SPECIAL PROVISION

SPECIFICATION 939 - BRIDGE JOINT SYSTEM REPAIR

939-1 DESCRIPTION

939-1.01 Scope

a. This work shall consist of the partial or full repair of bridge joint system in accordance with these specifications and in conformity with the lines, grades, details and notes shown on the plans or established by the Engineer.

b. The works also includes the preparation of the surfaces of existing or new bridge concrete decks that will be in contact with the new header material used for bridge joint system repair.

c. Each word, sentence, section or article of this document is independent. Not applying parts of it does not imply that it cannot be enforced afterwards nor invalidates the remaining provisions.

939-2 MATERIALS

939-2.01 Materials shall conform to the applicable specifications of the Standard Specifications for Road and Bridge Construction. Materials shall be as specified or as shown on the details and notes in the plans.

939-2.02 **Header Material** – The Header Material shall be of three types (Polymer Concrete, Elastomeric Concrete, and Accelerated Strength Concrete) as follows:

a. Polymer Concrete – The Polymer Concrete shall be a high strength, non-shrink material conforming to the following requirements:

1. The Polymer Concrete shall consist of a liquid resin, powder filler, and coarse aggregates. The mix of Polymer Concrete shall attain a minimum compressive strength of 4,000 psi at 4 hours. The minimum compressive strength shall conform to the requirements of ASTM C 39 and AASHTO T 22. The Polymer Concrete shall resist the typical road chemicals including fuels, oils and others.

2. The Polymer Concrete shall be capable of providing a permanent patch in concrete and gaining the required strength in a manner that allows the roadway to be opened to traffic within two (4) hours of placement while maintaining all contract quality and durability requirements.

3. The pot life of the Polymer Concrete shall have a range of 8 to 15 minutes minimum and be consistent over a temperature range of 60º to 90ºF.

4. The coarse aggregates shall conform to the Article **939-2.06** of this specification.

5. The Contractor shall submit the product technical data sheets and Manufacturer's certifications for review and approval by the Engineer. When required by the Engineer, the Contractor shall also submit certified test reports for approval.

6. Material shall be factory packaged in strong moisture proof bags or containers capable of withstanding shipping, handling and storage without breakage. Material shall have a storage life of at least one year. Each container shall be clearly labeled including:

   (a) Manufacturer's name and batch number.

   (b) Component designation, if two or more components.

   (c) Mixing directions and ratios.

   (d) Potential hazards and precautions.

7. Acceptance of the material will be based on certification by the Manufacturer that the material meets these requirements. However, failure by the material to perform adequately in actual use shall be just cause for rejection regardless of certification.

8. Coarse aggregates for polymer concrete shall be pre-packed and compatible according to the Manufacturer's recommendations and the requirements this specification.

b. Elastomeric Concrete – The Elastomeric Concrete shall be a high strength, self-leveling material conforming to the following requirements:

1. The Elastomeric Concrete shall consist of a two-component or three-component polyurethane material, and coarse aggregates. The mix of Elastomeric Concrete shall attain a minimum compressive strength of 2,000 psi at 3 hours. The minimum compressive strength shall conform to the requirements of ASTM D 695. The Elastomeric Concrete shall resist

the typical road chemicals including fuels, oils and others, and it shall be skid-resistant.

2. The Elastomeric Concrete shall provide a permanent patch in concrete and gaining the required strength in a manner that allows the roadway to be opened to traffic within two (2) hours of placement while maintaining all contract quality and durability requirements. When properly mixed in accordance with the Manufacturer's instruction.

3. The pot life of the Elastomeric Concrete shall have a range of 8 to 15 minutes minimum and be consistent over a temperature range of 60º to 90ºF. The Resilience at 5% deflection shall be 90% (minimum) as per ASTM D 695.

4. The coarse aggregates shall conform to the Article **939-2.06** of this specification.

5. The Contractor shall submit the product technical data sheets and Manufacturer's certifications for review and approval by the Engineer. When required by the Engineer, the Contractor shall also submit certified test reports for approval.

6. Material shall be factory packaged in strong moisture proof bags or containers capable of withstanding shipping, handling and storage without breakage. Material shall have a storage life of at least one year. Each container shall be clearly labeled including:

   (a) Manufacturer's name and batch number.

   (b) Component designation, if two or more components.

   (c) Mixing directions and ratios.

   (d) Potential hazards and precautions.

7. Acceptance of the material will be on the basis of certification by the Manufacturer that the material meets these requirements. However, failure by the material to perform adequately in actual use shall be just cause for rejection regardless of certification.

8. Coarse aggregates for elastomeric concrete shall be pre-packed and compatible according to the Manufacturer's recommendations and the requirements this specification.

b. Accelerated Strength Concrete – The Accelerated Strength Concrete shall be a rapid strength material conforming to the following requirements:

1. The mix of Accelerated Strength Concrete shall consist of a homogeneous mixture of hydraulic cement, fine aggregates, coarse aggregates, water, and chemical admixtures. The concrete mix may also contain fly ash, silica fume, ground granulated blast-furnace slag (GGBS) or a combination thereof. The mix of Accelerated Strength Concrete shall attain a minimum compressive strength of 5,000 psi at 7 days. The minimum compressive strength shall conform to the requirements of ASTM C 39 and AASHTO T 22. The Accelerated Strength Concrete shall resist the typical road chemicals including fuels, oils and others, and it shall be used in Patching Areas greater than 2.0 square meters.

2. Temperature of Accelerated Strength Concrete:

   a. Maximum temperature of fresh concrete containing no set controlling admixtures shall not exceed 80 degrees F (27°C) at the time of placement.

   b. Maximum temperature of fresh concrete containing set controlling admixtures shall not exceed 90 degrees F (32°C) at the time of placement.

   c. The maximum temperature of fresh concrete containing calcium nitrite shall be 80 degrees F (27 °C).

3. The proportioning of Accelerated Strength Concrete shall meet the following requirements:

   (a) The Contractor shall design the concrete mixes and determine the proportions of concrete to conform to these specifications and ensure that the concrete mix proportions are adequate to meet at least the minimum standards of practice for the concrete's intended use. The minimum required average compressive strength of concrete used as basis for selection of concrete proportions (f'cr) shall conform to the requirements of American Concrete Institute, ACI-318 section 5.3 "Proportioning on the basis of field experience or trial mixtures or both". The volumetric

proportioning methods such as outlined in the American Concrete Institute (ACI) Standard 211.1, "Recommended Practice for Selecting Proportions for Normal Weight Concrete", or other approved volumetric proportioning methods, shall be employed in the design of mixes.

(b) The Contractor shall submit for the record, prior to the start of concreting operations, the proposed mix ingredients and proportions certified by a professional engineer (legally authorized to practice engineering in Puerto Rico). Submit separate mix designs for each mix to be used or whenever a change in fine or coarse aggregates source occurs. The Contractor shall submit a Certificate of compliance for all materials proposed to be used in the production of each type concrete mix for the project except for Hydraulic cement and Supplementary Cementitious Material (SCM). This certification shall be made by a professional engineer (legally authorized to practice engineering in Puerto Rico) and provide information identifying the source of raw materials, manufacturing facility and supplier of each material. Any changes in the source of raw materials, manufacturing facilities and/or suppliers of any of the materials shall require that the contractor conduct trial mixes to verify that the performance of concrete meets all specification requirements. The Contractor shall provide certified laboratory test results performed on the concrete trial mix to the Engineer prior to their use in the project.

The concrete mix design submittal shall contain as a minimum the following information:

a. Contractor and PRHTA project identification.
b. Intended location of pour and mix identification
c. Plant location and identification
d. Source of hydraulic cement
e. Amount, percent of cement replacement, for each supplementary cementitious material (SCM) in the mix (lbs/cy).
f. Amount and source of each fine and coarse aggregate (lbs/cy).
g. Report individual aggregate properties of individual aggregates per Specification 703-1 and 703-2
h. Specific gravities of mix constituents
i. Dry (AASHTO T-27 without T-11) and wet (AASHTO T-27 with T-11) aggregate gradings to be used (both individual and combined gradations). In addition, report combined grading on the FHWA 0.45 power chart and the percent retained graph. The following sieve sizes shall be used for reporting combined gradation: 2-inch, 1 1/2-inch, 1-inch, ¾-inch, ½-inch, 3/8-inch, #4, #8, #16, #30, #50, #100 and #200. Calculate

and report the coarseness and workability factor of the combined gradation. The Coarseness factor (CF) and the workability factor (WF) will be calculated as follows:

CF = (% Retained above 3/8-inch sieve) / (% Retained above #8 sieve) x 100

WF = (% Passing #8 sieve + ((2.5 x amount of cementitious material – 564) / 94)

j. Nominal Maximum Size of Aggregates and Size Number as per ASTM C-33

k. Fineness modulus of fine aggregate.

l. Dosage and source of chemical admixtures (oz/cw) and (oz/cy)

m. Total water content (lb/cy)

n. Water to cementitious ratio (w/cm)

o. Cement Content (lb/cy)

p. Cementitious Content (lb/cy)

q. Slump (in.)

r. Certified laboratory reports on the tests performed on trial mixes including:

1. Slump (in.)
2. Fresh Concrete temperature (F)
3. Air Content (%)
4. Compressive strength at specified time (psi), including the data used to determine the minimum required average compressive strength of concrete used as basis for selection of concrete proportions (f'cr).
5. Split Tensile strength at specified time (psi) (AASHTO T-198)
6. Unit weight (lbs/cy)
7. Total air content (%)
8. Drying shrinkage (%)

In the event that the proportions of concrete mixture designed by the Contractor does not produce concrete meeting the performance requirements for strength and the other requirements of this specification, the Contractor shall adjust the mix accordingly at no additional cost to the Authority. With this, the Contractor shall submit new certified test results for the adjusted concrete mix. No concrete, shall be placed until the Contractor executes the corrective measures submitted to obtain the required strength.

Whenever the Contractor modifies the concrete mix, other than minor (3%) adjustment in the relative quantities of fine and coarse aggregates, he shall submit copy of the new mix design to the Engineer together with

copies of test results of the new mix for approval before using the mix in the project.

In the event ready-mixed concrete from a commercial plant is used by the Contractor, such concrete and plant shall meet the requirements of AASHTO M-157 except as modified by these specifications and shall have been inspected and approved by the Authority for use on its projects within the last six months.

The concrete mix shall be of adequate fresh concrete properties to be placed, consolidated and finished without segregation or defects that will affect the performance of the concrete in service.

4. The mix of Accelerated Strength Concrete shall have a Maximum Cementitious Content of 825 (lbs. /cu. yd.). The Maximum Cementitious Content (lbs. /cu. yd.) refers to the total weight of Portland cement, Blended Hydraulic Cement, ground granulated blast-furnace slag, silica fume and fly ash added to the concrete expressed in lbs./cu. yd. When Table 937-1 requires coarse aggregate size #7 or #8, the maximum cementitious content (lbs. /cu. yd.) could be increased up to 15%.

5. All Supplementary Cementitious Materials (SCM) shall meet the following requirements:

a. Silica Fume can be used in concrete as a cement replacement on an equal weight basis. Maximum amounts of silica fume are in the range of up to six percent (6%) of the total weight of the cementitious material. The SCM limits presented above include any Silica Fume present in ASTM 1157 cements.

b. Fly ash can be used in concrete as a cement replacement on an equal weight basis. Maximum amounts of fly ash are in the range of up to thirty percent (30%). The SCM limits presented above include any Fly ash present in AASHTO M240 Type IP (MS) and ASTM 1157 cements.

Fly Ash for use with Portland cement or Performance Hydraulic Cements shall conform to the requirements of AASHTO M-295, Class F only. In addition, fly ash shall meet the following requirements:

1) Loss on Ignition is limited to a maximum of 2 percent.

2) Sulfur trioxide (SO_3) is limited to a maximum of 3

percent.

3) Available alkalis (expressed as Na_2O equivalent) is limited to a maximum of 1.5 percent.

4) The optional chemical requirements of AASHTO M-295 Table 1A shall apply in all cases.

5) Fly Ash shall not be substituted for Type IP blended cements.

c. Grade 100 or Grade 120 Ground Granulated Blast-Furnace Slag (GGBFS) can be use as a cement replacement on an equal weight basis. Maximum amounts of ground granulated blast-furnace slag are in the range of 25 to 65 percent added as a cement replacement on an equal weight basis of the cement being replaced. The SCM limits presented above include any Slag present in AASHTO M240 Type IS (MS) and ASTM 1157 cements.

d. The Contractor shall submit notarized material certificates for each Supplementary Cementitious Materials proposed to be used in conformance with Section 106.06 of the General Provisions.

e. Ternary and quaternary systems using Portland cement, Performance Hydraulic Cements, Class F fly ash, Slag and Silica Fume are encouraged. The individual amounts of Supplementary Cementitious Materials shall comply with previous sections. In ternary and quaternary systems the total combined amount of fly ash and silica fume as a cement replacement shall meet the limits for fly ash used alone for Cement replacement. The total combined amount of fly ash, silica fume, and slag as a cement replacement shall meet the limits for slag used alone for Cement replacement.

6. The bond strength of the Accelerated Strength Concrete in partial-depth repairs shall be verified in the field by the Contractor under the inspection of the Engineer, and it shall conform to the requirements of ASTM C 1583.

939-2.03 Water – The water used in mixing or curing concrete shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substance injurious to the finished product. The water will be tested in accordance with and shall meet the suggested requirements of AASHTO T 26. Water known to be of potable quality may be used without

testing. Where the source of water is relatively shallow, the intake shall be so enclosed as to exclude silt, mud, grass or other deleterious substances.

939-2.04 Hydraulic Cement:

a. Hydraulic Cement - All hydraulic cement shall meet Specification 701 "Hydraulic Cement" as modified in this Section.

b. Portland Cement – All Portland Cement shall meet AASHTO M-85 or blended Portland cement meeting AASHTO M-240 and the following requirements:

1) Provide cement that meets the requirements of AASHTO M-240, Type IP (MS) or Type IS (MS).
2) As an alternative provide a combination of AASHTO M-85 Type I, Type II or Type V cement and an AASHTO M-295 Class F fly ash, an AASHTO M-307 Silica Fume and/or an AASHTO M-302 Ground Granulated Blast-Furnace Slag having a sulfate expansion at 180 days of less than 0.10 percent when tested according to ASTM C-1012 using cementitious materials from the same sources as those proposed for use in the project. The pozzolan constituent of Type IP (MS) shall be in the range of 15 to 25 percent by weight of the Portland-pozzolan cementitious material on an equal weight basis (1:1).

c. Performance Hydraulic Cements – Provide Hydraulic Cements meeting the requirements of ASTM 1157 *"Performance Specifications for Hydraulic Cements"* for one of the following types MS(R), HS(R), MH(R) or LH(R).

The Contractor shall furnish mill certificates of the cement with the requirements of these specifications. When Type IP (MS), Type IS (MS) or Performance Hydraulic Cements (ASTM 1157) cement is used, the mill certificates shall include the amount of SCM used expressed as percentage on weight basis. Cement may also be accepted from pre-tested and approved bins. However, the Authority may sample and test the cement at any time, at its discretion and require additional mill certificates. Cement shall be protected from rain and moisture by storing in suitable weatherproof bins or buildings. Any cement damaged by moisture or which fails to meet any of the specified requirements will be rejected and shall be removed from the work site.

Cement stored by the Contractor for a period longer than 60 days shall require the Engineer's approval before being used in the work. Stored cement shall meet the specification requirements at any time after storage when retesting is ordered by the Engineer.

Cement of different brands, types, or from different mills shall be stored separately.

939-2.05 Fine Aggregate – Shall be clean and conform to the requirements of Section 7031 of Specification 703 - Aggregates, except that the grading shall conform to Grading A of Table 703-1 and that manufactured sand shall not be used as fine aggregate for all concrete that is to serve as the travel way to vehicular traffic (unless they are produced from a preapproved aggregate source that meets a minimum polishing value of 48 as determined by ASTM D 3319).

939-2.06 Coarse Aggregate

a. All aggregates shall be clean and sound and shall comply with AASHTO M 80 and M 6. Shall meet the requirements specified in Article 703-2 - of Specification 703 Aggregates, except that the gradings in Table 703-2 are to be limited to those included in Table 937-1 of this specification. In addition, for header material that is to serve as the travel way for vehicular traffic, such as concrete pavements, bridge decks and bridge approach slabs, the coarse aggregate shall have a minimum polishing value of 48 as determined by ASTM D 3319
b. Coarse Aggregate Size Number shall be as per Table 937-1

Table 937-1
REQUIRED COARSE AGGREGATE SIZE NUMBER

Repair Thickness	Size(s) Number(s) (ASTM C-33)
2" (0.051 m)	7,8
3" (0.076 m)	6,67
≥ 4" (0.102 m)	57,5,56

939-2.07 Chemical Admixtures - All chemical admixtures shall meet the requirements of Specification Section 711 - "Concrete Curing Materials and Admixtures" as modified in this section. Use all admixtures in accordance with manufacturers' recommendations. All admixtures must be submitted to the Engineer for approval prior to their use in the production of concrete. All chemical admixtures shall be protected from excessive temperature and direct sunlight in accordance with Manufacturer specifications.

a. Do not use admixtures which have not been incorporated and tested in accepted

and approved mix designs.

b. Contractor shall submit the manufacturer's written certification of compliance with the specifications per Section 106.06 of the General Provisions.

c. Use only admixtures that are compatible with each other, and that produce the desired concrete properties.

d. Water Reducing and Set Controlling Admixtures shall meet the requirements of AASHTO M-194.

e. Use only admixtures containing less than 0.05 percent chloride ions.

f. The use of calcium chloride as an admixture shall not be permitted.

g. When calcium nitrite is added to the concrete mix a water reducing retarding admixture (Type D) and a high range water reducing admixture (Type F) shall be used. Other corrosion inhibitors may be evaluated at the convenience of the Authority based upon the properties indicated below. Submit the following data and certification for the corrosion inhibitor:

1) Test results and performance data for each of the Physical Requirements (Table 1) of AASHTO M-194 for any type of admixture.

2) The contractor shall submit the corrosion inhibitor documentation, either in the form of literature or a letter from an authorized representative of the manufacturer, which documents that the chloride protection level meets or exceeds fifteen (15) lb/cy. Whenever used, the corrosion inhibitor shall be dosed at the required application rate to achieve the required level of chloride protection as stated above.

h. Water reducing, set retarding, or superplasticizers chemical admixtures may be used at the option of the Contractor but subject to approval by the Engineer. The Contractor shall designate in advance the types, trade names and manufacturer of admixtures that he proposes to use and only such admixtures as are approved by the Engineer shall be incorporated into the concrete.

i. Retarding admixtures may be used when the setting time of concrete must be retarded for proper placement. The quantity of admixture added to the mix shall be the minimum required for minimum retardation consistent with placing conditions. Retarding admixtures, when used, shall be added at the plant.

j. Use high range water reducing admixture in concrete mixtures incorporating silica

fume.

k. Shrinkage reducing admixtures (SRA) may be used. The Contractor shall submit with the concrete mix proposal the particular type, trade name, manufacturer, proposed dosage rate, manufacturer's product data, and recommendations for use, test results, and performance data of the SRA. If approved, no other SRA as shall be incorporated into the concrete.

939-2.08 Measuring and batching of materials shall be done at a batching plant. The measuring equipment and batching plant, and the measuring and batching procedures followed shall be in accordance with the requirements of AASHTO M-157.

939-2.09 Concrete may be mixed at a central plant, in truck mixers or at the site as described in these specifications. The mixing and delivery of concrete shall be in accordance with the requirements of AASHTO M-157 as modified and supplemented by the following paragraphs of this article.

a. The Contractor shall supply concrete at a rate consistent with placement operations as determined by the Engineer. The intervals between deliveries of batches shall not be so great as to allow the concrete in place to harden partially.

b. The Engineer may order discontinuing the use of any type of concrete mixing or transporting units that fail to meet the specification requirements.

c. Volumetric batching and continuous mixing mobile equipment may be used if approved by the Engineer. In such case, the batching and mixing shall be in accordance with AASHTO M-241.

d. When an approved retarding admixture is authorized, the 1-hour limitation between the introduction of the cement to the aggregates and discharge at the site may be increased to the amount stipulated in the previously submitted certified mix design. This time limitation may be exceeded if the concrete is of such slump and workability that it can be placed and consolidated properly without the addition of water to the batch.

e. The entire contents of the mixer shall be removed from the drum before materials for another batch are placed therein. Upon cessation of mixing

for a period exceeding one hour the mixer shall be thoroughly cleaned. The delivery unit shall also be completely emptied, cleaned and free from concrete and wash water before receiving the next load of concrete.

f. When a truck mixer or agitator is approved for mixing or delivery of concrete, the addition of water shall be as per ASTM C-94.

g. Certification of Batches - Before unloading at the site of delivery, the concrete supplier shall furnish to the Engineer delivery tickets containing the following information concerning the concrete in the truck. The tickets shall be issued to the truck operator at the proportioning plant for each load.

(1) Name and number of batch plant
(2) Serial number of ticket
(3) Date and truck number
(4) Name of Contractor
(5) Specific designation of job (name and location)
(6) Specific class of concrete in conformance with job specifications
(7) Volume of concrete (cubic yards)
(8) Batching tickets with a list of all the constituents and the amount of each one used for the mix (target and actual weights)
(9) For central mixed concrete, time when first mixing was completed at the central mix plant.
(10) For transit mixed concrete and truck-mixed concrete, time when the cement was introduced to the aggregates
(11) Name and quantity of admixtures, if any.
(12) Spaces to indicate time when discharge commenced and when completed.

The Authority may, at its discretion, inspect the weights at the batch plant. The Contractor shall provide all necessary facilities to assist the inspector in performing this task.

h. Delivery - The organization supplying concrete shall have sufficient plant capacity and transporting equipment to insure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such as to provide for the proper handling, placing and finishing of the concrete. The methods of delivering and handling the concrete shall be such that they will facilitate placing with the minimum of handling and without damage to the structure or the concrete.

i. Tempering - The concrete shall be mixed only in such quantities as are required for immediate use and any concrete which has developed initial set shall not be used. Tempering concrete by adding water or by other means will not be permitted.

939-2.10 Structural Bonding Agent – The Structural Bonding Agent shall be an Epoxy-Cementitious type as well as provide anti-corrosion coating for the steel reinforcement. The Contractor shall submit the product technical data sheets, certified test reports and Manufacturer's certifications for review and approval by the Engineer. The Structural Bonding Agent shall not be applied in the field or incorporated in to the work without prior approval by the Engineer.

a. The material properties shall meet the requirements specified in the following parameters and specifications:

Minimum Pot Life.....	60 minutes	
Minimum Bond Strength at 24 hr. Open Time.....	2,500 psi	(ASTM C 882)
Minimum Compressive Strength at 28 days.....	8,000 psi	(ASTM C 109)
Minimum Flexural Strength at 28 days…….....	1,000 psi	(ASTM C 348)
Minimum Splitting Tensile Strength at 28 days..…	600 psi	(ASTM C 496)

b. Acceptance of the material will be based on Manufacturer's certification establishing the material meets the contract requirements. However, failure by the material to perform adequately in actual use shall be just cause for rejection regardless of certification.

c. Material shall be factory packaged in strong moisture proof bags or containers capable of withstanding shipping, handling and storage without breakage. Material shall have a storage life of at least one year.

939-2.11 Asphalt Binder Material – The Asphalt Binder Material shall be modified elastomeric binder or polymer modified asphalt binder for bridge joint system repair. The Binder Material shall resist the typical road chemicals including fuels, oils and others. The modified elastomeric binder shall meet or exceed the requirements of ASTM D 3405 and ASTM D 1190. The polymer modified asphalt binder shall meet the requirements of ASTM D 6297 and ASTM D 5167. The Contractor shall submit the product technical data sheets and Manufacturer's certifications for review and approval by the Engineer. When required by the Engineer, the Contractor shall also submit certified test reports for approval.

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939-2.12 Structural Bonding Agent – The Structural Bonding Agent shall be an Epoxy-Cementitious type as well as provide anti-corrosion coating for the steel reinforcement. The Contractor shall submit the product technical data sheets, certified test reports and Manufacturer's certifications for review and approval by the Engineer.

a. The material properties shall meet the requirements specified in the following parameters and specifications:

Minimum Pot Life.....…….….....	60 minutes
Minimum Bond Strength at 24 hr. Open Time.....	2,500 psi (ASTM C 882)
Minimum Compressive Strength at 28 days.....	8,000 psi (ASTM C 109)
Minimum Flexural Strength at 28 days……..……	1,000 psi (ASTM C 348)
Minimum Splitting Tensile Strength at 28 days…….	600 psi (ASTM C 496)

b. Acceptance of the material will be based on Manufacturer's certification establishing the material meets the contract requirements. However, failure by the material to perform adequately in actual use shall be just cause for rejection regardless of certification.

c. Material shall be factory packaged in strong moisture proof bags or containers capable of withstanding shipping, handling and storage without breakage. Material shall have a storage life of at least one year.

939-2.13 Structural Crack Healer / Sealer – The Structural Crack Healer / Sealer shall be a low-viscosity epoxy crack healer / sealer and high-strength adhesive for structures exposed to pneumatic tire traffic, water, chlorides, and chemical attacks. The Structural Crack Healer / Sealer shall meet the requirements specified in ASTM C 881 and AASHTO M 235 Specifications. The Contractor shall submit the product technical data sheets and Manufacturer's certifications for review and approval by the Engineer. When required by the Engineer, the Contractor shall also submit certified test reports for approval.

a. The material properties shall meet the requirements specified in the following parameters and specifications:

Maximum Viscosity (low, Grade 1)..……..…..…	90 cps	(ASTM D 2393)
Minimum Pot Life.....……..….....…	25 minutes	
Minimum Bond Strength at 2 days in 73°F.....	1,300 psi	(ASTM C 882)
Minimum Compressive Strength at 7 days in 73°F....	10,000 psi	(ASTM D 695)
Minimum Flexural Strength at 7 days in 73°F...……	9,000 psi	(ASTM D 790)
Minimum Tensile Strength at 7 days in 73°F…...….	7,000 psi	(ASTM D 638)

b. Acceptance of the material will be based on Manufacturer's certification establishing the material meets the contract requirements. However, failure by the material to perform adequately in actual use shall be just cause for rejection regardless of certification.

c. Material shall be factory packaged in strong moisture proof bags or containers capable of withstanding shipping, handling and storage without breakage. Material shall have a storage life of at least one year.

939-2.14 Corrosion Inhibitor – The Corrosion Inhibitor shall be a low-viscosity combination of amino alcohols, and inorganic inhibitors. It shall protect or reduce the corrosion in reinforced concrete structures exposed to pneumatic tire traffic, water, chlorides, and chemical attacks. The product shall meet the requirements specified in ASTM G 109 Specification with a viscosity less than 25 centipoise (CPS). The Corrosion Inhibitor shall not be slippery when the product dries. The Contractor shall submit the product technical data sheets and Manufacturer's certifications for review and approval by the Engineer. When required by the Engineer, the Contractor shall also submit certified test reports for approval.

a. Acceptance of the material will be based on Manufacturer's certification establishing the material meets the contract requirements. However, failure by the material to perform adequately in actual use shall be just cause for rejection regardless of certification.

b. Material shall be factory packaged in strong moisture proof bags or containers capable of withstanding shipping, handling and storage without breakage. Material shall have a storage life of at least one year.

939-2.15 Bridge Joint System – The Bridge Joint System shall be of the following types as shown on plans or contract documents: *Concrete Bridge Joint System*, *Asphaltic Bridge Joint System*, *Longitudinal Bridge Joint System, Special Concrete Bridge Joint System,* or *Special Asphaltic Bridge Joint System*. The Contractor shall submit the product technical data sheets and Manufacturer's certifications for

review and approval by the Engineer. When required by the Engineer, the Contractor shall also submit certified test reports for approval.

a. The *Concrete Bridge Joint System* shall include the Adhesive-Lubricant, Silicone Joint Sealant, Compression Seal and Premolded Joint Filler.

b. The *Asphaltic Bridge Joint System* shall include the Traffic Bearing Plate, Backer Rod, Expansion Gap, Galvanized Pins, Premolded Joint Filler, Adhesive-Lubricant, Structural Bonding Agent, Asphalt Primer and the Asphalt Binder Material.

c. The *Longitudinal Bridge Joint System* shall include the Compression Seal for concrete joint system or Reinforced Elastomeric Pad for asphaltic joint system, Adhesive-Lubricant, Silicone Joint Sealant, and Premolded Joint Filler.

d. The *Special Concrete Bridge Joint System* shall include the Adhesive-Lubricant, Hot Poured Joint Sealant, Compression Seal and Premolded Joint Filler.

e. The *Special Asphaltic Bridge Joint System* shall include the Reinforced Elastomeric Pad, Silicone Joint Sealant, Premolded Joint Filler, Adhesive-Lubricant, Structural Bonding Agent, Asphalt Primer and the Asphalt Binder Material.

939-2.16 Miscellaneous Materials

a. The **Silicone Joint Sealant** shall be one-component (Type S) silicone formulation and is furnished ready for application. The Silicone Joint Sealant shall meet the requirements specified in Table 705-1 of Standard Specification 705 – "Joint Materials". Acid cure sealants shall not be accepted.

b. The **Structural Silicone Joint Sealant** shall be one-component (Type S), grade P or NS, and of grade and use suitable traffic applications (use T) and ready for application. The Structural Joint Sealant shall meet the requirements specified in ASTM C 920 or ASTM D 5893 and ASTM C 1184. Acid cure sealants shall not be accepted.

b. The **Adhesive-Lubricant** shall meet the requirements specified in ASTM D 4070.

c. The **Compression Seal** shall be pre-formed, pre-compressed and self-expanding polyurethane foam with pre-coated silicon surface, field-molded-structural silicone or neoprene as specified in the construction plans. Neoprene seals shall meet the requirements specified in ASTM D 3542 and AASHTO M 297. The minimum width of uninstalled Compression Seal shall be 1.25 times the width of bridge opened joint.

d. The **Traffic Bearing Plate** shall meet the requirements specified in ASTM A 36, ASTM A 123, and AASHTO M 111.

e. The **Galvanized Pins** shall be 16D galvanized common nails and shall be placed through the holes in the Traffic Bearing Plate and down into the bridge open joint. The Galvanized Pins shall meet the requirements specified in ASTM A 123, and AASHTO M 111.

f. The **Backer Rod** shall be compressible, non-shrinkable, non-absorptive, and non-reactive with the joint sealant, such as stitched cotton piping cord, closed cell polyethylene foam rod, neoprene foam rubber or approved equal. The Backer Rod shall meet the requirements specified in ASTM D 5249.

g. The **Asphalt Primer** shall meet the requirements specified in ASTM D 41 and AASHTO M 116.

h. The **Reinforced Elastomeric Pad** shall meet the requirements of Specification 717 – "Elastomeric Bearings". The Reinforced Elastomeric Pad shall be laminated bearings consisting of layers of elastomer restrained at their interfaces by bonded laminates. The elastomer portion shall be 100 percent virgin chloroprene (neoprene) with a durometer of 50.

i. The **Steel Reinforcement** shall meet the requirements of Specification 602 – "Steel Reinforcing".

j. The **Hot Poured Joint Sealant** shall be a single component, hot-applied, polymer modified, asphalt base joint sealant to fill joints in bituminous and concrete substrates in hot climates. The hot poured joint sealant shall meet the requirements of AASHTO M 301 and ASTM D 3405.

939-2.17 Sampling and Testing - Acceptance and laboratory testing will be performed by the Authority.

a. Compliance with the requirements included in the above articles will be determined in accordance with the following AASHTO and ASTM standards:

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Sampling Fresh Concrete	T 141
Size of Aggregates	T 27
Consistency (Slump)	T 119
Weight per Cu. Ft. and Air Content	T 121
Air Content of Freshly Mixed Concrete (Pressure Method)	T 152
Air Content of Freshly Mixed Concrete (Volumetric Method)	T 196
Making and Curing Concrete Test Specimens in the Field	T 23
Compressive Strength of Cylindrical Concrete Specimens	T 22
Temperature of Fresh Concrete	C1064
Concrete Bond Strength	C1483
Split Tensile Strength	T 198
Standard Test Method for Compressive Properties of Rigid Plastics	D695

b. Sampling frequency for compressive strength testing shall be one set of six cylinders shall be obtained from each lot of 3.0 cubic meters or fraction thereof placed of Header Material per bridge for testing. The specimens shall be taken, handled and transported by the Contractor to the designated laboratory, under the supervision of the Material Testing Office representative and the Engineer. It shall be the Contractor's responsibility to coordinate the presence of a Material Testing Office representative, as well as with the designated laboratory, if delivery of the specimens is to be made outside of the laboratory normal working hours. All testing for acceptance shall be based only on the concrete cylinder samples obtained from each lot during mix placement operation.

c. The transportation of the specimens is the responsibility of the Contractor and requires special handling by the Contractor. In addition, the transportation from the project site to the designated PRHTA Materials Testing Laboratory shall be performed under the direct supervision of the Engineer. It shall be the Contractor's responsibility to coordinate transportation at least 36 hours in advance of the proposed pour with the Engineer and PRHTA Material Testing Office laboratory. As a minimum, the Contractor shall assure that specimens are enclosed in a rigid container and that they be surrounded by a minimum of three inches of adequate padding material around each specimen. The Contractor shall properly secure the transportation container to prevent excessive movement that may cause contact between the specimens. The Contractor shall furnish at no additional cost to the Authority all personnel, materials, and equipment necessary to comply with these requirements.

d. Additional sets of specimens will be made as needed to determine when a structure may be put into service, or if the Engineer deems it necessary to determine the acceptability of Header Material with no additional cost to the Authority for any additional set.

e. The Contractor shall furnish at his expense all metal molds or single use plastic molds with lids, conforming AASHTO and ASTM applicable standards that are necessary to comply with the required frequency of sampling. As a subsidiary obligation, when using single use plastic molds, the Contractor shall furnish stripping tools such as Gilson HM160, Humbold H3041S/H-3041SM, Myers ST-1/ST-2, or approved equal or equivalent for removing the sample from the mold. Cardboard molds will not be accepted.

f. Slump tests, and other tests when applicable, shall be made from each batch of lot of 3.0 cubic meters or fraction thereof placed of Header Material per bridge from which test cylinders are taken. These tests will be made by the Contractor. Additional slump tests could be required as determined by the Engineer to check the consistency of the Header Material.

g. Samples of each Type of Header Material will be taken of the fresh mix in situ or delivered to the project by the Contractor under the direction and supervision of the Engineer. For these samples, the mortar will be washed out and the remaining aggregates will be tested for compliance with the requirements of Articles **939-2.06** of this specification.

h. All the field sampling tests requirements for fresh concrete included in this section shall be performed by a certified technician as determined by the Engineer and under his supervision. The certified technician shall possess an active Field Testing Technician Certification from the ACT Technician Training Certification Program or an active certification from American Concrete Institute as Field Testing Technician Grade I.

939-2.18 Basis of Acceptance of each Type of Header Material

a. In general, the acceptability of the quality of each Type of the Header Material delivered to or made at the jobsite will be based on slump tests, air content test, aggregate tests and on the results of standard compressive strength tests of representative samples as covered by these specifications. However, this does not relieve the responsibility of the Contractor for the Header Material during placement, consolidation, finishing, curing and protection prior to final acceptance by the Authority.

b. Failure of the Coarse Aggregate to meet the polishing value requirements shall be cause for the rejection and removal of each Type of Header Material for use on vehicular travel ways.

c. The compressive strength of the quantity of each Type of Header Material placed and represented by one set of cylinders shall be determined as the average of the three cylinders comprising the set. If the Engineer determined that any cylinder shows evidence of improper sampling, molding, handling, curing or testing, the test result of such defective cylinder shall be discarded and the compressive strength of each Type of Header Material represented shall be determined from the test results of the remaining cylinders. Low strength shall not be a basis for discarding a cylinder test result.

d. The compressive strength level of each Type of Header Material will be considered satisfactory if both of the following requirements are met:

   l. The average of all sets of three strength tests equals or exceeds the specified compressive strength for all types of Header Material.

   2. No individual strength test (average of cylinder set) falls below the specified compressive strength by more than 500 psi.

e. When the average of all sets of each Type of Header Material fails to meet the compressive strength requirement, the Header Material will be considered deficient but will be accepted if the deficiency in the average does not exceed 500 psi, but payment for the Header Material by the failing averages will be paid for at the reduced unit price as specified in Article **939-5.08**.

f. Should each Type of Header Material used in the work fail to conform to the requirements in paragraph "d" above, the Contractor shall make at his expense corrective changes subjected to the approval of the Engineer, in the material mix proportions or in the Header Material fabrication procedures, before placing additional Header Material.

g. All Header Material represented by a cylinder set which shows a strength falling below the specified value by more than 500 psi will be considered deficient and will be rejected. Such lots may be accepted at the discretion of the Authority at a reduced price to be determined by the Authority on the basis of inspection and evaluation of the deficient Header Material under traffic.

h. Retesting shall not be permitted.

i. Each Type of Header Material that fails the specimen strength tests acceptance criteria is rejected and shall be removed and disposed of at the Contractor's expense. In some cases, the location of rejected Header Material may be such as to require the removal, at the Contractor's expense, of otherwise satisfactory Header Material. The removal shall be performed in such a manner as will not cause damage to the remaining Header Material or to other units of the structure.

939-3 CONSTRUCTION REQUIREMENTS

939-3.01 General

a. The repairs of the bridge joint system shall be performed according to the details and notes shown on plans or as ordered by the Engineer.

b. The joint repair operations will be conducted in half width of bridge at a time offering minimum inconvenience to public traffic. The work shall be accomplished in coordination with other operations in progress within an area. Speed control measurements shall be in place when traffic is allowed through the bridge and until final curing is completed. Speed control measurements are subsidiary item of Header Material.

c. A Bridge Joint Repair Pre-Construction Meeting discussing surface preparation, Header Material placement and curing, and compression seal placement procedures shall be held at the jobsite at least 10 working days before beginning repair operations. The contractor shall coordinate with the Engineer at least 10 working days in advance; the proposed meeting the time, place, and agenda of the meeting to ensure the attendance of representatives of all subcontractors and suppliers involved in the deck repair process. The engineer may require at his discretion the presence of any additional personnel.

   At this meeting, the contractor shall submit a joint repair plan that includes all work related to surface preparation, Header Material production, placement, and curing. The Contractor shall also discuss its quality control procedures as well as the contract quality assurance and acceptance requirements. The presence of the contractor, its subcontractors, concrete supplier, specialty material suppliers for structural bonding agent if applies, structural crack healer/sealer and corrosion inhibitor (impregnated) is mandatory. Also, the Engineer and the inspectors will attend this meeting.

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SPECIFICATION 939 - BRIDGE JOINT SYSTEM REPAIR

The contractor shall submit to the Engineer a revised joint repair plan that includes any changes, revisions made and agreements reached during the Bridge Joint Repair Pre-Construction Meeting. The revised construction plan shall be submitted at least 5 working days before the proposed repair operation. No joint repair operations shall be conducted until the Engineer has accepted the plan. The Bridge Joint Repair Pre-Construction Meeting and the joint repair plan are subsidiary work to the applicable Deck Patching Material items in the project at no additional cost to the Authority. This plan shall include all applicable items as determined by the Engineer but shall not be limited to the following:

1) All equipment to be used during the procedures including contingency equipments.
2) Procedures for surface preparation, placing, consolidating, finishing and curing. The procedures shall include a detailed CPM showing all the activities required to successfully reconstruct the joint and its interrelationships.
3) Measures to effectively maintain the evaporation rate throughout the placement area below the limits required in this specification. Such procedures may include but are not limited to the following:
   a. Produce, deliver, and place concrete at the lowest acceptable temperature to conform to evaporation rate limits.
   b. Erecting windbreaks to effectively reduce the wind speeds throughout the placement area.
   c. Fog spraying throughout the placement area to effectively increase the relative humidity.
   d. Placing concrete at favorable ambient temperature conditions.
4) Use of vibrators
5) Concrete placing rate
6) Contingency measurements
7) Safety and security provisions
8) Use of retarding admixtures, setting time of concrete for proper placement. Minimum retardation consistent with placing conditions.
9) Compliance with PRHTA concrete plant inspection requirements
10) Contractor Quality Control Procedures
11) Contract Quality Assurance and Acceptance Requirements
12) MOT and speed control measurements
13) Other applicable requirements or procedures included in this specification.

d. Protection from adverse hot weather conditions before, during and after placement including air temperature, relative humidity and evaporation rate of the accelerated concrete shall be clearly established in the joint repair plan and shall

comply with the requirements of SP-937 – Bridge Concrete Deck Repair, Section 937-3.01 (e and f).

939-3.02 Equipment

a. The Contractor shall use sawing equipment adequate in size and power to saw cut the joints and other sides of the areas to be repair to the required widths and depths.

b. A lightweight power chipping hammer or hand tools shall be used for removal of defective concrete. Only power operated equipment, capable of producing a surface profile International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) 6 to 8 shall be used. The lightweight power chipping hammer shall be pneumatic or electric hammers and these shall not be heavier than **20 pounds**. The lightweight power hammers, and chipping tools shall not be operated at an angle exceeding 60 degrees relative to the surface of the bridge deck or approach slabs. Such tools may be started in the vertical position but must be immediately tilted to a 60 degree operation angle.

939-3.03 Preparation for Bridge Joint Repair

a. For Partial Repair of Bridge Joint System:

1. The Contractor shall remove the asphalt or concrete patch or overlay over bridge open joint with a lightweight power chipping hammer or hand tools, if it applies. The Contractor shall remove the existing bridge joint system in armored and armorless joint.

2. The following preparation applies to armorless joint only.

(a) If it applies, the Contractor shall cut to a maximum depth of 0.10 meter with a saw cutting equipment. The minimum distance for the limit of saw cutting shall be 0.013 meter in both sides of bridge open joint. All cuts shall be made at right angles as shown on the details.

(b) If it applies, after the limit of saw cutting is defined, the existing concrete shall be removed carefully with a lightweight power chipping hammer. Remove the debris and clean the surface.

(c) Grinding the damaged corners and the surface of blockout. All surfaces of blockout and the existing steel reinforcement shall be

dried, cleaned, free from all dust, laitance oil, and foreign material before applying the Corrosion Inhibitor.

(d) All surfaces of blockout and the existing steel reinforcement shall be treated with a Corrosion Inhibitor.

b. For Full Repair of Bridge Joint System:

1. The Contractor shall remove the asphalt or concrete patch or overlay over bridge open joint with a lightweight power chipping hammer or hand tools, if it applies. The Contractor shall remove the existing bridge joint system and the steel angles, if it applies.

2. The Contractor shall cut to a maximum depth of 0.025 meter with a sawing equipment and avoid the cutting of the existing steel reinforcement. The minimum distance for limit of saw cutting shall be 0.30 meter in both sides of bridge open joint. All cuts shall be made at right angles as shown on the details.

3. After the limit of saw cutting is defined, the existing concrete shall be removed carefully with a lightweight power chipping hammer. Remove the debris and clean the surface.

4. The existing steel reinforcement shall not be damaged, and it shall remain during the removal of the existing concrete. The existing steel reinforcement shall be cleaned with water blasting in all corroded or dirty areas.

5. Install the new steel reinforcement in each side of blockout, if it applies.

6. All surfaces of concrete slab to be repaired and steel reinforcement shall be dried, cleaned, free from all dust, laitance oil, and any foreign material before applying the Structural Bonding Agent and placing the Header Material.

7. All surfaces of concrete slab to be repaired shall be treated with a Structural Bonding Agent before placing the Polymer Concrete or Elastomeric Concrete Header Materials. The Structural Bonding Agent shall be broomed into the surface with a stiff bristle broom. The thickness of application shall be an average of 20 to 25 mils. If the concrete substrate absorbs the Structural Bonding Agent, another coat shall be applied.

8. Before placing the accelerated concrete as Header Material, all surfaces of the area to be repaired shall be saturated. The substrate shall be soaked in water for a period of 12 to 24 hours in advance of the placement.

9. The Contractor shall supply additional moisture to exposed surfaces of the substrate. A burlap or cotton mat system with white plastic or other suitable moisture retaining material shall be provided to protect the substrate from the sun and provide a system to maintain the substrate continuously and thoroughly saturated.

10. The contractor shall remove any excess of water from substrate surface employing a high-pressure air hose. The substrate surfaces shall be Saturated Surface Dry (SSD) before placing the accelerated concrete as Header Material. Care must be exercised to ensure that all prepared surface areas have no excess of water. No excess of water is permitted to collect in pockets.

11. The substrate must not be allowed to dry prior to placement of any portion of the accelerated concrete as Header Material. Accelerated concrete shall only be placed on Saturated Surface Dry (SSD) substrate surfaces.

12. Place in situ the Header Material. The Header Material shall meet the requirements of this specification.

13. The Header Material shall be cured in accordance of the Article **939-3.04** of this specification.

14. The Contractor shall apply a Structural Crack Healer / Sealer between the Header Material and existing concrete slab at top of construction joint.

939-3.04 Curing of Header Material

a. General

1. Curing shall be initiated immediately after placing and finishing. Curing shall be done so that moisture is always present and shall be an integral part of the mix operations. Improperly cured Header Material will be considered defective and the Engineer will stop all the Contractor's mix placing operations until proper curing procedures are put into effect.

2. The Polymer Concrete and Elastomeric Concrete shall be cured as recommended by the Product's Manufacturer.

3. The Accelerated Concrete shall be cured according to the requirements, methods and procedures of SP-937 – Bridge Concrete Deck Repair, Section 937-3.07.

4. The Contractor will be held responsible for any cracking of the Header Material and will be the Contractor's responsibility to repair or remove and replace the affected Header Material at no cost to the Authority.

939-3.05 Installation of Bridge Joint System

a. The Bridge Joint System shall be of the following types as indicated on plans or contract documents: *Concrete Bridge Joint System*, *Asphaltic Bridge Joint System*, *Longitudinal Bridge Joint System*, *Special Concrete Bridge Joint System* or *Special Asphaltic Bridge Joint System*.

b. The *Concrete Bridge Joint System* shall be installed as follows:

   1. Apply the Adhesive-Lubricant to the Header Material, existing concrete or steel angles surface as it applies.

   2. Install new Compression Seal and Silicone Joint Sealant.

c. The *Asphaltic Bridge Joint System* shall be installed as follows:

   1. Apply the Structural Bonding Agent in one side of open joint over Header Material, existing concrete slab or steel angles as it applies.

   2. Install the Traffic Bearing Plate with Backer Rod, Expansion Gap, Galvanized Pins and other accessories.

   3. Apply the Asphalt Primer to the surfaces of Header Material, concrete slab and vertical sides of bituminous surface course.

   4. Place the Asphalt Binder Material between bituminous surface course.

d. The *Longitudinal Bridge Joint System* shall be installed as follows:

1. Apply the Adhesive-Lubricant to the concrete surface as it applies in the types of bridge joint systems.

2. Install new Compression Seal for concrete joint system or Reinforced Elastomeric Pad for asphaltic joint system, and Silicone Joint Sealant.
3. For asphaltic joint system only, apply the Asphalt Primer to the surfaces of concrete slab, tar paper, and vertical sides of bituminous surface course.

4. For asphaltic joint system only, place the Asphalt Binder Material between bituminous surface course.

e. The *Special Concrete Bridge Joint System* shall be installed as follows:

1. Use the procedures for Full Bridge Joint Repair in accordance of the Article **939-3.03b** of this specification.

2. Apply the Adhesive-Lubricant to the Header Material.

3. Install new Compression Seal.

f. The *Special Asphaltic Bridge Joint System* shall be installed as follows:

1. Use the procedures for Full Bridge Joint Repair in accordance of the Article **939-3.03b** of this specification.

2. Apply the Adhesive-Lubricant in one side of open joint over Header Material.

3. Install the Reinforced Elastomeric Pads, Silicone Joint Sealant, tar paper, and other accessories.

4. Apply the Asphalt Primer to the surfaces of concrete slab, tar paper, and vertical sides of bituminous surface course.

5. Place the Asphalt Binder Material between bituminous surface course.

939-4 METHOD OF MEASUREMENT

939-4.01 The *Header Material* will be measured by the cubic meter or linear meter in accordance with the dimensions of each Type shown on the plans or ordered by the Engineer.

939-4.02 The *Concrete Bridge Joint System* will be measured by the linear meter of Bridge Joint System completed and accepted.

939-4.03 The *Asphaltic Bridge Joint System* will be measured by the linear meter of Bridge Joint System completed and accepted.

939-4.04 The *Longitudinal Bridge Joint System* will be measured by the linear meter of Bridge Joint System completed and accepted.

939-4.05 The *Special Concrete Bridge Joint System* will be measured by the linear meter of Bridge Joint System completed and accepted.

939-4.06 The *Special Asphaltic Bridge Joint System* will be measured by the linear meter of Bridge Joint System completed and accepted.

939-4.07 The *Sealing of Construction Joints in Bridge Joint System* will be measured by the linear meter of construction joint sealed and accepted. No separate measurement will be made for construction joints ordered by the Engineer to be re-sealed due to improper installation or damages caused by the Contractor's operations.

939-4.08 Each Type of Header Material for the test specimens will not be measured for payment but shall be a subsidiary obligation of the Contractor.

939-5 BASIS OF PAYMENT

939-5.01 Header Material (Type)

a. The completed and accepted quantities of each Type of *Header Material*, measured as Article **939-4.01**, will be paid for at the contract unit price per unit of measurement except as specified in Article **939-5.08**. Such prices and payment shall constitute full compensation for all saw cutting, cleaning, placing, finishing and curing, including the furnishing of all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

b. The unit prices of each Type of Header Material include full compensation for furnishing, cleaning and placing or applying all subsidiary items necessary to complete the bridge open joint repair such as Structural Bonding Agent,

Structural Crack Healer / Sealer and Miscellaneous Materials called for in the contract documents unless they constitute or are specifically covered by other pay items included in the contract.

c. The full compensation for furnishing of equipments and operations for removal of existing bituminous or concrete patchs on bridge concrete deck shall be a subsidiary obligation of the Contractor under the pay item for each Type of Header Material.

d. No separate pay allowance will be made for any increased cement content, for any admixtures, nor for any finishing of any description for concrete surfaces indicated on the plans or required by the specifications.

e. No additional payment will be made for any Type of Header Material over dimensions stipulated in the contract documents nor for strength in excess of that specified. No payment will be made for the removal and disposal of any Type of Header Material found deficient and not accepted.

939-5.02 Concrete Bridge Joint System

a. The completed and accepted quantities of *Concrete Bridge Joint System*, measured as Article **939-4.02**, will be paid for at the contract unit price per unit of measurement. Such prices and payment shall constitute full compensation for all saw cutting, cleaning, placing and curing, including the furnishing of all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

b. The unit prices of Concrete Bridge Joint System include full compensation for furnishing, cleaning and placing or applying all subsidiary items necessary to complete this bridge joint system such as Premolded Joint Filler, Adhesive-Lubricant, Compression Seal, Silicone Joint Sealant, Corrosion Inhibitor, and Miscellaneous Materials called for in the contract documents unless they constitute or are specifically covered by other pay items included in the contract.

c. The full compensation for furnishing of equipments and operations for removal of existing bridge joint systems shall be a subsidiary obligation of the Contractor under the pay item for Concrete Bridge Joint System.

939-5.03 Asphaltic Bridge Joint System

a. The completed and accepted quantities of *Asphaltic Bridge Joint System*, measured as Article **939-4.03**, will be paid for at the contract unit price per unit of measurement. Such prices and payment shall constitute full compensation for all the saw cutting, removal, cleaning, placing and curing, including the furnishing of all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

b. The unit prices of Asphaltic Bridge Joint System include full compensation for furnishing, cleaning and placing or applying all subsidiary items necessary to complete this bridge joint system such as Traffic Bearing Plate, Premolded Joint Filler, Backer Rod, Expansion Gap, Galvanized Pins, Adhesive-Lubricant, Structural Bonding Agent, Asphalt Primer, Asphalt Binder Material, Corrosion Inhibitor, and Miscellaneous Materials called for in the contract documents unless they constitute or are specifically covered by other pay items included in the contract.

c. The full compensation for furnishing of equipments and operations for removal of existing bridge joint systems shall be a subsidiary obligation of the Contractor under the pay item for Asphaltic Bridge Joint System.

939-5.04 Longitudinal Bridge Joint System

a. The completed and accepted quantities of *Longitudinal Bridge Joint System*, measured as Article **939-4.04**, will be paid for at the contract unit price per unit of measurement. Such prices and payment shall constitute full compensation for all saw cutting, cleaning, placing and curing, including the furnishing of all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

b. The unit prices of Longitudinal Bridge Joint System include full compensation for furnishing, cleaning and placing or applying all subsidiary items necessary to complete this bridge joint system such as Premolded Joint Filler, Adhesive-Lubricant, and Compression Seal for concrete joint system or Reinforced Elastomeric Pad, tar paper, Asphalt Primer and Asphalt Binder Material for asphaltic joint system, Silicone Joint Sealant, and Miscellaneous Materials called for in the contract documents unless they constitute or are specifically covered by other pay items included in the contract.

c. The full compensation for furnishing of equipments and operations for removal of existing bridge joint systems shall be a subsidiary obligation of the Contractor under the pay item for Longitudinal Bridge Joint System.

939-5.05 Special Concrete Bridge Joint System

a. The completed and accepted quantities of *Special Concrete Bridge Joint System*, measured as Article **939-4.05**, will be paid for at the contract unit price per unit of measurement. Such prices and payment shall constitute full compensation for all saw cutting, cleaning, placing and curing, including the furnishing of all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

b. The unit prices of Special Concrete Bridge Joint System include full compensation for furnishing, cleaning and placing or applying all subsidiary items necessary to complete this bridge joint system such as Premolded Joint Filler, Adhesive-Lubricant, Compression Seal, Steel Reinforcement, and Miscellaneous Materials called for in the contract documents unless they constitute or are specifically covered by other pay items included in the contract.

c. The full compensation for furnishing of equipments and operations for removal of existing bridge joint systems shall be a subsidiary obligation of the Contractor under the pay item for Special Concrete Bridge Joint System.

939-5.06 Special Asphaltic Bridge Joint System

a. The completed and accepted quantities of *Special Asphaltic Bridge Joint System*, measured as Article **939-4.06**, will be paid for at the contract unit price per unit of measurement. Such prices and payment shall constitute full compensation for all the saw cutting, removal, cleaning, placing and curing, including the furnishing of all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

b. The unit prices of Special Asphaltic Bridge Joint System include full compensation for furnishing, cleaning and placing or applying all subsidiary items necessary to complete this bridge joint system such as Reinforced Elastomeric Pad, Premolded Joint Filler, Silicone Joint Sealant, Adhesive-Lubricant, Structural Bonding Agent, tar paper, Asphalt Primer, Asphalt Binder Material, and Miscellaneous Materials called for in the contract

documents unless they constitute or are specifically covered by other pay items included in the contract.

c. The full compensation for furnishing of equipments and operations for removal of existing bridge joint systems shall be a subsidiary obligation of the Contractor under the pay item for Special Asphaltic Bridge Joint System.

939-5.07 Sealing of Construction Joints in Bridge Joint Systems – The completed and accepted quantities of *Sealing of Construction Joints in Bridge Joint System*, measured as Article **939-4.07**, will be paid for at the contract unit price per unit of measurement. Such prices and payment shall constitute full compensation for all saw cutting, cleaning and sealing, including the furnishing and placing or applying of Structural Crack Healer / Sealer and all required materials, and for all equipment, tools, labor and incidentals necessary to complete each item as required by the plans and specifications.

939-5.08 Price Reduction – Each Type of Header Material found deficient in strength but which is accepted by the Authority under the provision of Article **939-2.12** of this specification will be paid for at a reduced unit price.

a. The reduction in unit price of each Type of Header Material will be computed in accordance with the following formula:

$R = 0.05\ D$

where R = Percentage reduction in unit price of the Header Material.

D = Deficiency in psi of the average value from the specified strength.

b. The price reduction will be applied to all the volume of each Type of Header Material represented by the three cylinder sets in an average subject to the following:

1. No price reduction will be applied when the deficiency “D” in the average does not exceed 100 psi.

2. Drilling and testing cores shall not be permitted for price reduction.

SPECIAL PROVISION

SPECIFICATION 939 - BRIDGE JOINT SYSTEM REPAIR

939-5.09 Payment will be made under:

Pay Item	**Pay Unit**
Header Material (Polymer Concrete).....	Cubic Meter or Linear Meter
Header Material (Elastomeric Concrete).....	Cubic Meter or Linear Meter
Header Material (Accelerated Strength Concrete).....	Cubic Meter or Linear Meter
Concrete Bridge Joint System, Type __.....	Linear Meter
Asphaltic Bridge Joint System, Type __.....	Linear Meter
Longitudinal Bridge Joint System, Type __.....	Linear Meter
Special Concrete Bridge Joint System…….....	Linear Meter
Special Asphaltic Bridge Joint System…….....	Linear Meter
Sealing of Construction Joints in Bridge Joint System...……....	Linear Meter