elastomer is required, unless shown otherwise in the Contract Documents.

Provide laminates for the bearings that comply with ASTM A 36, AASHTO M 270 (ASTM A 709) Grade 36, ASTM A 1011 SS Grade 36 or A 1008 SS Grade 40, unless otherwise specified in the Contract Documents.

Refer to the Contract Documents for the design method used:

(1) For steel reinforced elastomeric bearings designed using Design Method A, provide bearings that conform to and are tested according to the requirements of AASHTO M 251, sections 8.6 and 8.8.2, and Appendices X1 and X2. The testing requirements of section 8.8.1 will apply if a maximum value for compressive strain is shown in the Contract Documents. Follow the test procedure described in section 8.8.2, except load the sampled bearing to 1500 psi.

(2) For steel reinforced elastomeric bearings designed using Design Method B, provide bearings that conform to and are tested in accordance with AASHTO M 251, sections 8.6 and 8.8, including the shear modulus test of section 8.8.4. Report the test method used to determine shear modulus. The testing requirements of section 8.8.1 will apply if a maximum value for compressive strain is shown in the Contract Documents. Report the percent creep at 25 years (section 8.8.3) if an allowable value is shown in the Contract Documents. Follow the test procedure described in section 8.8.2, except load the sampled bearing to 2400 psi.

For sampling and testing of finished bearings, a lot is defined as being of the same size, thickness, design, and type - manufactured in a reasonably continuous manner for a single bridge.

1701 - BEARINGS AND PADS FOR STRUCTURES

d. PTFE/Elastomeric Sliding Bearings. Provide an elastomeric portion satisfying **subsection 1701.2(c)**.

Provide a sliding surface for the PTFE that is chromium-nickel stainless steel sheet or plate that complies with ASTM A 240, UNS S31600 or UNS S30400. Polish the surface to an 8 micro-inch RMS (#8 mirror) finish.

Provide special bearing quality polytetrafluoroethylene (PTFE) unfilled sheets having a static loading coefficient of friction of not more than 0.03 at a bearing pressure of 3.0 ksi or greater and a temperature of 68°F.

e. Steel Bearings. Face the bearing surfaces of the bearings as required by **DIVISION 700**.

When specified on the Contract Documents, provide structural steel that is hot dip galvanized in accordance with ASTM A 123.

When specified on the Contract Documents, paint the surfaces of the bearings as required by **DIVISION 700**.

f. Pot Bearings. Provide an elastomeric portion satisfying **subsection 1701.2c**, except that the nominal hardness will lie between 50 and 60 on the Shore A scale. Fabricate the pot and piston of structural steel that complies with AASHTO M 270 Grade 36, 50 or 70 as shown in the Contract Documents. Do not use weathering steel for any of these components. Provide brass seal rings that comply with ASTM B 36 for rectangular cross-sections or Federal Specification QQB62 Composite 2 for circular cross-sections.

g. Disc Bearings. Provide PTFE and stainless steel materials satisfying **subsection 1701.2d**. Construct disc from polyether urethane with a Shore A Durometer hardness of 55 ± 10 . Provide steel satisfying **subsection 1701.2f**. Do not use weathering steel for any of these components. Design and use materials consistent with limitations and criteria from AASHTO's "LRFD Bridge Construction Specifications".

h. Spherical Bearings. Use woven PTFE material. Do not use weathering steel for any of these components. Design and use materials consistent with limitations and criteria from AASHTO's "LRFD Bridge Construction Specifications".

i. Anchor Bolts. Provide AASHTO M 314 Grade 36 or Grade 55 anchor bolts that comply with **DIVISION 1600**. When specified on the Contract Documents, provide anchor bolts, nuts, and washers that have been hot dip galvanized in accordance with ASTM F 2329.

1701.3 TEST METHODS

As specified in the various AASHTO and ASTM standards cited in this specification.

1701.4 PREQUALIFICATION

None required.

1701.5 BASIS OF ACCEPTANCE

a. Plain Elastomeric Pads. Receipt and approval of a Type D certification as specified in **DIVISION 2600**.

b. Bearings (all types except Steel) Accepted on the basis of the following:

(1) Receipt and approval of a Type A certification as specified in **DIVISION 2600**.

(2) Receipt and approval of a certification from the bearing producer describing the results of a visual examination by QC personnel performed during the testing of AASHTO M 251, section 8.8.2. Reject bearings having cracks exceeding the criteria of section 8.8.2, having bulging that suggest poor laminate bond, or bulging patterns that imply laminate placement does not meet the tolerance requirements of M 251, section 6. Include the following with the certification:

(a) A statement certifying the bearings conform to the design, material, and manufacturing requirements of this specification.

(b) High resolution pictures of all four sides of the loaded bearing. Take the pictures from an angle and distance, using appropriate lighting, to clearly indicate the amount of bulging and bulging patterns.

1701 - BEARINGS AND PADS FOR STRUCTURES

- (c) A detailed description of any surface cracks
- (3) Visual inspection for condition and compliance with the shop drawings by the Field Engineer at the project site.

c. Steel Bearings. Accepted on the basis of the following:

- Receipt and approval of a Type A certification as specified in **DIVISION 2600** for all steel components provided through this specification.
- Visual inspection for compliance with the shop drawings and fabrication requirements of **SECTION 705** at either the point of production, at the bridge fabricator's facility, or at the project site, as determined by the Field Engineer.

1702 - CALCIUM CHLORIDE

SECTION 1702

CALCIUM CHLORIDE

1702.1 DESCRIPTION

This specification covers calcium chloride to be added to bases or surfaces as a stabilizer or dust palliative.

1702.2 REQUIREMENTS

a. Provide calcium chloride that complies with AASHTO M 144 with the exception that “Impurities Content” does not apply. Supply one of the types listed below:

- (1) Type S (Flake, pellet or granule)
 - (a) Grade 1 (77% CaCl_2)
 - (b) Grade 2 (90% CaCl_2)
- (2) Type L (Liquid)

b. Base the application rate used in the Contract Documents on Type S, Grade 2 calcium chloride. Increase the rate by 20% when using Grade 1. Calculate the application rate of Type L based on the concentration of the material supplied.

1702.3 TEST METHODS

Sample and test according to the applicable provisions of AASHTO T 143.

1702.4 PREQUALIFICATION

Not required.

1702.5 BASIS OF ACCEPTANCE

a. Receipt and approval of a Type D certification as specified in **DIVISION 2600**. Include the concentration of CaCl_2 if certifying a Type L material.

b. Satisfactory performance in the field.

1703 - ELECTRIC LIGHTING AND TRAFFIC SIGNAL EQUIPMENT

SECTION 1703

ELECTRIC LIGHTING AND TRAFFIC SIGNAL EQUIPMENT

1703.1 DESCRIPTION

This specification covers general materials, electrical conduit and miscellaneous hardware for highway lighting and traffic signal systems. Construct these systems in accordance with, and at locations indicated in the Contract Documents or designated by the Engineer.

1703.2 REQUIREMENTS

a. General Materials. Whether the installation involves a single Contract or tied contracts, use a single manufacturer when purchasing all major items of electrical equipment to be used on the project(s). Make all attempts to maintain the same type and consistency of products to promote uniformity, singular responsibility and serviceability. Provide equipment that is new, the best standard product of a manufacturer regularly engaged in the production of this type of equipment, the manufacturer's latest approved design and of best quality and workmanship.

Provide a complete lighting/traffic signal system. Provide and install all equipment necessary for the complete and satisfactory operation of the lighting/traffic signal system whether specifically mentioned or not.

b. Electrical Conduit.

(1) **Metallic Conduit and Fittings.** Provide a rigid steel conduit suitable for use as a raceway for wires or cables of an electrical system. Comply with all requirements of American National Standards Institute (ANSI) C80.1. Protect the exterior surface with a metallic zinc coating and on the interior surface with zinc, enamel or other equivalent corrosion-resistant coating. Metallic conduit fittings are to be zinc coated and comply with ANSI C80.4.

(2) **Nonmetallic Conduit and Fittings.**

(a) **Polyvinyl Chloride (PVC) Conduit.** Provide a Schedule 40 or Schedule 80 rigid polyvinyl chloride conduit complying with the latest edition of the National Electrical Manufacturing Association (NEMA) Standard TC-2. Comply with NEMA Standard TC-3 on all PVC conduit fittings. Fabricate from polyvinyl chloride having the same chemical and physical properties as the conduit, which is made in accordance with the manufacturer's recommendations. Underwriters, Inc. (UL) labels are required on all conduit and fittings.

(b) **Polyethylene Conduit.** Provide a smooth wall, Schedule 40 or Schedule 80, high-density polyethylene duct complying with NEMA Standard TC-7.

(3) Supply conduits complying with the dimensional requirements shown in the Contract Documents.

c. Miscellaneous Hardware. Hot dip galvanize or electroplate with zinc or cadmium all miscellaneous hardware such as bolts, nuts, washers, studs, pins, terminals, springs and similar fastenings in accordance with the following requirements:

(1) **Hot Dipped Galvanized.** Comply with requirements stated in ASTM A 153. Complying with the requirements stated under Class C or D for threaded fittings.

(2) **Electroplated Articles.** Provide sufficient coating to complying with ASTM B 633.

1703.3 TEST METHODS

For hot dipped galvanized materials, determine acceptable coating thickness as stated in ASTM A 90, ASTM B 499 or methods stated in ASTM B 633.

For electroplated articles, measure thickness by any one of the methods specified in ASTM B 633 and, in addition, by eddy current techniques. The eddy current methods, ASTM B 244 may be utilized provided appropriate calibration procedures and standards have been applied. The ASTM B 659 provides a guide to these methods. The magnetic methods of ASTM B 499, referenced in ASTM B 633, and eddy current techniques are nondestructive and are preferred.

1703 - ELECTRIC LIGHTING AND TRAFFIC SIGNAL EQUIPMENT

1703.4 PREQUALIFICATION

a. Traffic Signals. Prequalification or preapproval by the Bureau of Traffic Engineering is required of all materials stated in the Contract Document's Bill of Materials before use on KDOT projects. Upon approval by the Bureau of Traffic Engineering, the material will be added to the prequalified list of materials maintained by the Bureau of Construction and Materials. When a manufacturer or supplier is intending to supply traffic signal materials under these specifications, proceed as follows:

- (1) Submit an original catalog cut, shop drawing, drawing and/or data sheets on the material.
- (2) Send a signed certification letter from the manufacturer or fabricator certifying that the material complies with the applicable specifications. Submit this information to:

KDOT
Bureau of Transportation Safety and Technology
Eisenhower State Office Building
700 SW Harrison Street
Topeka, Kansas 66603-3754

b. Lighting. Not Applicable.

1703.5 BASIS OF ACCEPTANCE

Acceptance of material provided under this specification will be based on the following:

a. Traffic Signals.

- (1) Prequalification for traffic signal materials as specified in **subsection 1703.4**.
- (2) Traffic Signal Materials List: Before the installation of traffic signals, submit for the approval of the Engineer a complete list of traffic signal materials proposed for installation. Submit the list as soon as practicable. Include items on the list for all quantities which are indicated in the Bill of Materials. Include the make, model and other descriptive data as may be required by the Engineer to identify the product. Sign the list certifying that the project-provided materials fulfill the requirements above. The Engineer will compare the items on the traffic signal materials list to the prequalified list. If all of the items match, the Engineer will sign the traffic signal materials list attesting that the materials are approved for use on the project. Forward a copy of the list to each of the following: Bureau Chief of Construction and Materials, Bureau Chief of Transportation Safety & Technology, and the maintaining agency's contact person indicated in the Contract Documents.

In the event the Contractor wishes to provide any item that is not on the prequalified list, provide the Engineer with the information for prequalification per **subsection 1703.4**. Forward this information to the Bureau of Transportation Safety & Technology for review and approval, along with possible addition to the prequalified list.

- (3) Electrical conduit: Receipt and approval of a Type D certification as specified in **DIVISION 2600** and visual inspection for condition and compliance with dimensional or other requirements.

(4) Structural steel poles and mast arms:

(a) Receipt and approval of a copy of the certified mill test reports for each heat or lot of material showing process of manufacture and compliance with chemical and physical requirements of the applicable specifications. Submit these reports to the Engineer of Tests.

(b) Satisfactory results of tests performed at destination to determine the weight of the zinc coating.

(c) Provide detailed shop drawings on all poles from the traffic signal pole manufacturer. Include drawings of the poles, mast arm and luminaire arm (on combination poles) dimensions, arm attachment details, handhole details, and anchor bolt details. Include the signal weight, projected areas and mounting arrangement the poles are designed to accommodate. Submit design calculations along with the shop drawings. Approved shop drawings will be included on the prequalified list.

For traffic signal poles that are not covered by the approved manufacturer's standard shop drawings, submit 3 copies of the detailed shop drawings, along with the design calculations to the Engineer for approval by the Bureau of Transportation Safety & Technology.

(d) Along with the traffic signal materials list, submit the necessary traffic signal pole ordering information. The Engineer will review the information for compliance with the plan dimensions for pole height, mast arm length/mounting height and luminaire arm length/mounting height.

1703 - ELECTRIC LIGHTING AND TRAFFIC SIGNAL EQUIPMENT

(e) Visual inspection at destination for condition, compliance with dimensions and requirements as indicated by the approved documents.

(5) Materials such as ferrous-and non-ferrous metals or other materials are governed by other sections of these specifications.

b. Lighting.

(1) Electrical conduit: Receipt and approval of a Type D certification as specified in **DIVISION 2600** and visual inspection for condition and compliance with dimensional or other requirements.

(2) Structural steel poles and mast arms:

(a) Receipt and approval of a copy of the certified mill test reports for each heat or lot of material showing process of manufacture and compliance with chemical and physical requirements of the applicable specifications. Submit these reports to the Engineer of Tests.

(b) Satisfactory results of test performed at destination to determine the mass of the zinc coating.

(c) Visual inspection at destination for condition and compliance with dimensions or other requirements.

(3) Materials such as ferrous-and non-ferrous metals or other materials are governed by other sections of these specifications.

(4) Materials for electric lighting installations not covered elsewhere in these specifications are shown in the Contract Documents. Base acceptance of these materials on the following:

(a) Approval of shop drawings, catalog cuts, brand names or other requirements as shown in the Contract Documents. Submit 7 copies of all catalog cuts, shop drawings, etc. to the following address for approval:

KDOT
Bureau of Transportation Safety and Technology
Eisenhower State Office Building
700 SW Harrison Street
Topeka, Kansas 66603-3754

(b) Visual inspection at destination for condition and compliance with requirements as indicated by the approved documents.

1704 – WARNING LIGHTS

SECTION 1704

WARNING LIGHTS

1704.1 DESCRIPTION

This specification covers warning lights for use on traffic control devices.

1704.2 REQUIREMENTS

a. General. Provide warning lights of the type or types shown in the Contract Documents and complying with the latest edition of the MUTCD, Part VI, Warning Lights and the Institute of Transportation Engineers (ITE) Purchase Specification for Flashing and Steady Burn Warning Lights.

Clearly mark the manufacturer's name, type and model number on the outside of each unit used on the project.

Provide lights that comply with the crashworthy criteria contained in the testing and acceptance guidelines of the National Cooperative Highway Research Program (NCHRP) Report 350.

b. Batteries. Use batteries that are recommended by the light manufacturer. Replace batteries when they no longer provide satisfactory performance as determined by the Engineer.

1704.3 TEST METHODS

As specified in ITE Purchase Specification for Flashing and Steady Burn Warning Lights. Test lights as specified by NCHRP Report 350.

1704.4 PREQUALIFICATION

Supply test data from an approved testing laboratory for each type and model of warning light showing compliance with the specification. Submit test results, along with the brand, model and type of warning light to the Engineer of Tests. Requalify any unit that has been modified or changed in such a way as to affect the performance of the unit. Submit a NCHRP Report 350 crashworthy certification to the Engineer of Tests.

The Bureau of Construction and Materials will maintain a list of prequalified warning lights.

1704.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1704.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Satisfactory performance in the field.

1705 – EPOXY-RESIN-BASE BONDING SYSTEMS FOR CONCRETE

SECTION 1705

EPOXY-RESIN-BASE BONDING SYSTEMS FOR CONCRETE

1705.1 DESCRIPTION

This specification covers two-component, epoxy-resin bonding systems for application to portland cement concrete, which are able to cure under humid conditions and bond to damp surfaces, and comply with the AASHTO M 235 (ASTM C 881).

a. Seven types of systems are covered by this specification.

(1) Type I - For use in non-load bearing applications for bonding hardened concrete to hardened concrete and other materials, and as a binder in epoxy mortars or epoxy concretes.

(2) Type II - For use in non-load bearing applications for bonding freshly mixed concrete to hardened concrete.

(3) Type III - For use in bonding skid-resistant materials to hardened concrete, and as a binder in epoxy mortars or epoxy concretes used on traffic bearing surfaces (or surfaces subject to thermal or mechanical movements).

(4) Type IV - For use in load bearing applications for bonding hardened concrete to hardened concrete and other materials, and as a binder for epoxy mortars and concrete.

(5) Type V - For use in load bearing applications for bonding freshly mixed concrete to hardened concrete.

(6) Type VI - For bonding and sealing segmental pre-cast elements with internal tendons and span-by-span erection when temporary post tensioning is applied.

(7) Type VII - For use as a non-stress carrying sealer for segmental pre-cast elements when temporary post tensioning is not applied as in span-by-span erection.

b. Three grades of systems are covered by this specification.

(1) Grade 1 - Low viscosity (0-2.0 Pa)

(2) Grade 2 - Medium viscosity (2.0-10 Pa)

(3) Grade 3 - Non-sagging consistency.

c. Classes A, B, and C are defined for Types I through V, and Classes D, E, and F are defined for Types VI and VII, according to the range of temperatures for which they are suitable. The temperature in question is usually that of the surface of the hardened concrete to which the bonding system is to be applied. This temperature may be considerably different from that of the air. Where unusual curing rates are desired, it is possible to use a class of bonding agent at a temperature other than that for which it is normally intended. For example, a Class A system will cure rapidly at room temperature. Any deviation of this sort must be approved by the Engineer before application. Classes are defined as follows:

(1) Class A - For use below 40°F. The lowest allowable temperature is defined by the manufacturer of the product.

(2) Class B - For use between 40 and 60°F.

(3) Class C - For use above 60°F. The highest allowable temperature is defined by the manufacturer of the product.

(4) Class D - For use between 40 and 65°F.

(5) Class E - For use between 60 and 80°F.

(6) Class F - For use between 75 and 90°F.

1705.2 REQUIREMENTS

Provide material that complies with AASHTO M 235 (ASTM C 881), is the type and grade specified in the Contract Documents, and is the class appropriate for the temperature at the time of use, as designated by the manufacturer.

1705.3 TEST METHODS

As specified in AASHTO M 235 (ASTM C 881).

1705 – EPOXY-RESIN-BASE BONDING SYSTEMS FOR CONCRETE

1705.4 PREQUALIFICATION

a. All epoxy resin systems intended for use under this specification must be prequalified on the basis of Type, Grade and Class prior to use. Manufacturers desiring to supply material for KDOT jobs must submit a written request to the Bureau Chief of Construction and Materials, with the following information for each type and brand name:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the material.

(3) Type, Grade and Class of the material.

(4) Information regarding recommended usage and application instructions.

(5) Material Safety Data Sheets.

(6) One copy of a certified test report prepared by a laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards Technology or other approved reference laboratory, showing test results complying with AASHTO M 235 (ASTM C 881). Include evidence that the laboratory is inspected regularly.

b. The information and test reports will be reviewed by the Bureau Chief of Construction and Materials. The manufacturer will be advised as to whether or not the product is prequalified.

c. The Bureau of Construction and Materials will maintain a list of prequalified epoxy resin systems. Products will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the material functions appropriately. Changes in formulation or manufacturing processes will require new prequalification testing. Failure of the material to function appropriately in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be considered for requalification if the manufacturer can provide evidence that the cause of failure has been positively identified, and necessary formulation changes and quality control measures have been implemented to eliminate that cause. Complete prequalification testing may be required for products that have been removed from prequalified status.

1705.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1705.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Observation of performance at the project to verify that the epoxy is effective for the specified purpose.

1706 – ABUTMENT STRIP DRAIN

SECTION 1706

ABUTMENT STRIP DRAIN

1706.1 DESCRIPTION

The abutment strip drain is a prefabricated geocomposite system used to provide drainage behind abutment backwalls, wing walls, retaining walls or under slopes.

1706.2 REQUIREMENTS

a. General. The system is preformed using a lightweight, high impact polymeric core with an attached geotextile (filter fabric). The composite polymer core is bonded to the geotextile at intervals not exceeding 1 1/8 inch in any direction. The preformed system permits the flow of water through the core. The geotextile fabric is thermal (heat) bonded or fungicide glue bonded to the polymeric core. The composite product sheets or rolls have a minimum width of 3 feet with a minimum area of 40 square feet. Store and handle the system in accordance with manufacturer's recommendations, except that in no case may geotextile be exposed to direct sunlight, ultraviolet rays, temperature greater than 140°F, mud, dirt, dust, and debris. Do not use any core section that becomes torn or punctured. All material delivered to the project must meet or exceed the physical requirements based on minimum average roll or sheet values in **TABLE 1706-1**.

TABLE 1706-1: COMPOSITE SYSTEM PROPERTIES		
Property	Requirement	Test Method
Thickness (mils)	250 min., 500 max	ASTM D 1777
Peel Strength (lbs/ft)	5 minimum	ASTM D 1876
Transmissivity at hydraulic gradient of 1.0 and normal stress of 3,600 lbs / sq ft		
Wall Drain (gals/min/ft)	7 minimum	ASTM D 4716
Slope Drain (gals/min/ft)	10 minimum	ASTM D 4716

b. Core. The core is a lightweight polymer plastic composition of either polystyrene, polyethylene, polypropylene, or PVC, with a convexity structure and complies with **TABLE 1706-2**.

TABLE 1706-2: CORE PROPERTIES		
Property	Requirement	Test Method
Std. Crush Strength:		
Wall Drain (lbs/sq ft)	Min. 8,000	ASTM D 1621
Slope Drain (lbs/sq ft)	Min. 17,000	ASTM D 1621
Deflections (%)	Max. 20	ASTM D 1621
Thickness (mils)	Min. 230	ASTM D 1777

c. Geotextile Filter Fabric. Provide fabric that complies with AASHTO M 288 for subsurface drainage geotextiles with properties for Class 2 geotextile with elongation greater than or equal to 50%, and percent in-situ soil passing the No. 200 sieve of greater than 50%.

NOTE: Use backfill soils with a liquid limit less than 50.

1706.3 TEST METHODS

Test the composite and individual components according to the standards cited in **subsection 1706.2**.

1706 – ABUTMENT STRIP DRAIN

1706.4 PREQUALIFICATION

For prequalification, supply samples of the finished product from production to the KDOT Engineer of Tests for testing and evaluation. Submit separate samples of the core material and the filter fabric. All samples must be 10 feet long by nominal roll width. Submit a manufacturer's or independent laboratory test report addressing the properties in **subsection 1706.2**.

When it becomes available, test results for the product will be accepted from the AASHTO National Transportation Product Evaluation Program (NTPEP) without submitting samples. Forward an official copy of the test report to the Bureau Chief of Construction and Materials for evaluation. Prequalification will be based on satisfactory compliance of NTPEP results with this specification.

If the KDOT test or NTPEP results comply with **subsection 1706.2**, the name of the product will be placed on a list of prequalified products maintained by the Bureau of Construction and Materials. No geocomposite drainage system will be used on KDOT projects unless it has been prequalified.

1706.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1706.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

A visual inspection in the field for damage and to verify compliance with these specifications.

1707 – MANHOLE STEPS

SECTION 1707

MANHOLE STEPS

1707.1 DESCRIPTION

This specification covers the requirements for steps for use in precast or cast in place manholes. The steps may be either Type 1 or Type 2 unless otherwise shown in the Contract Documents.

1707.2 REQUIREMENTS

a. Type 1. Provide a manhole step made of a No. 3 or larger deformed steel reinforcing bar encapsulated in a copolymer polypropylene plastic possessing good impact and load-bearing properties and corrosion resistance.

Use a steel bar that complies with ASTM A 615 and make it continuous throughout the entire length of the legs and tread. Use a copolymer polypropylene plastic coating that complies with ASTM D 4101, Group 2.

b. Type 2. All steps not complying with Type 1 are considered Type 2 and require prequalification. Provide steps that comply with ASTM C 478, Sections 13.4 and 13.6. Galvanize ferrous metal steps, or encapsulate them in a plastic, which possesses good impact, load bearing, and corrosion resistant properties.

1707.3 TEST METHODS

Test in accordance with the ASTM methods shown for each step type.

1707.4 PREQUALIFICATION

Submit a sample and a certified test report, listing the results of all applicable tests, from a qualified laboratory, for each model and size of Type 2 step to be prequalified to the Engineer of Tests. The Engineer of Tests will review the test results and inspect and/or test the sample, and will notify the manufacturer in writing of the status of each type of step submitted.

The Bureau of Construction and Materials will maintain a list of prequalified Type 2 manhole steps.

1707.5 BASIS OF ACCEPTANCE

a. Type 1 manhole steps. Receipt and approval of a Type D certification as specified in **DIVISION 2600** and visual inspection for conditions and dimensional requirements.

b. Type 2 manhole steps. Receipt and approval of a Type C certification as specified in **DIVISION 2600** and visual inspection for conditions and dimensional requirements.

1708 – BRIDGE BACKWALL PROTECTION SYSTEM

SECTION 1708

BRIDGE BACKWALL PROTECTION SYSTEM

1708.1 DESCRIPTION

This specification covers waterproofing protection systems to be applied to the face of a concrete abutment against which a backfill will be placed. Requirements for the systems other than the coal-tar membrane are performance oriented, and not limited to any single methodology to accomplish the desired results.

1708.2 REQUIREMENTS

a. General. Make bridge backwall protection systems of permanent non-biodegradable materials possessing the waterproofing protection qualities outlined below. All materials incorporated into a system must be environmentally acceptable, and not prohibited by any regulatory body. Handle, store and install bridge backwall protection systems in strict compliance with the manufacturer's recommendations.

b. Properties.

(1) The system provides an impermeable layer that adheres to the concrete surface. Such adherence may require the presence of water to activate the system. The activated system prevents lateral movement of water at the interface between the concrete and the impermeable layer.

(2) The system is self healing when punctured by sharp objects. It has the capability to flex and bridge over, or move into and seal any cracks which may develop in the concrete.

(3) Acceptable bentonite based systems contain a minimum of 9 lb of evenly distributed bentonite per square yard of system surface area.

1708.3 TEST METHODS

None required.

1708.4 PREQUALIFICATION

a. Bridge backwall protection systems that are intended for use under this specification must be prequalified. Submit a written request to the Bureau Chief of Construction and Materials, with the following information for each type and brand name being offered:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the system.

(3) Complete technical information on the system, including test reports addressing requirements cited above. Include small sales samples of the system. Larger samples will be requested if further testing is necessary.

(4) Information regarding recommended usage and application instructions. Specifically identify any concrete surface or system curing requirements.

(5) Material Safety Data Sheets.

b. The information will be reviewed by the Bureau Chief of Construction and Materials, and the manufacturer will be advised as to whether or not the product is prequalified.

c. The Bureau of Construction and Materials will maintain a list of prequalified bridge backwall protection systems. Products will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the material functions appropriately. Changes in formulation or manufacturing processes will require a new prequalification review.

1708.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1708.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection at destination for condition and compliance with dimensional and other requirements.

1709 – SUBSTRUCTURE WATERPROOFING MEMBRANE

SECTION 1709

SUBSTRUCTURE WATERPROOFING MEMBRANE

1709.1 DESCRIPTION

Material covered by this specification forms a waterproofing system to be applied to selected areas of a bridge substructure.

1709.2 REQUIREMENTS

a. General.

(1) Provide a flexible coating which is moisture insensitive, and which seals the surface to which it is applied to prevent the penetration of water.

(2) When applied to a concrete substrate and given 500 hours of exposure in an accelerated weathering apparatus (ASTM G 153, Table X1.1, Cycle 1) the waterproofing membrane system must be continuous, free of deep cracks and give complete protection from moisture intrusion.

(3) Prepare surfaces and apply each component in accordance with the manufacturer's instructions. Provide a copy of the manufacturer's literature including mixing, thickness of application, and installation instructions to the Field Engineer prior to application of the system.

b. Epoxy Primer/Urethane Mastic System.

(1) Primer. The primer is a two-part penetrating epoxy polyamide specially formulated for use on concrete surfaces to improve adhesion before application of one or two-part polyurethane coatings, with a minimum solids content of 20 percent.

(2) Mastic. The mastic is a one or two-part modified urethane elastomer, formulated as a weather resistant membrane, with a minimum solids content of 80 percent.

c. Epoxy System. Epoxy systems comply with AASHTO M 235 (ASTM C 881) Type III, grade and class as required for work to be performed. Epoxy systems must be prequalified under **SECTION 1705**, "Epoxy-Resin-Base Bonding Systems for Concrete."

1709.3 TEST METHODS

None specified.

1709.4 PREQUALIFICATION

a. All substructure waterproofing systems intended for use under this specification must be prequalified. Submit a written request to the Bureau Chief of Construction and Materials, with the following information for each type and brand name being offered:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the system.

(3) Complete technical information on the system, including test reports addressing requirements cited above. For epoxy systems, submit complete AASHTO M 235 (ASTM C 881) test reports if the material has not already been prequalified under **SECTION 1705**. Include small sales samples of the system. Larger samples will be requested if further testing is necessary.

(4) Information regarding recommended usage and application instructions. Specifically identify any concrete surface or system curing requirements.

(5) Material Safety Data Sheets.

b. The Bureau Chief of Construction and Materials will review the information, and the manufacturer will be advised as to whether or not the product is prequalified.

1709 – SUBSTRUCTURE WATERPROOFING MEMBRANE

c. The Bureau of Construction and Materials will maintain a list of prequalified substructure waterproofing systems. Products will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the material functions appropriately. Changes in formulation or manufacturing processes will require a new prequalification review.

1709.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1709.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection of performance in the field.

1710 – GEOSYNTHETICS

SECTION 1710

GEOSYNTHETICS

1710.1 DESCRIPTION

This specification covers the requirements for paving fabrics and geosynthetics and securing pins installed for subsurface drainage, separation, base course reinforcement and subgrade stabilization. This also covers the requirements for separation geotextile for erosion control.

1710.2 REQUIREMENTS

a. General.

- (1) Compose all geosynthetics of at least 85% by weight polyolefins or polyesters.
- (2) Use geosynthetics resistant to chemical attack, mildew and rot.
- (3) Package in protective wrapping, store, handle and identify all geosynthetics according to ASTM D 4873.
- (4) Do not use torn or punctured geosynthetics.
- (5) Woven geotextiles with slit-tape or slit-film filaments in both the machine direction (MD or warp) and the cross-machine direction (CD, weft or fill) are prohibited.
- (6) When seams are required for geotextiles, use "Butterfly" seams that have a Federal Standard designation of Type SSD-1. Place the stitching approximately 1 inch from the fold. Make sure the two fabric edges are even and have been completely penetrated by the seam. Use polyester, polypropylene or Kevlar thread with durability equal to or great than the material used in the fabric. Seam strength requirements shall be as specified in the Contract Documents.

b. Securing Pins. When required, provide steel securing pins that are nominally 1/4 inch diameter, 18 inches long, pointed at one end and fitted with a 1-1/2 inch outside diameter steel washer at the other end.

c. Paving Fabric. Provide a nonwoven geotextile that complies with the general physical and the geotextile property requirements for an AASHTO M 288 paving fabric unless otherwise specified in the Contract Documents. Use a paving grade asphalt recommended by the manufacturer and conforming to the provisions in the AASHTO M 288 Appendix Section 1.6, unless otherwise specified in the Contract Documents, to saturate the paving fabric, as well as bond it to the existing pavement.

d. Subsurface Drainage. Provide a woven or nonwoven geotextile that complies with the general physical and the geotextile property requirements for an AASHTO M 288, Class 2, subsurface drainage geotextile unless otherwise specified in the Contract Documents.

e. Separation Geotextile. Provide a woven or nonwoven geotextile that complies with the general physical and the geotextile property requirements for an AASHTO M 288, Class 2, separation geotextile unless otherwise specified in the Contract Documents. See **subsection 1710.2a.(5)** regarding the use of slit-tape geotextiles.

f. Base Course Reinforcement. Provide a single-layer geogrid or woven geotextile that complies with the properties in **TABLE 1710-1** for reinforcement of an aggregate base course. MD: Machine Direction, CD: Cross-machine Direction.

1710 – GEOSYNTHETICS

TABLE 1710-1: BASE COURSE REINFORCEMENT GEOSYNTHETIC MINIMUM AVERAGE ROLL VALUES			
Property	Test Method	Requirements	
Tensile Strength (at 5% strain)	ASTM D 4595	580 lb/ft MD	900 lb/ft CD
Tensile Strength (at 2% strain)	ASTM D 4595	280 lb/ft MD	450 lb/ft CD
Coefficient of Soil Interaction	GRI-GT6/GG5	0.8	
Junction Strength (geogrid)	GRI:GG2	25 lbs	
Permittivity (geotextile)	ASTM D 4491	0.40 sec ⁻¹	
Apparent Opening Size* (geotextile)	ASTM D 4751	30 U.S. Sieve (0.0232 inches)	
Aperture Stability (geogrid)	**	Minimum of 0.32 m-N/Deg (MD direction)	

* ASTM D 4751: AOS IS A MAXIMUM OPENING DIAMETER VALUE

** The Aperture Stability is based on resistance to in-plane rotational movement measured by applying a 20 kg-cm (2 m-N) moment to the central junction of a 9 inch by 9 inch specimen restrained at its perimeter in accordance with U.S. Army Corps of Engineers Methodology for measurement of Torsional Rigidity.

The coefficient of interaction is based on the soil being a granular, non-cohesive material with less than 10% fines. If these base soils are not available, perform a site specific design and increase the base course thickness, accordingly.

g. Subgrade Stabilization. Provide a woven geotextile, geogrid or geogrid/geotextile combination, as specified in the Contract Documents, for subgrade stabilization that complies with the properties in **TABLE 1710-2**. This table is only applicable for subgrades with CBR values greater than 1. For subgrades with CBR values less than 1, a site specific design will be required.

TABLE 1710-2: SUBGRADE STABILIZATION GEOSYNTHETIC MINIMUM AVERAGE ROLL VALUES			
Property	Test Method	Requirements	
Tensile Strength (at 5% strain)	ASTM D4595	810 lb/ft MD	1340 lb/ft CD
Tensile Strength (at 2% strain)	ASTM D4595	410 lb/ft MD	620 lb/ft CD
Coefficient of Soil Interaction	GRI-GT6/GG5	0.8	
Junction Strength (geogrid)	GRI:GG2	25 lbs	
Permittivity (geotextile)	ASTM D4491	0.40 sec ⁻¹	
Apparent Opening Size ^a (geotextile)	ASTM D4751	30 U.S. Sieve (0.0232 inches)	

^aASTM D 4751: AOS is a Maximum Opening Diameter Value

h. Pavement Waterproofing Membrane. Provide an asphalt saturated paving fabric coated with a rubberized asphalt adhesive that complies with the properties in **TABLE 1710-3**.

TABLE 1710-3: PAVEMENT WATERPROOFING MEMBRANE MINIMUM AVERAGE ROLL VALUES		
Property	Test Method	Requirements
Permeance-Perms	ASTM E 96 Method B	0.10 perms (max)
Pliability (180° bend on a 1/4" mandrel @ -25°F)	ASTM D 146	No cracking in fabric or rubber
Puncture Resistance	ASTM E 154	200 lbs
Tensile Strength	ASTM D 882	50 lbs/in

If required, provide a material for a prime coat (comprised of refined asphalt and a rapidly drying solvent) that complies with the requirements of **DIVISION 1200**.

1710.3 TEST METHODS

Test geosynthetic materials according to the ASTM test methods cited in **subsection 1710.2**.

1710.4 PREQUALIFICATION

a. All material provided under this specification must be prequalified through the Engineer of Tests.

1710 – GEOSYNTHETICS

b. Manufacturers interested in prequalifying material under this specification must provide, to the Engineer of Tests, at least a 1 foot by 1 foot sample of the material, installation instructions for the material, certification that the properties of the type of material submitted meet the requirements of this specification, current NTPEP testing results associated with the type of material submitted and any other information requested by the Engineer of Tests.

c. The submittals will be evaluated for compliance with this specification, and the manufacturer will be notified of the results.

d. Approved materials will be placed on the prequalified list maintained by the Bureau of Construction and Materials. Products will remain on the prequalified list as long as the field performance and NTPEP test results of the product are satisfactory.

1710.5 BASIS OF ACCEPTANCE

a. Prequalification as specified in **subsection 1710.4**.

b. Receipt and approval of a Type C certification as specified in **DIVISION 2600** for each shipment. A shipment consists of all material arriving at the job site at substantially the same time but in no instance greater than 1 week. Each week will constitute a new time period requiring a new Type C certification even if the site has been supplied continuously from the previous week.

c. Visual inspection of the material at the job site for quality of workmanship and damage incurred during shipping or job site storage.

1711 – GABIONS

SECTION 1711

GABIONS

1711.1 DESCRIPTION

This specification covers gabion fabricated in accordance with this specification and as shown in the Contract Documents. Gabions manufactured from both twisted and welded wire are described here. Provide the type that is specified in the Contract Documents. If neither is specified, either may be provided.

1711.2 REQUIREMENTS

a. General. The following applies, regardless of the method of manufacture. Make the mesh openings with a maximum dimension less than 5 inches, and area less than 11 square inches, and a size less than the gabion orrevet mattress rock to be used with the mesh.

b. Twisted Wire Mesh. Provide gabions and permanent fasteners, lacing, stiffeners and other assembly components that comply with ASTM A 975 with the following specific designations.

- (1) Provide Style 1 unless polyvinyl chloride (PVC) coating is specified.
- (2) If PVC coating is specified, provide Style 3.

c. Welded Wire Fabric. Provide gabions and permanent fasteners, lacing, stiffeners and other assembly components that comply with ASTM A 974 with the following specific designations.

- (1) Provide Style 2 (zinc coating after welding) unless polyvinyl chloride (PVC) coating is specified.
- (2) If PVC coating is specified, provide Style 5 made from Style 2 components.

1711.3 TEST METHODS

Test gabion materials according to the ASTM's cited in **subsection 1711.2**.

1711.4 PREQUALIFICATION

a. All material provided under this specification must be prequalified.

b. Manufacturers interested in prequalifying material under this specification must provide 1 gabion that are galvanized and 1 gabion that is PVC coated to the Engineer of Tests for laboratory testing and evaluation. Include samples of all fasteners used to assemble the units and incorporate them into a structure. Include test reports for the same type of units being submitted, a copy of all technical data, and a complete set of installation recommendations and instructions.

c. The submittals will be evaluated for compliance with this specification, and the manufacturer will be notified of the results.

d. The Bureau of Construction and Materials will maintain a list of qualified materials and a file of installation instructions. Products will remain on the prequalified list as long as the field performance is satisfactory.

1711.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1711.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600** for each shipment. A shipment consists of all material arriving at the job site at substantially the same time.

Visual inspection at the job site for quality of workmanship and coatings, and for compliance to dimensions and dimensional tolerances.

1712 – PRE-FABRICATED VERTICAL DRAIN

SECTION 1712

PRE-FABRICATED VERTICAL DRAIN

1712.1 DESCRIPTION

This specification covers the requirements for prefabricated vertical drains.

1712.2 REQUIREMENTS

Provide a prefabricated polypropylene channeled core wrapped in a non-woven polypropylene continuous filament geotextile complying with the minimum, minimum average roll values in **TABLES 1712-1 and 1712-2**.

TABLE 1712-1: PREFABRICATED VERTICAL DRAIN FABRIC, MINIMUM AVERAGE ROLL VALUES		
Property	Requirement	Test Method
Grab Tensile Strength	130 lbs	ASTM D4632
Grab Elongation at Failure	> 50%	ASTM D4632
Trapezoidal Tear	60 lbs	ASTM D4533
Permittivity	0.5 sec ⁻¹	ASTM D4491
Apparent Opening Size (AOS)	≤ 0.3 mm	ASTM D4751

TABLE 1712-2: PREFABRICATED VERTICAL DRAIN COMPOSITE, MINIMUM AVERAGE ROLL VALUES		
Discharge	Capacity Requirement	Test Method
1.5 gpm	1.5 psi	ASTM D4716
1.5 gpm	43.5 psi	ASTM D4716

1712.3 TEST METHODS

Test in accordance with the requirements stated in **subsection 1712.2**.

1712.4 PREQUALIFICATION

None required.

1712.5 BASIS OF ACCEPTANCE

The Engineer will accept the geosynthetic material upon the basis of satisfactory test results for each lot. A lot is defined as 10,000 feet. If the material fails to comply with the requirements, the entire lot will be rejected.

Any geosynthetic material proposed for use must be evaluated by the Bureau of Structures and Geotechnical Services, Geotechnical Unit, Soils Section. The entire lot of geosynthetic material must be on site before samples are taken and laboratory testing performed.

Allow a minimum of 15 working days for the approval process. After sufficient data has been collected, the testing frequency may be modified upon approval by the Chief Geotechnical Engineer.

1713 – INERTIAL BARRIER SYSTEM AND REPLACEMENT MODULES

SECTION 1713

INERTIAL BARRIER SYSTEM AND REPLACEMENT MODULES

1713.1 DESCRIPTION

This specification covers inertial barrier systems and replacement modules.

1713.2 REQUIREMENTS

Provide an inertial barrier system and replacement modules as shown in the Contract Documents. Inertial barrier systems may be previously used.

1713.3 TEST METHODS

None specified.

1713.4 PREQUALIFICATION

All inertial barrier systems must be prequalified as a unit. Manufacturers wishing to supply inertial barrier systems to KDOT projects must send a complete evaluation package including the FHWA letter of acceptance and all design and testing information to the KDOT Bureau of Road Design. The information will be reviewed and the manufacturer will be notified of the results. Those systems that are satisfactory for use will be placed on a prequalified list maintained by the Bureau of Construction and Materials.

1713.5 BASIS OF ACCEPTANCE

Inertial barriers and repair modules will be accepted as a complete system or module on the basis of a prequalified brand name, a Type C certification and visual inspection of the completed installation.

1714 – CEMENTITIOUS GROUT

SECTION 1714

CEMENTITIOUS GROUT

1714.1 DESCRIPTION

This specification covers cementitious grouts used to bond anchor bolts and reinforcing steel to hardened concrete. This includes self-contained grouts, which are cementitious materials encapsulated in a water permeable layer. This includes the backfilling of CSL tubes.

1714.2 REQUIREMENTS

- a. Provide material that complies with ASTM C 1107 or Corps of Engineers CRD-C 621.
- b. For self-contained grouts, provide material complying with **TABLE 1714-1**:

Property	Test Method	Requirement
Soaking Time		1 to 3 min.
Initial Set Time, min.	ASTM C 1102	20 min.
Compressive Strength 28-day min.	ASTM C 39	4,000 psi
Shrinkage	ASTM C 1090	0.00%
Expansion	ASTM C 1090	1.5%
Pull Out Strength	ASTM E 488	9,000 lbf
Freeze-Thaw, min.	ASTM C 666, 300 cycles	95%

1714.3 TEST METHODS

Test as specified in **subsection 1714.2**.

1714.4 PREQUALIFICATION

a. Manufacturers interested in prequalifying material under **subsection 1714.2a**. must submit the following to the Bureau of Construction and Materials:

- (1) A complete description, literature, and set of instructions and recommendations,
- (2) A copy of test results performed in accordance with ASTM C 1107 or CRD-C 621,
- (3) Certificate stating results comply with ASTM C 1107 or CRD-C 621, and
- (4) Material Safety Data Sheets (MSDS).

b. Manufacturers interested in prequalifying material under **subsection 1714.2b**. must submit the following to the Bureau of Construction and Materials:

- (1) A complete description, literature, and set of instructions and recommendations,
- (2) A copy of test results performed as outlined in **subsection 1714.2b**.,
- (3) Certificate stating results comply with the values outlined in **subsection 1714.2b**., and
- (4) Material Safety Data Sheets (MSDS).

c. The Bureau of Construction and Materials will maintain a list of qualified materials. Products will remain on the list as long as field performance is satisfactory.

1714.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1714.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection by the Field Engineer.

1715 – CONCRETE MASONRY COATING

SECTION 1715

CONCRETE MASONRY COATING

1715.1 DESCRIPTION

This specification covers cement based polymer or acrylic polymer water seal for use in coating and sealing the exterior face of exterior prestressed concrete beams, joints between concrete overlays, bridge curb faces, masonry and other applications as stated in the Contract Documents.

1715.2 REQUIREMENTS

Provide materials with the following properties:

- Coats and waterproofs concrete and masonry.
- Does not produce a vapor barrier (breathes).
- Is thermally compatible with portland cement mortar and concrete.
- Exhibits no chalking, checking, cracking, scaling, blistering or other deleterious effects after 5000 hours in a Xenon Arc Light Apparatus. (ASTM G 155).
- Color is to be gray to retain a natural concrete appearance, unless otherwise specified in the Contract Documents.

1715.3 TEST METHODS

As specified in ASTM G 155 for the Xenon Arc Light Apparatus only.

1715.4 PREQUALIFICATION

All concrete masonry coatings must be prequalified. Manufacturers interested in prequalifying material under this specification must submit the following to the Bureau of Construction and Materials:

- A complete description, technical data, and set of instructions and recommendations.
- A copy of test results from an independent laboratory regularly inspected by a national reference organization (CCRL, AMRL, etc) confirming the various properties outlined above.
- Material Safety Data Sheets (MSDS).

The Bureau of Construction and Materials will maintain a list of qualified materials. Products will remain on the list as long as field performance is satisfactory.

1715.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1715.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection by the Field Engineer.

1716 – RAPID-SET CONCRETE PATCHING MATERIAL

SECTION 1716

RAPID-SET CONCRETE PATCHING MATERIAL

1716.1 DESCRIPTION

This specification covers requirements for rapid setting cementitious materials for concrete repairs.

1716.2 REQUIREMENTS

- a. Provide material that complies with ASTM C 928.
- b. Freeze-thaw durability will be determined using ASTM C 666, Procedure B. At the end of 300 freeze-thaw cycles, acceptable products must exhibit expansion of less than 0.10%, and a calculated durability factor of 90.0% minimum.
- c. When allowed in the Contract Documents, extender aggregate may be combined with the neat rapid setting material according to the manufacturer's recommendations. The resulting combined material is subject to the foregoing requirements. Products will be tested neat as received, and also extended to the full amount allowed by the manufacturer, and will be classified as Rapid Hardening (R1), Very Rapid Hardening (R2) or Ultra Rapid Hardening (R3) based on the results. A product may be classified in one category when tested neat as received, and another when tested extended the maximum amount. All extender aggregate used on Contracts must be from a source that has a current Official Quality approval status for Mixed Aggregate per **SECTION 1102**.
- d. Provide material classified as Rapid Hardening, Very Rapid Hardening or Ultra Rapid Hardening as specified in the Contract Documents. Any prequalified higher class of material may be substituted for a lower class specified at no additional cost. If no class is specified, any prequalified product may be supplied.
- e. Provide the same product as prequalified under the AASHTO National Transportation Product Evaluation Program (NTPEP), including water/cement ratio and proportion of aggregate (if applicable). If the product was prequalified using a manufacturer-provided aggregate, then the aggregate may be substituted by using an approved local source at the same proportioning established during prequalification.

1716.3 TEST METHODS

Test material in accordance with the applicable parts of ASTM C 928 and ASTM C 666, Procedure B.

1716.4 PREQUALIFICATION

Supply samples for prequalification to the AASHTO National Transportation Product Evaluation Program (NTPEP). Forward an official copy of the test report to the Bureau Chief of Construction and Materials for evaluation. Include information regarding the soluble chloride content of the material, and the mandatory statement from ASTM C 928 if it exceeds 1 lb/cu yd. Include the metallic iron content and the mandatory statement from ASTM C 928 if it exceeds 1% by mass. Prequalification will be based on satisfactory compliance of NTPEP results with this specification. Products will be classified as Rapid Hardening, Very Rapid Hardening or Ultra Rapid Hardening in both the neat and extended mixes based on the NTPEP results.

If the NTPEP laboratory results comply with **subsection 1716.2** and if, after 300 freeze-thaw cycles, the laboratory test specimens exhibit no cracking and only very slight scaling or spalling (minimum 1/8 inch depth) with no coarse aggregate visible, the name of the product will be placed on a list of prequalified products maintained by the Bureau of Construction and Materials. No rapid setting concrete patch material will be used on KDOT projects unless it has been prequalified.

Manufacturers are required to resubmit their products for testing at intervals stipulated by NTPEP. Failure to resubmit products may be cause for removal from the prequalified listing.

1716.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1716.4**.

Receipt and acceptance of a Type C certification as specified in **DIVISION 2600**.

1717 – PRECAST PANEL BEDDING MATERIALS

SECTION 1717

PRECAST PANEL BEDDING MATERIALS

1717.1 DESCRIPTION

This specification covers material for bedding prestressed concrete panels used as a slab in bridge construction.

1717.2 REQUIREMENTS

a. Provide bedding material for precast units that complies with **TABLE 1717-1** for expanded or extruded polystyrene.

Property	Test Method
Compressive Strength, 60 psi, min.	ASTM D 1621
Water Absorption, 2% by vol. max.	ASTM D 2842
Oxygen Index, 24 min.	ASTM D 2863

b. Use a type of glue recommended by the bedding material manufacturer to secure the bedding material to the girder.

1717.3 TEST METHODS

ASTM tests as specified above.

1717.4 PREQUALIFICATION

Manufacturers desiring to provide material under this specification are to submit a 2 x 2 ft prequalification sample of each product which they wish to prequalify.

Provide complete instructions on the use of the material and a Material Safety Data Sheet (MSDS). State the type of glue which is acceptable for use with the material.

Provide a test report from an independent laboratory for the properties cited above.

Forward the prequalification samples and information to the Engineer of Tests. The Material will be tested as necessary to verify the information on the independent laboratory test report. Manufacturers will be notified of the test results.

If the prequalification samples comply with **subsection 1716.2**, the name of the product, along with the allowable type of glue to be used, will be placed on a list of prequalified products maintained by the Bureau of Construction and Materials. No precast bedding material may be used on KDOT projects unless it has been prequalified.

1717.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1717.4**.

Receipt of a Type C certification as specified in **DIVISION 2600**.

Observation of performance in the field.

**1718 – BOND-BREAKER FOR PORTLAND CEMENT
CONCRETE PAVEMENT DOWEL BARS**

SECTION 1718

**BOND-BREAKER FOR PORTLAND CEMENT
CONCRETE PAVEMENT DOWEL BARS**

1718.1 DESCRIPTION

Bond-breaker is applied to dowel bars to be placed in contraction joints in rigid pavement before placement of the concrete. The material serves to prevent the concrete from bonding to the dowel bars, thus preserving the joint as a working one.

1718.2 REQUIREMENTS

- a. Bond-breaker must have an average pull out resistance less than 3400 lbs.
- b. Bond-breaker must not have any detrimental effects on portland cement concrete or the epoxy coating on the dowel bars.
- c. Apply bond-breaker according to the manufacturer's instructions. Do not apply bond-breaker with a thickness value greater than 24 mils. The thickness value is the average of 3 measurements taken at $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ bar length spaced 120 degrees apart. No measurements are permitted to exceed 24 mils.
- d. Dowels that have bond-breaker applied in the plant by the dowel supplier must be stored in such a way as to prevent dust, dirt or any other contaminant that would impair the bond-breaking action, from accumulating on the treated surface. Pre-coated dowels that have been stored in the field for any length of time will be inspected to verify that the coating is still active and will perform as required.

1718.3 TEST METHODS

Test pull out resistance using KDOT Test Method KTMR-16, Testing of Dowel Bars Placed in Concrete for Resistance to Removal (Pull Out).

1718.4 PREQUALIFICATION

- a. All bond-breakers intended for use under this specification must be prequalified before use. Submit a written request to the Bureau Chief of Construction and Materials with the following information for each type and brand name:
 - (1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.
 - (2) Brand name of the material.
 - (3) Information regarding recommended usage and application instructions.
 - (4) Material Safety Data Sheets.
- b. Submit three smooth 1 1/8 inch diameter (No. 9) epoxy coated dowel bars and sufficient bond-breaker material to coat the bars before sample preparation and testing. Send the samples to the Engineer of Tests. The bars will be coated, then cast in concrete and the bond tested. Submit one additional No. 9 bar for the noncoated comparison test. All sample bars should be a minimum of 24 inches in length.
- c. The information and test reports will be reviewed by the Bureau Chief of Construction and Materials. The manufacturer will be advised as to whether or not the product is prequalified.
- d. The Bureau of Construction and Materials will maintain a list of prequalified bond-breakers. Products will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the material functions appropriately. Changes in formulation or manufacturing processes will require new prequalification testing. Failure of the material to function appropriately in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be again

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CONCRETE PAVEMENT DOWEL BARS**

considered for prequalification if the manufacturer can provide evidence that the cause of failure has been positively identified, and necessary formulation changes and quality control measures have been implemented to eliminate that cause. Complete prequalification testing will be required for products which have been removed from prequalified status.

1718.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1718.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1719 - RELEASE COMPOUND FOR ASPHALT MIXES

SECTION 1719

RELEASE COMPOUND FOR ASPHALT MIXES

1719.1 DESCRIPTION

This specification covers release compounds for asphalt mixes.

1719.2 REQUIREMENTS

Provide a concentrated liquid release compound containing no petroleum solvents (diesel fuel, kerosene, etc.) that complies with the following:

- Deleterious Effects: The percentage of coating on the aggregate-binder mixture containing the release compound is equal to that of the mixture without the release agent.
- Release Capabilities: A hot aggregate-binder mixture slides freely in a shallow pan wetted with the release compound.
- Effect on Asphalt Penetration: No more than 7 units difference between a sample in water and one placed in the release compound.

1719.3 TEST METHODS

Test the material in accordance with KTMR-19.

1719.4 PREQUALIFICATION

a. Each release compound must be prequalified. Submit a written request to be evaluated for prequalification to the Bureau Chief of Construction and Materials. Provide the following for each brand and type of material to be evaluated:

- (1) Name, address, and telephone number of the manufacturer and the preferred contact person.
- (2) Name of product and manufacturers dilution recommendation.
- (3) Material Safety Data Sheets.
- (4) Results of tests from the AASHTO National Transportation Product Evaluation Program (NTPEP).

Include the most recent NTPEP test report along with evidence that the product being offered is identical to the one reported in the NTPEP report.

b. A one quart sample will be accepted in lieu of the NTPEP test report until June 1, 2016. Submit the sample in addition to the documentation requested above for prequalification to the Engineer of Tests. The manufacturer will be advised of the results.

c. The Bureau of Construction and Materials will maintain a list of prequalified release compounds. Any prequalified product that does not have a NTPEP test report on file as of January 1, 2017 will be removed from the list of prequalified release compounds. Changes in the formulation, manufacturing process, or failure of the release compound to function appropriately will require a new prequalification.

1719.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1719.4**.

Satisfactory performance in the field.

1720 - MODULAR EXPANSION DEVICES

SECTION 1720

MODULAR EXPANSION DEVICES

1720.1 DESCRIPTION

This specification covers providing a prefabricated modular expansion device on bridges in accordance with these specifications. The device includes the entire manufactured product (multiple sealing elements, steel edge beams and separation beams, joint armoring and attachments, support bars, support boxes and all parts) as well as all attached components. When shown in the Contract Documents, drains at the ends of the devices are subsidiary to the modular expansion devices.

1720.2 REQUIREMENTS

a. Unless shown otherwise in the Contract Documents, provide one of the prequalified brands and models that will accommodate the total design movement shown in the Contract Documents. All modular expansion devices for any single structure must be provided by one supplier.

b. Shape the device to comply closely to the cross slope. Field cutting of the device will not be permitted.

c. Use steel for all major metal components.

d. Use neoprene (Polychloroprene) complying with ASTM D 2628 for the elastomeric sealing units/elements unless modified otherwise by the supplier on the shop drawings. Make the elements one-piece full length of the expansion device, including curbs, and as detailed in the Contract Documents.

e. After installation, there may be no appreciable change in the surface of the modular expansion device when the bridge expands and contracts.

f. Submit shop drawings as specified in **DIVISION 700**.

1720.3 TEST METHODS

Compliance with approved shop drawings for the assembly. Use ASTM D 2628 for the neoprene.

1720.4 PREQUALIFICATION

All modular expansion devices must be prequalified as a unit. Manufacturers wishing to supply modular expansion devices to KDOT projects must send a complete evaluation package including all design and testing information to the KDOT Bureau of Structural and Geotechnical Services. The information will be reviewed and the manufacturer will be notified of the results. Those systems that are satisfactory for use will be placed on a prequalified list maintained by the Bureau of Construction and Materials.

1720.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1720.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection for condition and dimensional requirements shown on the shop drawings.

1721 - FABRIC TROUGH

SECTION 1721

FABRIC TROUGH

1721.1 DESCRIPTION

This specification covers a material to be installed as a trough below the finger type and sliding plate type expansion joints (or for other applications as shown in the Contract Documents) to carry drainage off the bridge, and prevent saltwater and debris from running down on other bridge members.

1721.2 REQUIREMENTS

Provide fabric trough material composed of one or two ply tightly woven nylon fabric bonded to, laminated, or covered on both sides with a high density neoprene, ethylene-propylene-diene-monomer (EPDM), or buna-nitrile PVC, that complies with **TABLE 1721-1**.

TABLE 1721-1: REQUIREMENTS FOR FABRIC TROUGH		
Property	Requirement	Test Method
Thickness (mm)	3 to 5	
Mass (g/sq m minimum)	3560	
Durometer Hardness (Shore A)	50A to 75A	ASTM D 2240
Low Temperature Brittleness (22 hrs. @ -29°C, then wrapped around a 75 mm diameter mandrel)	No Cracks	
Tensile Strength, kg/25 mm minimum, both directions	363	ASTM D 412
Elongation, %, maximum	35	ASTM D 412
Tear (Die C), kg/25 mm minimum	55	ASTM D 624
Ozone Resistance (100 hours of exposure of 20% elongated samples @ 38°C and 100 PPHM ozone.)	No Cracks	ASTM D 1149

Provide material that is resistant to abrasion, sunlight, oils, and saltwater.

1721.3 TEST METHODS

Use the ASTM methods cited above.

1721.4 PREQUALIFICATION

None required.

1721.5 BASIS OF ACCEPTANCE

Receipt and approval of a Type B certification as specified in **DIVISION 2600**, and visual inspection for condition.

1722 - FIBROUS REINFORCEMENT FOR CONCRETE

SECTION 1722

FIBROUS REINFORCEMENT FOR CONCRETE

1722.1 DESCRIPTION

This specification covers both micro and macro fibers for use as reinforcement in concrete. Micro fibers are used to control plastic shrinkage cracks in concrete while macro fibers control cracking in hardened concrete and are often used as a substitute for traditional crack control steel reinforcing bars or mesh. In addition, macro fibers add toughness, and impact and fatigue resistance to hardened concrete.

1722.2 REQUIREMENTS

a. Micro fibers.

(1) Provide fibers that are 100% virgin polypropylene, fibrillated, rough textured, interconnected fibers containing no reprocessed olefin materials and specifically manufactured as concrete reinforcement.

(2) Provide fibers that are graded with a maximum length of 2 inches and a minimum tensile strength of 32 ksi.

b. Macro fibers.

(1) Provide macro synthetic fibers as defined in ASTM C 1116, Type III, and ASTM D 7508.

(2) Provide fibers having a minimum length of 1.25 inches, a maximum length of 2.0 inches, and an aspect ratio (length divided by equivalent diameter) between 70 and 100, inclusive.

(3) Provide fibers with a minimum tensile strength of 50 ksi.

(4) Provide fibers, which when tested using the procedure described in **subsection 1722.4b.**, result in a minimum strength ratio ($R_{e,3}$) of 25%.

1722.3 TEST METHODS – MICRO FIBERS

None specified.

1722.4 TEST METHODS – MACRO FIBERS

a. Determine the tensile strength of macro fibers using ASTM D 7508.

b. Determine equivalent flexural strength ratio ($R_{e,3}$) using ASTM C 1609 with the following modifications:

(1) Utilize 6 x 6 x 20 inch (150 x 150 x 500 mm) beam specimens tested using an 18 inch (450 mm) span.

(2) Test at least three beam specimens using the concrete mixture described below.

(3) Test beam specimens when the concrete compressive strength is between 3,000 and 5,000 psi. Test three 6 x 12 inch cylinders to verify concrete compressive strength of beam specimens at testing. No single cylinder break shall deviate from the other breaks by more than 10%. Provided the average of the three breaks is within the test limits described above, beam testing can proceed.

(4) In addition to the strength requirements, use test concrete satisfying the following:

- 0.35 to 0.50 water cement ratio by weight
- no supplementary cementitious materials
- air-entraining admixtures only
- 50% coarse – 50% fine aggregate by weight
- maximum aggregate size: $\frac{3}{4}$ "
- fine aggregate: naturally occurring (uncrushed) sand - no manufactured sand
- percent air by volume: $6.5 \pm 1.5\%$
- minimum fiber dosage: 4.0 lbs per cubic yard of concrete

c. Testing shall be performed by a laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards and Technology, or other approved reference laboratory.

1722 - FIBROUS REINFORCEMENT FOR CONCRETE

1722.5 PREQUALIFICATION

a. Manufacturers wishing to provide fibrous reinforcement for concrete for KDOT projects must be prequalified.

b. Submit a small sample to the Bureau of Construction and Materials for prequalification. Include the following information:

- (1) Name, address and telephone number of the manufacturer and the preferred contact person.
- (2) Name of product and manufacturer's recommended dosage rate or rates.
- (3) Technical data sheets.
- (4) Material Safety Data Sheets.

In addition, submit either of the following:

- (5) For micro fibers - Test reports substantiating the requirements of **subsection 1722.2a**.
- (6) For macro fibers - Test reports substantiating the requirements of **subsection 1722.2b**. For the C 1609 requirements, include both the mix design of the test concrete, the compressive strength data of the test concrete at the time of beam testing, and the fiber dosage used during testing to satisfy the $R_{e,3}$ requirements of **subsection 1722.2b**.

c. The submittal will be reviewed and the manufacturer will be notified of the results. The Bureau of Construction and Materials will maintain a list of prequalified fibrous reinforcement. For each prequalified macro fiber, a minimum fiber dosage, reported from **subsection 1722.5b.(6)**, will be shown for each product.

1722.6 BASIS OF ACCEPTANCE

Prequalification as required by **subsection 1722.5**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

In addition, when macro fibers are being used as a substitute for 6 X 6 – W4 X W4 welded wire reinforcement in valley gutters and entrance pavement, provide a copy of the approved mix design with the prequalified fiber manufacturer, product name, and dosage clearly identified. Use a fiber dosage that is not less than the product's value shown on the prequalified list.

1723 - NON-METALLIC OFFSET BLOCKS FOR GUARDRAIL

SECTION 1723

NON-METALLIC OFFSET BLOCKS FOR GUARDRAIL

1723.1 DESCRIPTION

This specification governs non-metallic offset blocks for guardrail that are not covered under the wood post specification in **DIVISION 2300**. Substitution for the wood offset blocks is permitted for line and bullnose guardrail sections as shown on the Contract Documents. Substitution within the end terminal sections is only permitted when specified by the manufacturer of the end terminal.

1723.2 REQUIREMENTS

a. General.

(1) Any manufacturer producing non-metallic offset blocks for guardrail under this specification must be currently prequalified. Procedures for prequalification are outlined in **subsection 1723.4**.

(2) Unless shown otherwise in the Contract Documents, manufacture all offset blocks provided under this specification that comply with the applicable subsections.

b. Material Specifications. Provide offset blocks of the same chemical composition and physical properties as those accepted under the NCHRP 350 crash test. Provide offset blocks that comply with **TABLE 1723-1**.

TABLE 1723-1, REQUIREMENTS FOR NON-METALLIC OFFSET BLOCKS		
Property	Test Method	Requirement
UV Protection	ASTM G 155	No visible change to the block.
Compressive Strength	See subsection 1723.3	To become prequalified ≥ 450 psi. Verification Samples not to exceed $\pm 20\%$ of prequalification results.
Water Absorption	ASTM D 2842	% Absorption $\leq 20\%$
Solvent Resistance	KTMR-31	No evidence of softening, blistering, crinkling, dissolving, or change in color or appearance.
Defects and Voids	Visual	Not to exceed $\frac{1}{2}$ inch diameter.

c. Dimensions. Provide offset blocks that comply with the dimensions and details shown in the Contract Documents.

1723.3 TEST METHODS

Test the ultraviolet (UV) protection of the block using ASTM G 155, "Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-metallic Materials." Utilize Cycle #1 for 500 hours following Table X3. Use a sample size of 1 inch by 4 inch by 4 inch.

Perform KTMR-31, "Solvent Resistance of Non-metallic Materials." Obtain a copy of this test by contacting KDOT's Quality Assurance Section in the Materials and Research Center.

Determine the strength of 1 complete block in this manner: Apply the compressive force along the entire length and in the direction that is perpendicular to both the guardrail and post. Support the post track so no force is applied to edges. Blocks are required to have a minimum compressive stress of 450 psi. Calculate the pressure by using the average longitudinal cross section area. Use a properly calibrated compression machine as defined in ASTM E 4.

Determine the water absorption of the block using ASTM D 2842, Procedure B, with the following exceptions:

- Use the actual width and thickness of the specimen instead of the specified 6 inch by 6 inch dimensions.
- Under 9. Conditioning, delete 9.2 and 9.3. Add 9.2 Cool to room temperature and weigh to the nearest 0.1 g. Change 9.4 to 9.3.
- Under 10. 2 Procedure B, maintain a water bath temperature of $77 + 2^{\circ}\text{F}$.

1723 - NON-METALLIC OFFSET BLOCKS FOR GUARDRAIL

- When calculating the absorption, use this equation:
$$\% \text{absorption} = \frac{((W_{2i} - W_{3i}) - (W_{2f} - W_{3f}))}{(W_{2i} - W_{3i})} \times 100$$

1723.4 PREQUALIFICATION

To become prequalified, provide the Bureau of Construction and Materials with a copy of the FHWA letter showing the product has been accepted under the National Cooperative Highway Research Program (NCHRP) Report 350. Blocks must be able to comply with **subsection 1723.3**. Submit 4 offset blocks to the Engineer of Tests.

The Bureau of Construction and Materials will maintain a prequalified list of all complying manufacturers.

1723.5 BASIS OF ACCEPTANCE

The plant must be currently prequalified as specified in **subsection 1723.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection for voids as outlined in **subsection 1723.2.b**.

1724 - SILICONE RUBBER SURFACE CRACK SEALANT

SECTION 1724

SILICONE RUBBER SURFACE CRACK SEALANT

1724.1 DESCRIPTION

This specification covers material for sealing surface cracks previous to epoxy resin crack repair.

1724.2 REQUIREMENTS

a. Provide Type S, Grade NS, Class 50, NT or O, one-part, clear or gray, neutral-cure, silicone rubber sealant that easily extrudes in any weather and cures quickly at room temperature.

b. Provide sealant that complies with **TABLE 1724-1**.

Property	Test Method	Requirement
Tack-Free Time	ASTM C 679	3 hrs
Working Time	ASTM C 639	20-30 minutes
Peel Strength	ASTM C 794	32 lb/in
Tensile Adhesion Strength	ASTM C 1135	45 psi at 25% extension

c. Clean all tools and other application or mixing equipment frequently using a solvent type that is approved by the crack sealant manufacturer.

1724.3 TEST METHODS

Test the material in accordance with the ASTM standards stated in **subsection 1724.2**.

1724.4 PREQUALIFICATION

a. All silicone rubber sealant intended for use under this specification must be prequalified on the basis of Type, Grade, Class and Use prior to prequalification. Manufacturers desiring to supply material for KDOT jobs must submit a written request to the Bureau Chief of Construction and Materials, with the following information for each type and brand name:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the material.

(3) Type, Grade, Class and Use of the material.

(4) Information regarding recommended usage and application instructions.

(5) Material Safety Data Sheets.

(6) One copy of a certified test report prepared by a laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards Technology or other approved reference laboratory, showing test results complying with ASTM C 920. Include evidence that the laboratory is inspected regularly.

b. The information and test reports will be reviewed by the Bureau Chief of Construction and Materials. The manufacturer will be advised as to whether or not the product is prequalified.

c. The Bureau of Construction and Materials will maintain a list of prequalified silicone rubber sealants. Products will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the material functions appropriately. Failure of the material to function in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be considered for requalification if the manufacturer can provide evidence that the cause of failure has been positively identified, and necessary formulation changes and quality control measures have been implemented to eliminate that cause. Complete prequalification testing may be required for products that have been removed from prequalified status.

1724.5 BASIS OF ACCEPTANCE

Receipt and approval of a Type D certification as specified in **DIVISION 2600**.

1725 - DETECTABLE WARNING SURFACE PANELS FOR CURB RAMPS AND MEDIANS

SECTION 1725

DETECTABLE WARNING SURFACE PANELS FOR CURB RAMPS AND MEDIANS

1725.1 DESCRIPTION

This specification governs fabrication of panels compliant with the Public Rights-of-Way Accessibility Guidelines (PROWAG). The panels are required to comply with all dimensional requirements as stipulated within the PROWAG.

1725.2 REQUIREMENTS

a. General.

(1) Any manufacturer producing panels under this specification must be currently prequalified. Procedures for prequalification are outlined in **subsection 1725.4**.

(2) Unless shown otherwise in the Contract Documents, manufacture all panels provided under this specification to comply with the applicable subsections.

(3) Provide in the appropriate color stipulated in the Contract Documents. Warrant the color for 10 years.

b. Prestressed Concrete Panels.

(1) Provide a non-rusting prestressed support system integrated into the lower portion of the panel. The system is required to impart pressure in excess of 200 psi in both horizontal directions on a fully cured panel.

(2) Dimensions. Provide a 2 X 2 foot panels that comply with the dimensions and details specified by the PROWAG. Larger panels may be used if approved by the Engineer.

(3) Material Specifications. Provide panels that comply with **TABLE 1725-1**.

Table 1725-1: REQUIREMENTS FOR PRESTRESSED CONCRETE PANELS		
Property	Test Method	Requirement
Accelerated Weathering	ASTM G 155	No visible change (2915 hrs)
Compressive Strength	ASTM C 39	≥ 8,000 psi
Slip Resistance	ASTM D 2047	≥ 0.80

c. Polymer Concrete Panels.

(1) Provide a polymer concrete panel. For this specification, polymer concrete is defined as having a cementitious material blended with an epoxy material to create a high-strength, tough and durable panel. Fibers may be used.

(2) Dimensions. Provide a 2 X 2 foot panels that comply with the dimensions and details specified by the PROWAG. Larger panels may be used if approved by the Engineer.

(3) Material Specifications. Provide a polymer concrete panel that complies with **TABLE 1725-2**.

Table 1725-2: REQUIREMENTS FOR POLYMER CONCRETE PANELS		
Property	Test Method	Requirement
Accelerated Weathering	ASTM G 155	No visible change (2915 hrs)
Compressive Strength	ASTM C 39 or ASTM C 170	≥ 8,000 psi
Slip Resistance	ASTM D 2047 or ASTM C 1028	≥ 0.80

d. Composite Panels.

(1) Provide an anchored cast-in-place design that is replaceable without removing or damaging the surrounding hardened concrete.

1725 - DETECTABLE WARNING SURFACE PANELS FOR CURB RAMPS AND MEDIANS

(2) Panel. Provide a homogeneous, monolithic, glass-reinforced polymer composite panel that is colorfast and UV stable. Disperse coloring pigments and chemicals to enhance UV stability uniformly throughout the product. Panels using a coating to achieve color fastness or UV stability will not be approved.

If provided, a reinforcing flange or wedge along the perimeter of the panel can be no more than 0.75 inch deep (total depth, including panel thickness) and must be shaped in such a fashion so that it does not prevent panel removal and replacement in hardened concrete. Provide breaks in the perimeter flange to allow for air evacuation from under the panel during installation.

Cast the manufacturer's name into the top surface of the panel.

(3) Dimensions. If possible, provide a single, standard size panel large enough to comply with the length and width requirements in the contract documents. If a single panel will not satisfy the dimensional requirements in the contract documents, arrange the fewest number of standard size panels to minimize total joint length and panel cutting.

Provide a panel whose dome size and in-line spacing is compliant with PROWAG.

(4) Anchor. Provide nylon composite or HDPE, corrosion resistant anchors. Provide a self-threading anchor design that allows for repeated panel removal and re-installations.

Provide a minimum 2.0 inch long spike type anchor whose shape facilitates insertion into stiff, plastic concrete by minimizing concrete displacement while maximizing aggregate/anchor interlock. Other anchor shapes and lengths will be considered as part of the prequalification review on a case-by-case basis provided the panel manufacturer can provide a 3-year history of satisfactory anchor performance, especially in relation to anchor insertion under less than ideal concrete conditions and anchor pullout.

The outer "ring" of anchors can be centered no more than 5 inches from the nearest edge of the panel, measured perpendicular to the edge. The center-to-center spacing between adjacent anchors can be no more than 24 inches in any direction.

(5) Anchor Fastener. Provide minimum #10 size, tamper-proof, countersunk, flathead, stainless steel fasteners that sets flush with the dome or field surface and provides at least 1 inch of embedment into the anchor. As part of the prequalification review of alternate anchors as described in **subsection 1725.2d.(4)**, a shorter fastener embedment or different type of fastener will be considered on a case-by-case basis.

(6) Panel Modification. Provide a panel which, when cut, is engineered to conveniently facilitate the drilling of additional countersunk holes at thickened auxiliary anchor points to accommodate the maximum anchor spacing and edge distance requirements of **subsection 1725.2d.(4)**. If this requirement cannot be met, the panel will be approved for uncut applications only.

(7) Surface Protection. Provide a removable plastic film to protect the panel surface during installation.

(8) Material Specifications. Provide a composite panel that complies with **TABLE 1725-3**.

Table 1725-3: REQUIREMENTS FOR COMPOSITE PANELS		
Property	Test Method	Requirement
Water Absorption	ASTM D 570	≤ 0.50%
Accelerated Weathering	ASTM G 155	No visible change (2915 hrs)
Flexural Strength	ASTM D 790, Procedure A	≥ 15,000 psi
Slip Resistance	ASTM C 1028	≥ 0.80 wet or dry
Abrasion Resistance	ASTM C 501	I _w > 130
Salt Spray	ASTM B 117	No visible change (120 hrs)
Freeze/Thaw/Heat	ASTM C 1026	No chipping, cracking, or peeling

1725.3 TEST METHODS

Perform all test methods as specified in **subsection 1725.2** for the given product.

1725.4 PREQUALIFICATION

To prequalify concrete panels, send three (3) 6 x 6 inch samples of each color to be prequalified to the Engineer of Tests along with test results from a certified laboratory (CCRL, A2LA or NVLP).

1725 - DETECTABLE WARNING SURFACE PANELS FOR CURB RAMPS AND MEDIANS

To prequalify composite panels, send a single 1 x 1 foot panel (w/installed anchors) of any color and three (3) 6 x 6 inch sample of each color to be prequalified to the Bureau Chief of Construction and Materials along with test results from an approved laboratory. In addition, provide detailed product information, including all dimensional information, and step-by-step procedures covering original installation and panel removal/re-installation. Consideration of alternate anchors shapes will require additional information as described in **subsection 1725.2d.(4)**. Material or physical changes to panels or anchors requires re-prequalification. Changes in panel size or additions to the number of standard panel sizes does not require re-prequalification as long as the spacing and edge distance requirements of **subsection 1725.2d.(4)** continue to be satisfied.

Panels must be able to comply with the general and product specific requirements of **subsection 1725.2**.

The Bureau of Construction and Materials will maintain a prequalified list of all complying manufacturers. Products will remain on the prequalified list as long as performance in the field is satisfactory.

1725.5 BASIS OF ACCEPTANCE

The manufacturer must be currently prequalified as specified in **subsection 1725.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Visual inspection for cracked or damaged panels.

1726 - IMPACT ATTENUATORS AND REPLACEMENT MODULES

SECTION 1726

IMPACT ATTENUATORS AND REPLACEMENT MODULES

1726.1 DESCRIPTION

This specification covers impact attenuators and replacement modules.

1726.2 REQUIREMENTS

Provide an impact attenuator and replacement modules as shown in the Contract Documents. Temporary impact attenuators may be previously used.

1726.3 TEST METHODS

None specified.

1726.4 PREQUALIFICATION

All impact attenuators must be prequalified as a unit. Manufacturers wishing to supply impact attenuators to KDOT projects must send a complete evaluation package including the FHWA letter of acceptance and all design and testing information to the KDOT Bureau of Road Design. The information will be reviewed and the manufacturer will be notified of the results. Those systems that are satisfactory for use will be placed on a prequalified list maintained by the Bureau of Construction and Materials.

1726.5 BASIS OF ACCEPTANCE

The complete system or module must be currently prequalified as specified in **subsection 1726.4**.
Receipt and approval of a Type C certification as specified in **DIVISION 2600**.
Visual inspection of the completed installation.

1727 - SHOTCRETE CONCRETE

SECTION 1727

SHOTCRETE CONCRETE

1727.1 DESCRIPTION

This specification covers shotcrete concrete used to repair, reinforce or modify concrete structures.

1727.2 REQUIREMENTS

a. Provide material that complies with the following:

TABLE 1727-1: SHOTCRETE CONCRETE PROPERTIES		
Hardened Properties	Test Method	Requirement
Slant Shear Bond Strength @ 24 hours	ASTM C 882 Modified*	1200 psi, min.
Drying Shrinkage @ 28 days	ASTM C 157 Modified**	0.08%, max.
Rapid Chloride Permeability @ 28 days	ASTM C 1202*** / AASHTO T 277***	750 coulombs, max.
Volume of Permeable Voids @ 7 days	ASTM C 642***	10%, max.
Freeze-Thaw Resistance @ 300 cycles	ASTM C 666, Procedure A	95% RDM, min.
Flexural Strength @ 24 hours	ASTM C 348	650 psi, min.
Compressive Strength @ 24 hours	ASTM C 109	2500 psi, min.

*No epoxy bonding agent used.

** ICRI Guideline No. 03733, "A Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces", 1"x1"x10" prism, air cured

***Either Rapid Chloride Permeability or Volume of Permeable Voids can be used.

b. If the mix is not in bag or tote form (pre-blended in a manufacturer's controlled environment), then provide a mix design with weight quantities of each component for a cubic yard of finished product. All components are required to be prequalified.

c. Provide material with a corrosion inhibitor.

d. Material may contain fibers.

e. Provide material to satisfy application requirements – vertical, overhead, low-pressure spraying, or hand packed.

1727.3 TEST METHODS

Test as specified in **subsection 1727.2a.**

1727.4 PREQUALIFICATION

a. Manufacturers interested in prequalifying material under **subsection 1727.2a.** must submit the following to the Bureau of Construction and Materials:

- (1) A complete description, literature, and set of instructions and recommendations,
- (2) A copy of test results performed in accordance with the tests stated in **subsection 1727.2a.**,
- (3) Certificate stating results comply with **subsection 1727.2a.**, and
- (4) Material Safety Data Sheets (MSDS).

b. The Bureau of Construction and Materials will maintain a list of qualified materials. Products will remain on the list as long as field performance is satisfactory.

1727.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1727.4.**

Receipt and approval of a Type D certification as specified in **DIVISION 2600.**

Visual inspection by the Field Engineer.

1728 - EXPANDED FOAM FOUNDATION MATERIAL FOR SIGN POSTS

SECTION 1728

EXPANDED FOAM FOUNDATION MATERIAL FOR SIGN POSTS

1728.1 DESCRIPTION

This specification covers expanded foam backfill used for setting sign posts. The rigid polyurethane foam is shipped in two parts and mixed on site. Soon after mixing the two components, the product expands in volume and conforms to the shape of the excavation. Reaction and cure times vary with component temperature.

1728.2 REQUIREMENTS

- a. Store, handle, and mix according to the manufacturer’s instructions.
- b. Provide material complying with **TABLE 1728-1**:

TABLE 1728-1: PROPERTIES OF CURED PRODUCT		
Property	Test Method	Requirement
Shear Strength, min.	ASTM D 732	70 psi
Compressive Strength, min.	ASMT D 1621	165 psi
Density ¹ , min.	ASTM D 1622	8.5 pcf
Tensile Strength ¹ , min.	ASTM D 1623, Type A	150 psi

¹minimum of five test specimens

1728.3 TEST METHODS

Test as specified in **subsection 1728.2b**.

1728.4 PREQUALIFICATION

a. Manufacturers interested in prequalifying material must submit the following to the Bureau of Construction and Materials:

- (1) A complete description, literature, and set of instructions and recommendations,
- (2) A copy of test results performed as outlined in **subsection 1728.2b**,
- (3) Certificate stating results comply with the values outlined in **subsection 1728.2b** and are from tests of material that has essentially the same chemistry and mechanical properties as that submitted for FHWA acceptance,
- (4) A copy of the Federal Highway Administration (FHWA) letter accepting the product as foundation material for use with certain sign post systems,
- (5) Material Safety Data Sheets (MSDS).

b. The Bureau of Construction and Materials will maintain a list of qualified materials. Products will remain on the list as long as field performance is satisfactory.

1728.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1728.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Receipt and approval of a certification from the manufacturer stating the furnished material has essentially the same chemistry and mechanical properties as that submitted for FHWA acceptance, and complies with the crashworthiness requirements of FHWA and National Cooperative Highway Research Program (NCHRP) Report 350.

Visual inspection by the Field Engineer.

1729 - ANTI-GRAFFITI COATING

SECTION 1729

ANTI-GRAFFITI COATING

1729.1 DESCRIPTION

This specification covers anti-graffiti coatings, which are coatings applied to substrates to facilitate the removal of graffiti.

1729.2 REQUIREMENTS

a. General.

(1) Anti-graffiti coatings must not react deleteriously with above grade concrete, concrete block, exposed aggregate concrete, brick, stonework, painted steel, or aluminum substrates.

(2) The applied coating must produce a firm, continuous, uniform film that is free of pinholes, cracks, or other film defects and exhibit satisfactory adhesion. The consistency must be such that the coating can be satisfactorily applied by spray, roller, or brush at atmospheric and material temperatures above 50°F without thinning. When applied properly to vertical surfaces, the coating must remain uniform during the required curing period and must not sag, disintegrate, check, peel, or crack.

(3) The VOC content of the coating must comply with the current national rule for industrial maintenance coatings.

(4) When the Contract Documents specify the coating as clear or translucent, the coating must cure clear or translucent, as appropriate.

b. Specific. In addition to the general requirements of subsection 1729.2a, the coating must meet the requirements of Type II or Type III.

(1) Type II - Permanent. Type II coatings are chemically resistant coatings that allow removal of the graffiti with solvent or chemical graffiti removers. The use of graffiti removers, solvents, or both must not cause damage or pigment loss.

The color must match Federal Standard 595B, color number 35630 unless otherwise shown in the Contract Documents. When the Contract Documents specify another color, the color must match the color standard supplied by the Engineer. The Contract Documents may specify clear or translucent as a color.

Provide material complying with the requirements listed in TABLE 1729-1.

TABLE 1729-1: REQUIREMENTS FOR TYPE II COATINGS		
Property	Test Method	Requirement
Graffiti Resistance	ASTM D 6578	Cleanability Level 8, 9, or 10
Recleanability	ASTM D 6578	Min. 10 cycles
Fluid Resistance	ASTM D 1308 ^a	No blistering, discoloration, softening or adhesion loss
Set-to-Touch Time	ASTM D 1640 ^b	4 hr. maximum
Dry-Through Time	ASTM D 1640 ^b	24 hr. maximum

^a Spot Test using Paint Thinner and Gasoline

^b 3-mil wet film tested at 77°F.

(2) Type III – Permanent, Water Cleanable. Type III coatings allow for the removal of the graffiti with a high-pressure cold water wash. Coatings must be self-recoatible for the life of the coating.

The color must match Federal Standard 595B, color number 35630, unless otherwise shown in the Contract Documents. When the Contract Documents specify another color, the color must match the color standard supplied by the Engineer. The Contract Documents may specify clear or translucent as a color.

Provide material complying with the requirements listed in TABLE 1729-2.

1729 - ANTI-GRAFFITI COATING

Property	Test Method	Requirement
Graffiti Resistance	ASTM D 7089	Cleanability Level 1
Recleanability	ASTM D 7089	Min. 10 cycles
Set-to-Touch Time	ASTM D 1640 ^a	4 hr. maximum
Dry-Through Time	ASTM D 1640 ^a	24 hr. maximum

^a 3-mil wet film tested at 77°F.

1729.3 TEST METHODS

Test in accordance with the requirements stated in **subsection 1729.2**.

1729.4 PREQUALIFICATION

a. Each anti-graffiti coating intended for use under this specification must be prequalified before use. Submit a written request for prequalification to the Bureau Chief of Construction and Materials. Provide the following documentation:

(1) Name, address, and telephone number of the manufacturer. Include the name and e-mail address of the preferred contact person.

(2) Brand name of the anti-graffiti coating.

(3) A complete description, literature, and set of instructions for removal of graffiti.

(4) Material Safety Data Sheets.

(5) A copy of test results performed as outlined in **subsection 1729.2b** from a recognized laboratory. Include evidence that the laboratory is regularly inspected. A recognized laboratory is one operated by any State Transportation Agency, the Federal Highway Administration, or any cement and concrete laboratory regularly inspected by the Cement & Concrete Reference Laboratory (CCRL) or the National Institute of Standards and Technology. Test results are to be no more than 24 months out of date.

(6) An infrared spectrum of the anti-graffiti coating which was used in the laboratory tests.

b. Submit a one gallon sample from production to the Engineer of Tests. All coatings will be fingerprinted using infrared spectroscopy for use in screening future verification samples to verify that materials submitted for use are of an identical formulation as originally approved.

c. The information, test reports and test results obtained at the Materials and Research Center on samples submitted, will be reviewed by the Bureau Chief of Construction and Materials. The manufacturer will be advised of the results.

d. The Bureau of Construction and Materials will maintain a list of prequalified products. Products that have been prequalified will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the anti-graffiti coating functions appropriately. Changes in formulation or manufacturing processes will require new prequalification testing.

Failure of the material to function appropriately in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be considered for requalification if the manufacturer can provide evidence that the cause of failure has been positively identified, and necessary formulation changes and/or quality control measures have been implemented to prevent future failures. Complete prequalification testing may be required for products that have been removed from prequalified status.

1729.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1729.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1730 – POLYMER RESINS FOR POLYMER CONCRETE OVERLAY SYSTEMS

SECTION 1730

POLYMER RESINS FOR POLYMER CONCRETE OVERLAY SYSTEMS

1730.1 DESCRIPTION

This specification covers polymer resins for use in Multi-Layer Polymer Concrete Overlay and Slurry Polymer Concrete Overlay for Portland cement concrete bridge decks.

The following types of systems are covered by this specification:

- Type III Epoxy Resin for Multi-Layer Polymer Concrete Overlay,
- Epoxy Resin for Slurry Polymer Concrete Overlay,
- Methyl Methacrylate Resin for Slurry Polymer Concrete Overlay,
- Polyester Resin for Multi-Layer Polymer Concrete Overlay with High Molecular Weight Methacrylate (HMWM) Primer, and
- Polyester Resin for Slurry Polymer Concrete Overlay with HMWM Primer.

1730.2 REQUIREMENTS

a. Epoxy Materials.

(1) Multi-Layer Polymer Concrete Overlay. Provide a system that complies with the requirements of AASHTO M 235 (ASTM C 881), Type III, Grade 1 or 2, with 100 percent solids, and is a thermosetting, moisture-insensitive epoxy resin. With the exceptions in **TABLE 1730-1**:

TABLE 1730-1: TYPE III EPOXY RESIN FOR MULTI-LAYER POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1000 - 2500 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	30-80 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C 579 with 2X2 inch cubes using 2.75 parts ASTM C778, 20-30 mesh sand to one part of mixed polymer resin binder by volume.

(2) Slurry Polymer Concrete Overlay. Provide a system that complies with **TABLE 1730-2**.

TABLE 1730-2: EPOXY RESIN FOR SLURRY POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1000 - 2500 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	1000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	30-80 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

1730 – POLYMER RESINS FOR POLYMER CONCRETE OVERLAY SYSTEMS

b. Methyl Methacrylate Materials. Slurry Polymer Concrete Overlay. Provide a system that complies with **TABLE 1730-3**.

TABLE 1730-3: METHYL METHACRYLATE RESIN FOR SLURRY POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1100-1300 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	100-200 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

c. Polyester Materials.

(1) Multi-Layer Polymer Concrete Overlay. Provide a system that complies with **TABLE 1730-4**.

TABLE 1730-4: POLYESTER RESIN FOR MULTI-LAYER POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1000-2000 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	10-25 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	30-80 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

(2) Slurry Polymer Concrete Overlay. Provide a system that complies with **TABLE 1730-5**.

TABLE 1730-5: POLYESTER RESIN FOR SLURRY POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	75-200 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation, 7 days	ASTM D 638, Type 1	100-200 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

(3) High Molecular Weight Methacrylate (HMWM) Primer. Provide a HMWM primer as part of a system of polyester materials that complies with **TABLE 1730-6**.

TABLE 1730-6: HMWM PRIMER WITH POLYESTER RESINS		
Property	Test Method	Requirements
Viscosity, max	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	50 cps, minimum
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	10-150 minutes
Specific Gravity	ASTM D 2849	0.90 – 1.10
Elongation, 7 days	ASTM D 638, Type 1	100-200 percent
Flash Point	ASTM D 3278	180°F, minimum

1730 – POLYMER RESINS FOR POLYMER CONCRETE OVERLAY SYSTEMS

1730.3 TEST METHODS

Test the systems as specified in **subsection 1730.2** with the following modifications:

- a. Precondition, cure and test all material at $75\pm 2^{\circ}$ F.
- b. Perform ASTM C 579 using only plastic inserts.

1730.4 PREQUALIFICATION

a. All systems intended for use under this specification must be prequalified prior to use. Manufacturers desiring to supply material for KDOT jobs must submit a written request to the Bureau Chief of Construction and Materials, with the following information for each system:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the system.

(3) Type of material.

(4) Information regarding recommended usage and application instructions. If HMWM primer is required for the system, include primer information regarding recommended usage and application instructions.

(5) Material Safety Data Sheets.

(6) One copy of a certified test report prepared by a laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards Technology or other approved reference laboratory, showing test results complying with **subsection 1730.2**. Include evidence that the laboratory is inspected regularly.

Test results from the AASHTO National Transportation Product Evaluation Program (NTPEP) for the identical system, including primer when applicable, are acceptable in lieu of a test report from an approved reference laboratory.

(7) Include a Fourier Transform Infrared Spectrophotometry (FTIR) spectrum in transmittance mode and a bulk sample of each liquid component tested. All liquid components will be “fingerprinted” using infrared spectroscopy for use in screening future verification samples to verify that materials submitted for use are of an identical formulation as originally approved. All data will be maintained as confidential and used only for QA/QC purposes.

b. In addition to the written request described above, prequalification is also dependent upon two years of satisfactory performance in the field. Proof of performance on non-KDOT projects in Kansas may be submitted to show satisfactory performance history in Kansas.

c. The information, test reports and field performance will be reviewed by the Bureau Chief of Construction and Materials. The manufacturer will be advised as to whether or not the product is prequalified.

d. The Bureau of Construction and Materials will maintain a list of prequalified Polymer Concrete Overlay systems. Systems will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the system functions appropriately. Changes in formulation or manufacturing processes will require new prequalification testing. Failure of the system to function appropriately in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be considered for requalification if the manufacturer can provide evidence the cause of failure has been positively identified, and necessary formulation changes and quality control measures have been implemented to eliminate the cause. Complete prequalification testing may be required for systems that have been removed from prequalified status.

1730.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1730.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Observation at the project to verify performance.

1731 – GROUT USED IN POST-TENSIONING

SECTION 1731

GROUT USED IN POST-TENSIONING

1731.1 DESCRIPTION

This specification covers grouts to be used to protect post-tensioning steel in haunched slab bridges.

1731.2 MATERIALS

a. Provide material that does not contain aluminum or other components which produce hydrogen, carbon dioxide or oxygen gas.

b. Provide material complying with the requirements listed in **TABLE 1731-1**. Conduct all tests with material mixed to produce the minimum time of efflux. Establish the water content to produce the minimum and maximum time of efflux.

Property	Test Method	Requirement
Total Chloride Ions, max.	ASTM C 1152	0.08% by weight
Hardened Height Change	ASTM C 1090 ^a	0.0% to +0.2%
Expansion	ASTM C 940	Max. 2.0% for up to 3 hours
Wet Density	ASTM C 188	Max. and min. obtained test value, lb/ft ³
Compressive Strength	ASTM C 942	Min. 7,000 psi
Initial Set Time, min.	ASTM C 953	3 hours
Initial Set Time, max.	ASTM C 953	12 hours
Time of efflux, immediately after mixing ^b	ASTM C 939	Min. 20 seconds Max. 30 seconds
	ASTM C 939 ^c	Min. 9 seconds Max. 20 seconds
Time of efflux, 30 minutes after mixing with remixing for 30 seconds ^b	ASTM C 939	Max. 30 seconds
	ASTM C 939 ^c	Max. 30 seconds
Permeability @ 28 days	ASTM C 1202	Max. 2,500 coulombs

^a Modify ASTM C 1090 to include verification at both 24 hours and 28 days.

^b Must meet one of the two sets of requirements shown.

^c Modify the ASTM C 939 test by filling the cone to the top instead of to the standard level.

1731.3 TEST METHODS

Test in accordance with the requirements stated in **subsection 1731.2**.

1731.4 PREQUALIFICATION

a. Each grout intended for use under this specification must be prequalified before use. Submit a written request to be evaluated for prequalification to the Chief of Materials and Research. Provide the following for the material to be evaluated:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the grout.

(3) A complete description, literature, and set of instructions.

(4) Material Safety Data Sheets.

(5) A copy of test results performed as outlined in **subsection 1731.2b** from a recognized laboratory. Include evidence that the laboratory is regularly inspected regularly. A recognized laboratory is one operated by any State Transportation Agency, the Federal Highway Administration, or other cement and concrete laboratory regularly

1731 – GROUT USED IN POST-TENSIONING

inspected by the Cement & Concrete Reference Laboratory (CCRL) of the National Institute of Standards and Technology. Test results are to be no more than 24 months out of date.

(6) An infra-red spectrum of the grout which was used in the laboratory tests.

b. Forward a one gallon sample from production of each grout being submitted for prequalification to the Engineer of Tests.

c. The information, test reports and test results obtained at the Materials and Research Center on samples submitted, will be reviewed by the Chief of Materials and Research. The manufacturer will be advised of the results.

d. The Bureau of Materials and Research will maintain a list of prequalified products. Products that have been prequalified will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the grout functions appropriately. Changes in formulation or manufacturing processes will require new prequalification testing.

Failure of the material to function appropriately in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be considered for requalification if the manufacturer can provide evidence that the cause of failure has been positively identified, and necessary formulation changes and/or quality control measures have been implemented to eliminate that cause. Complete prequalification testing may be required for products that have been removed from prequalified status.

1731.5 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 1731.4**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1732 – GEOFOAM

SECTION 1732

GEOFOAM

1732.1 DESCRIPTION

This specification covers the geof foam lightweight Expanded Polystyrene (EPS) fill for use at locations as designated in the Contract Documents. This includes lightweight embankment fill and abutment drainage systems.

1732.2 MATERIALS

a. **General.** Provide EPS blocks complying with ASTM D 6817 designated EPS 22 or higher with the minimum requirements in **TABLE 1732-1**:

Property	Requirement
Density	1.35 lb/cu ft;
Compressive Resistance	7.3 psi at 1% deformation
Flexural Strength	35 psi

Use EPS blocks in standard sizes that are typically from 4 feet wide x 2.5 feet thick x 8 to 16 feet long. Treat all EPS blocks with a tested and proven EPA registered material complying with ICC ES EG239 for termite treatment with a minimum 3 year field exposure limit.

Provide a minimum of 4 Geogripper Plates per block to restrain the EPS from moving laterally in layer over layer applications. Make the plate of galvanized or stainless steel with two-sided multi-barbed design capable of piercing the EPS. Make each plate capable of holding a lateral load of 60 lbs.

Use Grade 2.5 concrete for the cap that complies with the **SECTION 401**.

b. **Abutment Drainage System.** Provide EPS blocks complying with ASTM D 6817 designated EPS 12 or higher.

1732.3 TEST METHODS

Test in accordance with ASTM D 6817.

1732.4 PREQUALIFICATION

None required.

1732.5 BASIS OF ACCEPTANCE

a. Receipt and approval of a Type B certification as specified in **DIVISION 2600**.

b. **Verification Testing.** Perform of random sampling and testing for compressive strength and density in accordance with **TABLE 1732-2**. Failure of the samples to meet the compressive strength or density specification will serve as a basis for rejection of the entire lot.

Embankment Volume (cubic yards)	Number of EPS Blocks Sampled
< 650	3
650 – 1300	4
> 1300	5

1733- GEOMEMBRANE

SECTION 1733

GEOMEMBRANE

1733.1 DESCRIPTION

This specification covers the requirements for geomembrane installed as an impermeable barrier.

1733.2 MATERIALS

Provide either a polypropylene geomembrane or a polyethylene geomembrane that has the minimum, minimum average roll values (MARV) shown in **TABLE 1733-1**.

TABLE 1733-1: GEOMEMBRANE MINIMUM AVERAGE ROLL VALUES		
Type of Geomembrane: Property	Test Method	Requirement
Polypropylene:		
Thickness		30 mils
Puncture Resistance	ASTM D 4833	40 lbs.
Tensile Strength	ASTM D 638	78 lbs./in.
Polyethylene:		
Thickness		30 mils
Tensile Yield Strength	ASTM D 638	78 lbs./in.
Puncture Resistance	FTMS 101C, Method 2065	45 lbs.
Tear Resistance	ASTM D 1004	24 lbs.

Provide cushioning material (sand) that complies with the requirements of FA-A or FA-B, **DIVISION 1100**.

1733.3 TEST METHODS

Test in accordance with the requirements stated in **subsection 1733.2**.

1733.4 PREQUALIFICATION

None required.

1733.5 BASIS OF ACCEPTANCE

Receipt and approval of a Type D certification as specified in **DIVISION 2600**.