SPECIFICATIONS – JOB SPECIFIC

SPECIFICATIONS – JOB SPECIFIC

INDEX

Remove **Subsection 105.02, Plans and Shop Drawings**, pages 1-32 and 1-33 of the RI Standard Specifications for Road and Bridge Construction in its entirety and replace it with the following:

JOB SPECIFIC

PLANS AND SHOP DRAWINGS

105.02 Plans and Shop Drawings. Plans shall be supplemented by Contractor-prepared Shop Drawings as necessary to control the Work and its prosecution. Shop Drawings consisting of details that are not included in the Plans but required for the Work shall be furnished to the Department. Copies of any calculations required or used to prepare the Shop Drawings shall be furnished with the submission. Manufacturer's engineering data for prefabricated material, including that for falsework and forms shall be furnished with each set of Shop Drawings.

1) The Contractor shall submit to the Department for approval or documentation, the necessary Shop Drawings in a timely manner so as not to adversely affect the Contractor's accepted schedule. The Contractor shall not perform work for items requiring shop drawings before receiving approval of the corresponding Shop Drawings. This approval shall neither confer upon the State nor relieve the Contractor of any responsibility for the accuracy and completeness of the drawings, conformity with Contract requirements and successful completion of the Contract. Prior to approval of the Contractor's shop drawing the Contractor bears all risk and all costs of delays for items related to the respective shop drawing.

2) Shop Drawings illustrate the Contractor's way it intends to carry out the design concepts contained in the Contract and are not part of the Contract. The Contractor's submission of a Shop Drawing represents to the Engineer that the Contractor (i) coordinated the Shop Drawing with the Contract; (ii) verified and measured the field dimensions and other information; (iii) calculated all details, construction and performance criteria; and (iv) reviewed and accepted the Shop Drawings as its means and methods.

3) Submission of Shop Drawings. All shop drawings shall be submitted in a timely fashion such that the Contractor's accepted schedule will not be adversely impacted by the submittal process.

   Shop drawing submittals shall be via PDF files submitted electronically by the Contractor into the Department's web-based Project Management Portal(PMP),per RIDOT procedure posted in the Documents Tab. Each

shop drawing submittal shall be accompanied by design computations, cuts from manufacturers' catalogs, and/or all other supporting technical bulletins and data. Upon the Department's request, once shop drawings have been approved or approved as noted, the Contractor shall submit for the record four (4) hard copy sets of shop drawings to the Department.

a) All Shop Drawings shall be stamped by a Rhode Island Registered Professional Engineer. The stamping of Shop Drawings shall be in accordance with the applicable requirements of the Rhode Island Board of Registration for Professional Engineers, or other Boards of Professional Registration, as applicable.

4) **Approval of Shop Drawings** All shop drawings will be reviewed and returned to the Contractor for appropriate action within 45 calendar days from receipt of the submission or resubmission, or as detailed in the Contract.

a) Shop drawings that are found to be erroneous, lacking required Professional Engineer stamps, lacking information necessary to control construction, or not in conformance with accepted design criteria will be rejected and returned to the Contractor. The Contractor shall address the Engineer's comments and resubmit revised shop drawings.

b) Shop drawings designated "Approved-As-Noted" may be used by the Contractor to commence corresponding work subject to satisfying the written conditions of the approval; such shop drawings shall be revised according to the notes (as applicable) and transmitted to the Engineer within fourteen calendar days of such approval.

5) There shall be no claims for additional payment by the Contractor, nor will there be an extension of time under Section 108.03 for delays resulting from resubmissions due to incomplete Shop Drawings; for the time taken by the Contractor to submit revised Shop Drawings caused by an erroneous submission; or by a previous submission either lacking the information necessary to control construction; or for not conforming to accepted design criteria. In addition, the Engineer's review time of the revised Shop Drawings will not constitute justification for an extension of time.

6) The Contract price includes the cost of furnishing all Shop Drawings, including resubmissions

SECTION 108.03

PROSECUTION AND PROGRESS

In accordance with **Section 108.03, PROSECUTION AND PROGRESS, Para. a., General Requirements, 1 Project Schedule Program**

The Schedule Level for this Contract is Schedule Level B.

CODE 108.1000
PROSECUTION AND PROGRESS

In accordance with Section 108.08, Failure to Complete on Time, Para. a., Phased Completion, Interim Completion and Substantial Completion the following defines the Interim and Substantial Completion Dates and Associated Liquidated Damages:

Interim Completion 1: September 26, 2022

The new bridge shall be fully opened to vehicular traffic, shall accommodate pedestrians, and the temporary detour shall be removed by the date listed above.

Liquidated Damages: $2,350 per calendar day.

Interim Completion 2: May 19, 2023

All work shall be competed with the exception of the permanent utility relocations by the date listed above.

Liquidated Damages: $2,350 per calendar day.

Substantial Completion: July 14, 2023

All Contract work shall be completed, as defined by Section 101.71.

Liquidated Damages: $2,350 per calendar day.

CODE 201.9901 REMOVE AND STOCKPILE TEMPORARY CONCRETE BARRIER
CODE 201.9902 REMOVE AND STOCKPILE SHOCK ABSORBING BARRIER MODULES
CODE 201.9903 REMOVE AND STOCKPILE POLYETHYLENE DRUM BARRICADES
CODE 201.9904 REMOVE AND STOCKPILE TYPE 3 BARRICADES
CODE 201.9905 REMOVE AND STOCKPILE SIGNS

DESCRIPTION:

Work covered under this item shall consist of the removal and off-site stockpiling of Temporary Concrete Barrier, Shock Absorbing Barrier Modules, Polyethylene Drum Barricades, Type 3 Barricades, and Signs left in place from existing locations indicated on the plans or as directed by the Engineer, and as specified herein.

CONSTRUCTION METHODS:

The work shall be coordinated with the Engineer and the State's RIDOT Maintenance Facility Headquarters at 360 Lincoln Avenue, Warwick, R.I. (401-222-6765).

The Contractor shall carefully remove the Temporary Concrete Barrier, Shock Absorbing Barrier Modules, Polyethylene Drum Barricades, Type 3 Barricades, and Signs, load and haul it to the State's Jefferson Boulevard stockpile located on Jefferson Boulevard between the east and west bound lanes of Route 37 in Warwick. The Contractor shall then unload these items into a neat stockpile at a location within the Jefferson Boulevard site as directed by the Engineer. These items are the property of the State of Rhode Island. Stockpiling of these items shall be in accordance with Section 201 of the RIDOT Standard Specifications for Road and Bridge Construction.

METHOD OF MEASUREMENT:

"ITEM CODE 201.9901 REMOVE AND STOCKPILE TEMPORARY CONCRETE BARRIER" will be measured for payment by the "Linear Foot" of barriers actually removed and stockpiled in accordance with the Contract Documents and/or as directed by the Engineer.

"ITEM CODE 201.9902 REMOVE AND STOCKPILE SHOCK ABSORBING BARRIER MODULES" will be measured for payment by the "Group" of modules actually removed and stockpiled in accordance with the Contract Documents and/or as directed by the Engineer.

"ITEM CODE 201.9903 REMOVE AND STOCKPILE POLYETHYLENE DRUM BARRICADES" will be measured for payment by the "Each" of drum actually removed and stockpiled in accordance with the Contract Documents and/or as directed by the Engineer.

"ITEM CODE 201.9904 REMOVE AND STOCKPILE TYPE 3 BARRICADES" will be measured for payment by the "Each" of barricade actually removed and stockpiled in accordance with the Contract Documents and/or as directed by the Engineer.

"ITEM CODE 201.9905 REMOVE AND STOCKPILE SIGNS" will be measured for payment by the "Each" of sign actually removed and stockpiled in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of "ITEM CODE 201.9901 REMOVE AND STOCKPILE TEMPORARY CONCRETE BARRIER" will be paid for at its respective contract unit price per "Linear Foot" as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools and equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

The accepted quantity of "ITEM CODE 201.9902 REMOVE AND STOCKPILE SHOCK ABSORBING BARRIER MODULES" will be paid for at its respective contract unit price per "Group" as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools and equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

The accepted quantity of "ITEM CODE 201.9903 REMOVE AND STOCKPILE POLYETHYLENE DRUM BARRICADES" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools and equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

The accepted quantity of "ITEM CODE 201.9904 REMOVE AND STOCKPILE TYPE 3 BARRICADES" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools and equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

The accepted quantity of "ITEM CODE 201.9905 REMOVE AND STOCKPILE SIGNS" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools and equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

CODE 208.99

DEWATERING

DESCRIPTION:

The work covered by this section shall consist of designing, installing, maintaining, and subsequent removal of temporary dewatering basins, pumps, and all other necessary materials and equipment to maintain a dry work area during the abutment and wingwall construction as detailed on the Plans, in accordance with the Standard Specifications, and this Special Provision.

Work will only be allowed in the river within the low flow period, between July 1st and October 31st of any year. All materials, including any dewatering components at or below the 100-year flood elevation (EL 40.6) shall not be placed until after July 1st and shall be removed in their entirety prior to October 31st. Should construction activities in and/or along the river span multiple construction seasons, all materials and equipment, including any dewatering components, are required to be removed in their entirety between construction seasons in compliance with the aforementioned date restrictions. No additional payment will be made for the removal and re-installation of any dewatering components.

MATERIALS:

Materials are to be chosen by the Contractor but in general shall conform to the applicable requirements of the 2004 Edition of the Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction (RI Standard Specifications), Amended 2018, with all revisions.

CONSTRUCTION METHODS:

The Contractor is responsible for the means and methods for Dewatering. The Contractor shall provide means to ensure that effluent water from the dewatering process is at least as free and clear of sediment (turbidity) as the receiving water. Sediment control devices, as approved by the Engineer, shall be utilized and maintained at all times during dewatering operations. Pumps utilized for dewatering shall be screened with a maximum ¼ inch mesh opening. The dewatering operations, materials, equipment shall be limited to within the limits of disturbance shown on the plans. The Contractor's proposed methods shall not extend beyond the limits of disturbance shown on the plans.

The Contractor shall submit to the Engineer for approval prior to the start of work, a complete Dewatering Plan. Shop drawing submittal shall include all plans, descriptions, and calculations required for the method he intends to use to perform all work under this item. Shop drawings shall be prepared and submitted in accordance with Section

105.02; Plans and Shop Drawings, of these Specifications. No work shall commence on this item until such submission is approved by the Engineer.

METHOD OF MEASUREMENT:

This item will not be measured for payment.

BASIS OF PAYMENT:

No separate payment will be made for this item. Costs for this item shall be included in the various appropriate items for which they are required as listed in the Proposal.

CODE 301.9901
PEASTONE

DESCRIPTION:

This work consists of providing and placing peastone at the locations and within the limits specified on the Contract Documents and as directed by the Engineer.

MATERIALS:

Peastone shall meet the requirements of Section M.01, Table I Gradation VI of the Rhode Island Standard Specifications.

CONSTRUCTION METHODS:

The peastone behind the abutments shall be placed but not compacted.

METHOD OF MEASUREMENT:

“ITEM 301.9901 PEASTONE” will be measured for payment by the "Cubic Yard" actually placed in accordance with this Special Provision and elsewhere in the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of “ITEM 301.9901 PEASTONE” will be paid for at the contract unit price per "Cubic Yard" as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals necessary to complete the work as described in this Special Provision and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

CODE 301.9902
GRS REINFORCED BACKFILL

DESCRIPTION:

The work under this item shall consist of all work associated with furnishing materials and constructing the GRS Reinforced Backfill to lines and grades designated in the Contract Drawings and the approved shop drawings. All work shall be performed in accordance with the Rhode Island Standard Specifications and this Special Provision.

MATERIALS:

The Contractor shall furnish the Engineer a Certificate of Compliance, certifying that the applicable materials meet the requirements of this Special Provision prior to the start of work. All testing shall be performed and certified by an accredited, independent testing laboratory.

Geosynthetic Reinforcement: Geosynthetic reinforcement shall be a woven geotextile, manufactured from polypropylene, high density polyethylene, or polyester. The geotextile shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids. Geosynthetic reinforcement shall be biaxial. When a uniaxial type is used, the higher strength axis must be placed perpendicular to the wall face.

Geosynthetic reinforcement shall have a minimum tensile strength of 4800 lbs/ft at ultimate and a minimum tensile strength of 1250 lbs/ft at 2% strain, in accordance with current ASTM D4595. In addition, the reinforcement shall have a permeability coefficient greater than 0.15 centimeters per second according to ASTM D4491.

GRS Reinforced Backfill Material: All backfill material used in the structure volume shall be an open-graded material consisting of clean, crushed angular (not rounded) stone, free from organic or otherwise deleterious materials, meeting the following gradation as determined in accordance with AASHTO T 27:

U.S. Sieve Size	Percent Passing
½ inch	100
⅜ inch	90 –100
No. 4	20 - 55
No. 8	5 - 30
No. 16	0 - 10
No. 50	0 - 5

The backfill shall conform to the following additional requirements:

- The plasticity index (PI) as determined by AASHTO T 90 shall not exceed 6.
- The material shall exhibit an angle of internal friction of not less than 40 degrees, as determined by the Direct Shear Test, AASHTO T 236 (ASTM D3080), with the following parameters: A 12-inch x 12-inch direct shear box shall be used with a gap set to D85 of the actual sample being tested. The direct shear test may be run dry or in its natural moisture condition with minimal compactive effort. The test shall be run with normal stresses at 5, 10, 20, and 30 psi.
- Permeability – The material shall be free-draining and shall have a permeability coefficient greater than 1x10(E-4) centimeters per second at maximum density when measured according to AASHTO T 215.
- Soundness – The material shall be substantially free of shale or other soft, poor durability particles. The materials shall have a magnesium sulfate loss, as determined by AASHTO T 104 (ASTM C 88), of less than 30 percent after four cycles (or a sodium value less than 15 percent after five cycles).

Acceptance: The Contractor shall furnish to the Engineer a Certificate of Compliance certifying that the above materials comply with the applicable contract specifications. A copy of all test results performed by the Contractor necessary to assure contract compliance shall also be furnished to the Engineer. Acceptance will be based on the Certificate of Compliance, accompanying test reports, RIDOT Testing, and visual inspection by the Engineer.

Delivery, Storage and Handling: The Contractor shall check the material upon delivery to assure that the proper materials have been delivered.

- The Contractor shall prevent excessive mud, wet cement, epoxy and like substances which may affix themselves to the material from coming in contact with the material.
- Store geosynthetics as per the manufacturer's recommendations.

CONSTRUCTION METHODS:

All construction shall be in accordance with the approved shop drawings, the contract documents, and where provided with the specific products utilized, the manufacturer's recommendations and instructions. Where conflicts exist, the most stringent requirements shall govern as determined solely by the Engineer.

Submittals: The Contractor shall submit complete and accurate shop drawings to the Engineer for approval in accordance with Subsection 105.02 of the RI Standard Specifications

The Contractor shall submit a listing of similar projects demonstrating the necessary experience to perform the GRS reinforced backfill construction, including a brief description of each project that is similar in scope. A reference shall be included for each project listed.

As a minimum, the reference shall include the owner's name, address, and current phone number.

The Contractor shall also submit the manufacturer's product data and/or material certifications for the various components of the GRS reinforced backfill system, including geosynthetic reinforcement and type of backfill.

The shop drawings shall show the configuration and all details, dimensions, quantities and cross-sections necessary to construct the wall, including but not limited to, the following:

1. An elevation view of the backfill system which shall include the elevations at the top of the backfill at all horizontal and vertical break points, all steps in the GRS, and an indication of the final ground line.
2. A typical cross section or cross sections showing the elevation relationship between existing ground conditions and proposed grades, and the proposed backfill configuration.
3. General notes pertaining to the backfill construction.
4. Methods of excavation and backfill.
5. Methods of monitoring plumbness and deviation of wall.
6. All process/quality control testing.

Excavation, Foundation Preparation & Construction: Excavation for GRS structures shall be in accordance with the requirements of Section 203 of the Standard Specifications. The foundations shall be graded level for a width equal to or exceeding the GRS Reinforced Backfill, as shown on the Contract Drawings and compacted with a vibratory compactor (roller or plate) with an operating weight of at least 600 lbs. and which produces a centrifugal force of not less than 7,500 lbs. Any foundation soils found to be unsuitable shall be removed and replaced with gravel borrow as per Section 203 and Section 204. If the foundation is placed on fill material, the material shall be gravel borrow conforming to the relevant provisions of Section 302.

GRS Reinforced Backfill Placement: Prior to placing each backfill layer, smooth all wrinkles and loose areas from the geosynthetic reinforcement. Place backfill to prevent formation of wrinkles in reinforcement. Begin compaction of backfill material at the front face, proceeding backward toward end of wall to completely compact the backfill layer. Only hand operated compaction equipment shall be permitted within 3 feet of wall face. Compact GRS Reinforced Backfill with a minimum of 5 passes of a vibratory compactor and until there is no additional movement, as determined by the Contractor. This shall be verified by the Engineer at his/her discretion.

The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

Placement of Geosynthetic Reinforcement: Place layers of reinforcement directly on horizontal, compacted fill surface, providing 100% coverage without overlapping of adjacent sheets. Reinforcement shall be placed so that it is taut and free of wrinkles prior to subsequent backfilling. The geosynthetic reinforcement shall be placed such that the strength requirements stated in this Special Provision and on the Contract Drawings, are satisfied in the direction perpendicular to the face of abutment/wall.

Joints in reinforcement placed perpendicular to the wall face shall be offset from joints in adjacent layers by one-half the roll width or 7 feet, whichever is greater.

Provide a minimum backfill layer of 6 inches over geosynthetic reinforcement prior to operating any vehicle over it.

METHOD OF MEASUREMENT:

ITEM CODE 301.9902 “GRS REINFORCED BACKFILL” will be measured for payment by the “CUBIC YARD” of volume actually placed up in accordance with this Special Provision and elsewhere in the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of ITEM CODE 301.9902 “GRS REINFORCED BACKFILL” will be paid for at the contract unit price per “CUBIC YARD” as listed in the Proposal. The price so stated shall constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to complete the work as described in this Special Provision and elsewhere in the Contract Documents, complete and accepted by the Engineer.

SECTION 413
RIDEABILITY – SURFACE COURSE

413.01 DESCRIPTION. This specification covers pavement rideability as determined by the Engineer in accordance with the rating scale, based upon post-paving rideability determination.

413.02 MATERIALS. N/A

413.03 CONSTRUCTION METHODS. Pavement rideability, or ride quality, will be determined by the Engineer using a profiler on all travel lanes. A travel lane is defined as the primary traveled portion of the roadway excluding non-normally traveled pavement surfaces. The profiler will meet all the equipment requirements of AASHTO M 328 and R 56.

413.03.01 Rideability for Standard Roads. Standard roads shall be roadways with posted speed limits above 30 miles per hour (MPH). For roads with speed limits that vary based on time of day (e.g., school zones) the higher speed limit shall apply for the purposes of this specification.

The surface course ride quality acceptance will be based on the average International Roughness Index (IRI) from three tests using a profiler established for each wheel path for 528-foot (0.1-mile) standard fixed intervals, and a simulated 10-foot rolling straightedge analysis for the width of each travel lane from one representative test. The testing will be conducted by the Engineer. The selected tests will be chosen based on data correlation between tests, profile lengths, and any factors noted during data collection or evidenced upon review to better qualify or disqualify a test. The representative tests will be selected at the Engineer's discretion.

An IRI number in inches per mile will be established using ProVAL or software supplied by the manufacturer of the profiler for each 528-foot (0.1-mile) longitudinal section for each wheel path in each travel lane. A 300-foot long-wavelength (high-pass) filter will be applied during testing. A 250mm short-wavelength (moving average) filter will be applied during analysis using ProVAL or other aforementioned profiling software.

A sublot will be each single wheelpath for each 0.1-mile section of each travel lane. Therefore, each 0.1-mile section of travel lane will consist of two sublots. A standard lot is defined as 20 consecutive sublots. If a road segment has less than 20 but more than 6 consecutive sublots for each wheelpath, a lot will be comprised of all the sublots from one wheelpath. If a road segment has 6 or less consecutive sublots for each wheelpath, a lot will be comprised of all the sublots from the road segment. If the final lots include 10 or more sublots for each wheelpath, they will be considered their own lots. If the final lots are less than 10 sublots, they will be added to the preceding or adjacent lots. Lots may be combined with adjacent lots in the following order of preference: with previous lot of the same wheelpath in the same lane, with opposite wheelpath of the same lane, with both wheelpaths of adjacent lane in the same direction or similar lane in the opposite direction within the same road segment, or as determined by the Engineer. If project

paving limits for one roadway segment including all lanes consist of less than 0.46 lane-miles, the roadway segment paved shall be considered a pavement patch (413.03.02).

Areas that are excluded from rideability analysis for pay adjustment ("leave-out" sections) include roundabouts and bridge decks, the area 25 feet before and after pavement segments with catch basins in the travel lane and 15 feet before and after pavement segments with manholes or other structures in the travel lane, the areas 25 feet before and after bridge joints, and 25 feet after and before project paving limits, all as determined by the Engineer. Additional areas may be excluded from testing in the interest of obtaining data safely. All areas included in the paving limits (including "leave-out" sections) will be tested using a 10-foot rolling straightedge simulation analysis using ProVAL or other profiling software. The variation of the surface between any two contacts along the simulated straightedge shall be not more than 0.25 inches, except for manholes, catch basins and other structures in the travel lane which shall not deviate from the surface by more than 0.30 inches below final grade or 0.10 inches above final grade of pavement as tested with 10-foot straightedge or rolling straightedge simulation. Humps, depressions and utility structures (as adjusted or remaining) exceeding the specified tolerances shall be subject to correction at no additional cost to the State. The Contractor's corrective work plan including method of correction shall be submitted to the Engineer for approval. No corrective work shall be performed without the approval of the Engineer.

Sections before "leave-out" sections and the section at the end of the paving limit will be added to the previous sublot or subsequent section(s) if they are less than 0.05 miles or may be considered a full sublot if they are greater than or equal to 0.05 miles. For roadways having many utility structures, with successive sections before or between "leave-out" sections or at the end of the paving limit that are less than or near to 0.05 miles, sections will be combined to best approximate 0.10 miles for each sublot. No sublot will exceed 0.15 miles.

413.03.02 Rideability for Low-Speed Roads and Pavement Patches. Low-speed roads shall be roads with a posted speed limit of 30 MPH or below. The Department will measure from 10 feet before to 10 feet after paving limits of low-speed roads or permanent pavement patches in the lane and test this road segment using a 10-foot rolling straightedge simulation analysis in ProVAL or other profiling software. If the variation of the surface between any two contacts along the simulated straightedge exceeds 0.25 inches at any distance from 2 feet before to 2 feet after the paving limits or pavement patch, corrective action shall be required and the Contractor must submit a corrective work plan. No corrective work shall be performed without the approval of the Engineer. Corrective work shall be at no cost to the State. In addition, the -0.30" to +0.10" surface deviation tolerances noted in Section 413.03.01 above shall apply for any manholes or other structures in the lane that are within the paving limits of the low-speed road or pavement patch.

Permanent pavement patches and structures, including any corrective work, must continue to comply with the tolerances described above for the longer of one year after

installation or one year after completion of any required corrective work or additional corrective work will be required at no additional cost to the state.

413.03.03 Rideability for Bridges. The Department will measure the entire length of the bridge encounter using a 10-foot rolling straightedge simulation analysis in ProVAL or other profiling software. The bridge encounter starts 10 feet before the initial bridge pavement cut and match or 40 feet before the initial bridge joint, whichever is farther, and stops 10 feet beyond the terminal bridge pavement cut and match or 40 feet beyond the terminal bridge joint, whichever is farther. The bridge encounter includes approach pavement, entry approach slab, bridge deck, exit approach slab, and exit pavement. In the event only the bridge deck is paved (no approaches), the section of new pavement will be considered a pavement patch.

Perform corrective work when the variation of the surface between any two contacts along the simulated straightedge exceeds 0.25 inches in any profile within the full width of a marked traffic lane along the measured length of the bridge encounter. Submit a corrective work plan to the Engineer for approval prior to performing corrective work. This plan may include mill and overlay, PCC overlay, diamond grinding or combination thereof. Any costs associated with structural review of added loads to the bridge will be tracked by the Department and reimbursed by the contractor as a disincentive using a Report of Change. In order to produce a uniform cross section, the Engineer may require corrections to the adjoining lanes and shoulders. No corrective work shall be performed without the approval of the Engineer. Corrective work shall be at no additional cost to the State.

413.04 METHOD OF MEASUREMENT

Table 1 provides the pay adjustment and corrective action criteria for standard roads based upon the posted speed limit of the roadway and the IRI of each sublot. IRI values shall be rounded to the nearest integer value for each sublot before assessing the pay adjustment.**Table 1**

Posted Speed Limit (MPH)				**Pay Adjustment (Percent)**
35	**40-45**	**50**	**55-65**	
IRI (Inches Per Mile)				
55 and Under	45 and Under	40 and Under	35 and Under	+5%
56 - 62	46 - 52	41 - 48	36 - 40	+4%
63 - 70	53 - 62	49 - 55	41 - 48	+3%
71 - 80	63 - 70	56 - 65	49 - 55	+1%
81 - 90	71 - 85	66 - 75	56 - 65	0%
91 - 110	86 - 95	76 - 82	66 - 72	-5%
111 - 125	96 - 110	83 - 92	73 - 82	-10%
126 - 145	111 - 125	93 - 105	83 - 95	-20%
146 - 160	126 - 140	106 - 120	96 - 110	-30%
Over 160	Over 140	Over 120	Over 110	Corrective Action Required*

*__Corrective action will be required additionally for any section or segment with surface deviation(s) exceeding 0.25 inches when tested with a 10-foot straightedge or 10-foot rolling straightedge simulation analysis.__

When corrections to the pavement surface are required, the Contractor's corrective work plan including method of correction shall be submitted to the Engineer for approval. The method of correction shall be limited to diamond grinding, flat tooth grinding or removing and replacing the affected pavement. If grinding is chosen, a grinding simulation using ProVAL shall be submitted to the Engineer for approval. In order to produce a uniform cross section, the Engineer may require corrections to the adjoining lanes and shoulders. Corrections shall be at no cost to the State. No corrective work shall be performed without the approval of the Engineer.

Where corrections are made after the official Department test, the pavement will be retested by the Engineer to verify that corrections have produced an acceptable ride surface. No incentives will be provided for sections on which corrective actions are performed.

In the event the corrective action(s) results in an IRI greater than the corrective action threshold for any sublot in any wheel path of a standard road, the Contractor will be assessed an adjustment based on **Table 2**.

Table 2

Posted Speed Limit (MPH)				**Pay Adjustment (Percent)**
35	**40-45**	**50**	**55-65**	
IRI After Correction (Inches Per Mile)				
161 - 180	141 - 155	121 - 135	111 - 125	-50%
181 - 200	156 - 175	136 - 150	126 - 140	-75%
Over 200	Over 175	Over 150	Over 140	-100%

The pay adjustment for each sublot will be applied to the theoretical tonnage of each respective sublot. The theoretical sublot tonnage will be obtained by taking the sublot length, multiplied by half of the width of the travel lane (11 feet will be used for lane width unless otherwise indicated), multiplied by the design thickness of the surface course, multiplied by the unit weight derived from 94% of the average of the theoretical maximum densities for dense graded mixes or 90% of the theoretical maximum density for Friction Course or PPEST mixes. In the absence of plant tests for theoretical maximum density of any HMA or PPEST, average bulk specific gravity of mat final cores may be used to determine density. Theoretical tonnage values shall be rounded to 2 decimal places.

This rideability specification does not relieve the Contractor from responsibility concerning workmanship in accordance with the Specifications and other Contract requirements.

413.05 BASIS OF PAYMENT

A pay adjustment will be determined for each sublot based upon the IRI of that sublot as described above. The theoretical tonnages of all the sublots in one lot (as defined in 413.03 paragraph 4) will be totaled to yield the theoretical lot tonnage. The sublot tonnage adjustments will be obtained by multiplying the theoretical tonnage of a sublot by that sublot's pay adjustment. Tonnage adjustments shall not be rounded. The sublot tonnage adjustments will be totaled to determine the lot tonnage adjustment. The lot tonnage adjustment will be divided by the theoretical lot tonnage to obtain the unit price adjustment for that lot. Unit price adjustment will be rounded to six absolute decimal places for each lot (i.e. XX**.**XXXX%). This unit price adjustment will be multiplied by the unit price of the surface course HMA and applied to the theoretical tonnage of the lot for pay purposes.

If the Contract does not have an item number exclusively for the surface course HMA as it has been grouped with related work such as tack coat, base course HMA or micro-milling, or surface course HMA does not otherwise have an explicit price basis, and if the Contractor has not submitted an accepted exclusive unit price basis for the surface course HMA prior to beginning any resurfacing or paving activity, the Department may use the Weighted Average Unit Price (WAUP) for the respective surface course HMA for rideability pay adjustment purposes.

Incentives will be addressed using Item Code 416.0001. Incentives or Disincentives will be addressed using a Report of Change.

SECTION 416

PAY ADJUSTMENTS

416.01 DESCRIPTION. This specification provides a mechanism for the payment of performance incentives (positive pay adjustments) for binder content, air voids, in-place density and/or rideability.

416.02 MATERIALS. N/A.

416.03 CONSTRUCTION METHODS. N/A.

416.04 METHOD OF MEASUREMENT. Pay adjustments will be measured using the "Method of Measurement" section of the applicable HMA and/or rideability specification.

416.05 BASIS OF PAYMENT. Pay adjustments will be paid per each unit using the requirements in the "Basis of Payment" section of the applicable HMA and/or rideability specification.

CODE 702.9901
MODIFIED PRECAST 4' ROUND CATCH BASIN WITH 4' DEEP SUMP STD 4.4.0M

DESCRIPTION:

This work consists of furnishing and installing drainage catch basins with 4’ sumps as indicated on the Plans. All work and material shall be in accordance with the Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, 2004 Edition (Amended 2018) and all revisions, this Special Provision, and as directed by the Engineer.

MATERIALS:

Catch basins and inlets, frames, covers, and steps shall conform to the applicable requirements of Subsection 702.02 of the Rhode Island Standard Specifications for Road and Bridge Construction. Backfill and bedding shall conform to Subsection 203.02 of the Rhode Island Standard Specifications for Road and Bridge Construction.

CONSTRUCTION METHODS:

Catch basins and inlets shall be installed in accordance with Subsection 702.03 of the Rhode Island Standard Specifications for Road and Bridge Construction.

METHOD OF MEASUREMENT:

“ITEM CODE 702.9901 MODIFIED PRECAST 4' ROUND CATCH BASIN WITH 4' DEEP SUMP STD 4.4.0M” will be measured for payment by “EACH” unit actually installed in accordance with this Special Provision and elsewhere in the Contract Documents, and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity “ITEM CODE 702.9901 MODIFIED PRECAST 4' ROUND CATCH BASIN WITH 4' DEEP SUMP STD 4.4.0M” will be paid for at the contract unit price per "EACH” as listed in the Proposal. The price so-stated shall constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to finish the work as described in this Special Provision and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

CODE 702.9902
PERMEABLE PAVER SAND FILTER SYSTEM

DESCRIPTION:

This work consists of furnishing and installing the permeable paver sand filter system as detailed on the plans and as directed by the Engineer. The work shall include all soil testing, earth excavation, permeable pavers, washed crushed stone, pea stone filter blanket, geotextiles, sand filter, trimming & fine grading, and all incidentals required to finish the work as described in this Special Provision and as directed by the Engineer.

All work and material shall be in accordance with the Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, 2004 Edition (Amended March 2018) and all revisions, these Special Provisions, and as described elsewhere in the Contract Documents and as directed by the Engineer.

Excluded Items of Work: The work pertaining to the following items of work will be measured and paid for separately under their unit bid items as listed in the Proposal: trimming & fine grading adjacent to system and loam & seed.

MATERIALS:

Contractor shall supply manufacturer's specifications for approval by the Engineer.

A. Permeable Pavers: Shall conform to the following:

1. Shall be Unilock "Eco-Optiloc" style pavers, L-shape 9-7/8" x 9-7/8" x 3-1/8"D, or approved equal.
2. The finish and color shall be Smooth-River, respectively.

B. Non-Woven Geotextile: Non-Woven Geotextile shall conform as follows:

1. Black in appearance
2. Typical weight of 4.5 ox/SY (142 G/M)
3. Tensile Strength Value of 120 lbs. (533 N) per ASTM D4632 Testing Method
4. Elongation at Break Value of 50% per ASTM D4632 Testing Method
5. Mullen Burst Value of 225 psi (1551 KPa) per ASTM D3786 Testing Method
6. Puncture Strength Value of 65 lbs. (289 N) per ASTM D4833 Testing Method
7. CBR Puncture Value of 340 lbs. (1513 N) per ASTM D6241 Testing Method
8. Trapezoid Tear Value of 50 lbs. (222 N) per ASTM D4533 Testing Method
9. AOS Value of 70 U.S. Sieve (0.212 mm) per ASTM D4751 Testing Method
10. Permittivity Value of 1.7 sec-1 per ASTM D4491 Testing Method
11. Water Flow Rate Value of 135 gal/min/SF (5500 L/min/SM) per ASTM D4491 Testing Method
12. UV Stability at 500 Hours Value of 70% per ASTM D4355 Testing Method

C. Crushed Stone: Crushed Stone shall be as specified on the Plans and meet the requirements of Section M.01.09 Table 1, Column II as described in the RIDOT Standard Specifications for Road and Bridge Construction.

D. Sand Filter Layer: Sand Filter Layer shall be as specified on the Plans and meet the requirements of Section M.01.09 Table 1, Column Ia as described in the RIDOT Standard Specifications for Road and Bridge Construction and conform to ASTM C-33.

E. Pea Stone: Pea Stone shall be as specified on the Plans and meet the requirements of Section M.01.09 Table 1, Column IV as described in the RIDOT Standard Specifications for Road and Bridge Construction.

F. Excavation: Excavation shall be as specified on the Plans and shall meet the requirements as specified in Section 202 of the RIDOT Standard Specifications for Road and Bridge Construction.

CONSTRUCTION METHODS:

All construction shall be in accordance with the contract documents, and where provided with the specific products utilized, the manufacturer's recommendations and instructions. Materials listed in these specifications that are RIDOT standard items shall be constructed in accordance with the RIDOT Standard Specifications for Road and Bridge Construction. Where conflicts exist, the most stringent requirements shall govern as determined solely by the Engineer.

The concrete pavers shall be laid in Eco-Optiloc Block Pattern A (refer to manufacturer's web site). Pavers shall be laid on the subsurface sand filter system to the lines and grade indicated on the Plans or as directed by the Engineer. Where necessary to conform to angled edges, concrete paver blocks shall be cut neatly to the necessary shape and size with a concrete saw and fit snugly to the adjacent paver blocks and edging. The joints between the pavers shall be filled with ASTM-C33 fine sand to ensure a firm and stable installation. All applicable manufacturer's instructions and recommendations shall be followed during installation.

Compaction of the base beneath the sand filter and the required backfill shall be minimized. Where possible, excavation hoes shall be used to remove the original soil. If the sand filter area is excavated using a loader, the Contractor shall use wide track or marsh track equipment, or light equipment with turf-type tires. The use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high pressure tires is not acceptable within these areas.

Compaction of the bottom of the sand filter area may be alleviated by using a primary tilling operation such as chisel plow, ripper, or subsoiler. These tilling operations are to

re-fracture the soil profile through the 12-inch compaction zone. Substitute methods shall be approved by the Engineer.

If required, any dewatering system used to properly construct the underground sand filter shall be designed by the Contractor and approved by the Engineer.

METHOD OF MEASUREMENT:

This item will not be measured for payment.

BASIS OF PAYMENT:

"ITEM CODE 702.9902 PERMEABLE PAVER SAND FILTER SYSTEM" will be paid for at the contract unit price per "Lump Sum" as listed in the Proposal. The price so-stated will constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to finish the work as described in the Special Provision and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

Partial payments for this Lump Sum item will be made in accordance with Special Provision Code 109.07.

CODE 800.9901

HUNTS MILLS BRIDGE NO. 208

DESCRIPTION:

Except for the excluded items of work indicated below, this work consists of constructing the Hunts Mills Bridge No. 208 in its entirety including all incidental work associated with the construction of the bridge. This shall comprise all work pertaining to the construction of:

Superstructure:

- All the components above the beam seats inclusive of the bridge and precast concrete arched fascia panel bearings, the roadway bridge joints, and components or materials that are embedded, attached, or applied.

Substructure:

- All components of the reinforced concrete abutments including reinforcing concrete approach slabs, return walls, pylons, sheet piling, end posts, bridge rail, and other components or materials that are embedded, attached, or applied.

- All new components or materials attached to the portions of the existing concrete abutments to remain that are embedded, attached, or applied.

- The work under this item shall also include all the work pertaining to the Control of Water and Dewatering required to construct the bridge.

All of the above work shall be complete in place and accepted in accordance with the Contract Documents except that the Method of Measurement and the Basis of Payment will be in accordance with this Special Provision.

Excluded Items of Work: The work pertaining to the following items of work are excluded from this lump sum item and instead will be measured and be paid for separately under their own appropriate unit bid or lump sum items as listed in the Proposal: Earthwork (various structural excavation and various fill materials), Piles (including all pile components, mobilization, and testing), Remove and Dispose Existing Hunts Mills Bridge No. 208.

Work will only be allowed in the river within the low flow period, between July 1st and October 31st of any year. All materials and equipment at or below the 100-year flood elevation (EL 40.6) shall not be placed until after July 1st and shall be removed in their entirety prior to October 31st. Should construction activities in and/or along the river

span multiple construction seasons, all materials and equipment are required to be removed in their entirety between construction seasons in compliance with the aforementioned date restrictions. No additional payment will be made for the removal and subsequent re-delivery of any materials or the demobilization and remobilization of any equipment.

CONSTRUCTION METHODS: All work shall be performed in accordance with the phased sequence of construction, the Maintenance and Protection of Traffic Plans as well as the restrictions noted in the contract TMP, CS pages, and the regulatory permits.

The Contractor shall ensure that no debris or any other foreign material falls onto the ground beneath or into Ten Mile River. Should any debris fall onto the ground or into the river, all work shall stop until such time as the debris has been recovered and a revised procedure of operation submitted for approval. Any delay caused as a result of cessation of work shall not relieve the Contractor of any responsibilities under this contract, including the timely completion of the work.

METHOD OF MEASUREMENT:

This item will not be measured for payment.

BASIS OF PAYMENT:

“ITEM CODE 800.9901 HUNTS MILLS BRIDGE NO. 208” will be paid for at the contract unit price per “Lump Sum” price as listed in the Proposal. The price so-stated will constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to finish the work as described in this Special Provision and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

Partial payments for this Lump Sum item will be made in accordance with Special Provision Code 109.07.

CODE 803.9901

REMOVE AND DISPOSE EXISTING HUNTS MILLS BRIDGE NO. 208

DESCRIPTION:

This work consists of the complete removal, handling, transportation, and legal disposal of the existing Hunts Mills Bridge No. 208, to the limits indicated on the Plans and as described below.

Work shall also include the installation and subsequent removal of temporary containment to be in place during deck demolition. The temporary containment shall adequately prevent all equipment, materials, and debris from entering the Ten Mile River. The means and methods of the temporary containment shall be determined by the Contractor.

The plans and details of the existing structure shown on the Demolition Plans are illustrative only, depicting the minimum limits of removal. It is the Contractor's responsibility to visit the site and to review all existing information to assess the existing conditions and the scope of the demolition work required to accommodate the proposed construction, prior to submitting bids. No additional compensation, other than the lump sum price bid for this item, shall be made for additional material, disposal or work required to accommodate the proposed construction whether or not it differs from that inferred or described herein or shown on the plans.

Work will only be allowed in the river within the low flow period, between July 1st and October 31st of any year. All materials and equipment at or below the 100-year flood elevation (EL 40.6) shall not be placed until after July 1st and shall be removed in their entirety prior to October 31st. Should construction activities in and/or along the river span multiple construction seasons, all materials and equipment are required to be removed in their entirety between construction seasons in compliance with the aforementioned date restrictions. No additional payment will be made for the removal and subsequent re-delivery of any materials or the demobilization and remobilization of any equipment.

During the entire demolition operation, the Contractor shall make provisions to protect all public properties, private properties, utilities, roadway, and all other structures to remain.

All work shall be in accordance with the applicable provisions of Sections 803 and 817 of the State of Rhode Island Standard Specifications for Road and Bridge Construction, 2004 Edition (Amended March 2018) with all revisions, (hereinafter referred to as the RI Standard Specifications.

For the purposes of this Special Provision, the existing superstructure and substructures to be removed and disposed of (to the limits indicated on the Plans) are in general described as follows:

Superstructure:

- The entire superstructure of the Hunts Mills Bridge No. 208 from the existing North Abutment to the existing South Abutment and roadway makeup (All the components above the spring line inclusive of any/all components or materials that are embedded, attached, or applied).

Substructures:

- The upper portion of the existing reinforced concrete abutments; the existing reinforced concrete wing walls, parapets/end posts, side walks, and curbs in their entirety, to the limits indicated on the Contract Drawings (including all attached and embedded components).

MATERIALS:

Materials for the temporary deck underside and side protective shielding shall be in accordance with Code 803.0500 of the RI Standard Specifications.

CONSTRUCTION METHODS:

The Contractor shall perform this work in accordance with the provisions of the Plans and the restrictions noted in the CS pages. The Contractor shall segment the concrete removal portions of the superstructure and substructure so as to facilitate the removal with as few pieces as possible.

The Contractor shall ensure that the removal and disposal operations do not cause damage to the existing structures, properties, utilities, and/or roadways and any portion of the existing structures to remain. Any resulting damages shall be repaired to the satisfaction of the Engineer and property owner(s) at the expense of the Contractor. **No blasting or explosive demolition will be allowed.**

The Contractor shall provide for complete protection to portions of the roadways and overhead utilities during the demolition operation. The Contractor shall ensure that no debris or any other foreign material falls onto the ground beneath or into Ten Mile River. Should any debris fall onto the ground or into the river, all work shall stop until such time as the debris has been recovered and a revised procedure of operation submitted for approval. Any delay caused as a result of cessation of work shall not relieve the Contractor of any responsibilities under this contract, including the timely completion of the work.

Care shall be taken to protect all utilities and adjacent structures. Any damage to existing utilities and adjacent structures shall be repaired by the Contractor at his own expense to the satisfaction of the Engineer and the respective Utility Companies. All respective utility companies are to be given a minimum of two working days advanced notice of demolition activities to be performed adjacent to their utilities.

Boundaries of concrete areas to remain, where indicated on the Plans or as directed by the Engineer, shall be saw cut square to a minimum depth of 1 inch (unless otherwise noted).

Prior to commencement of any demolition activities, the Contractor shall prepare and submit to the Engineer for approval, detailed demolition plans and calculations signed and sealed by a Professional Engineer licensed in the State of Rhode Island. Said demolition plans and calculations shall include, but not be limited to, plans showing the location of all roadways, utilities, and other appurtenances in the area of demolition, method of protecting the roadway and utilities, method of protecting the Ten Mile River, anticipated pick weights, rigging, crane and equipment types and locations (including operating radii), removal sequence and effects on remaining structural elements, temporary shoring as required, design and details for temporary deck underside and side protective shielding, and all else necessary to clearly describe the work to be performed. An approved demolition plan as described above is required prior to commencement of any demolition activities. Approval(s) of demolition plans, procedures, etc. shall in no way relieve the Contractor of sole liability for damages resulting from the removal and disposal operations.

METHOD OF MEASUREMENT:

This item will not be measured for payment.

BASIS OF PAYMENT:

“ITEM CODE 803.9901 REMOVE AND DISPOSE EXISTING HUNTS MILLS BRIDGE NO. 208” will be paid for at the contract unit price per “Lump Sum” prices as listed in the Proposal. The price so-stated will constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

Partial payments for this Lump Sum item will be made in accordance with Special Provision Code 109.07.

804.9901
DRILLED MICROPILES

804.9911
MOBILIZATION & DEMOBILIZATION OF MICROPILE EQUIPMENT

804.9913
MICROPILE VERIFICATION LOAD TEST

804.9914
MICROPILE PROOF LOAD TEST

DESCRIPTION:

This work shall consist of constructing micropiles in accordance with the Plans, approved Working Drawings, applicable sections of the latest Rhode Island Standard Specifications, provisions of the FWHA "Micropile Design and Construction", Report No. FHWA NHI-05-039, the AASHTO LRFD Bridge Design Specifications, the Rhode Island LRFD Bridge Design Manual, and as specified herein. The micropile Contractor shall be responsible for furnishing all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and micropile connections to the bridge substructure for this project.

Micropiles shall consist of permanent casing sections and fully reinforced grout sections bonded with the bedrock. Permanent casings shall be included as part of the micropiles and shall remain in-place after grouting is complete. Temporary casings shall be installed, if necessary, to facilitate micropile construction and shall be removed during or after grouting.

The Contractor shall note that below grade obstructions to micropile drilling and construction, both man-made (e.g. existing bridge piles) and natural (e.g. cobble/boulder size rock) are likely to be encountered. The Contractor is responsible for removing or drilling through obstructions encountered during micropile installation.

The Contractor shall select and develop a complete micropile design including micropile type, size, bridge substructure connection details, installation means and methods, estimate the bedrock-grout bond value, and determine the required bond length and final micropile diameter. Micropile design and construction shall be subject to Engineer requirements, review and evaluation. The micropile Contractor shall design and install

micropiles that will develop a minimum Factored Axial Design Resistance in Compression of 129 kips, termed the design load or “DL” for testing purposes. Micropile resistance shall be verified by Verification and Proof static load testing as required and must meet the test acceptance criteria specified herein.

SUBSURFACE INFORMATION:

Project boring information is provided on the Plans. Boring program soil and bedrock samples are available for viewing in the office of Paul B. Aldinger and Associates, Inc. 860A Waterman Avenue, Suite 9, East Providence, Rhode Island. The Contractor may request to perform additional exploration(s), at no additional cost to the State, subject to Engineer approval.

CONSTRUCTION SITE SURVEY:

Prior to bidding, the Contractor shall review the available subsurface information and visit the site to assess the site’s geometry, equipment access conditions, and location of existing structures and above/below ground utilities.

The Contractor is responsible for coordinating with Dig Safe and for field locating and verifying the location of all utilities shown on the Plans and otherwise discovered prior to starting the Work and shall maintain uninterrupted service of those utilities designated to remain in service throughout the Work.

Prior to the start of micropile construction and post Dig Safe utility field mark-up, the Contractor and Engineer shall jointly inspect the site to observe and document the site’s pre-construction condition, existing structures and adjacent facilities.

MICROPILE DESIGN AND CONSTRUCTION REQUIREMENTS:

Micropile design shall meet the loading conditions shown on the Plans, this specification and the approved Contractor Working Drawings. The Contractor shall design the micropiles and micropile to bridge substructure connections using procedures contained in the FHWA Micropile Design and Construction Reference Manual, FHWA Publication No. NHI-05-039; the AASHTO LRFD Bridge Design Specifications latest edition; and the Rhode Island LRFD Bridge Design Manual latest edition. The following minimum requirements shall be met by the Contractor’s design and construction:

1. The Contractor shall design and construct micropiles that will develop a minimum Factored Axial Design Resistance in Compression of 129 kips, termed the Design Load (DL) for testing purposes.
2. The required micropile bond zone bedrock-to-grout geotechnical resistance factor for a micropile bond zone in very hard Sandstone bedrock shall be $\phi_{stat\ Sandstone} = 0.55$, and for a micropile bond zone in soft Shale bedrock shall be $\phi_{stat\ Shale} = 0.44$, a 20% reduction for the soft Shale bedrock due to its greater design uncertainty.
3. All micropile design resistance shall be derived exclusively from the bedrock-to-grout bond zone. Close coordination/communication between the driller and field Engineer during micropile drilling will be required. The field Engineer will make the determination of bedrock type for each micropile during bedrock drilling, and thus bond zone design (length) to utilize.
4. Micropile design shall neglect end bearing resistance.
5. The micropile bedrock-to-grout bond zone length shall be a minimum of ten (10) feet.
6. Micropile grout shall be a non-shrink, minimum 5,000 psi 28 day compressive strength cementitious material, utilizing Type I/II or Type II Portland cement.
7. Micropile actual grout volumes (utilizing cut-off to tip elevation limits) shall exceed their theoretical drill hole volumes by more than 110% to be acceptable. The Contractor shall provide actual and theoretical grout volume calculations to the field Engineer at completion of each micropile.
8. Micropile design shall provide a minimum one (1) inch grout cover over the central steel reinforcing bar including bar couplers. Centralizers attached to the micropile's central reinforcing bar shall be used to ensure the minimum grout cover.
9. Micropile permanent perimeter steel casing and central reinforcing bar shall be composed of domestically produced, minimum 80 ksi yield strength steel.
10. Micropile central reinforcing bar steel and bar couplers, and micropile to bridge substructure connection plates, nuts, washers, etc. shall be corrosion protected by hot-dipped galvanizing per ASTM A153.
11. Micropile permanent perimeter steel casing shall extend a minimum of three (3) feet into competent bedrock, termed the casing plunge depth, and shall extend a minimum of one (1) foot above bottom of bridge substructure foundation concrete.
12. Micropile perimeter steel casing shall have a minimum pipe wall thickness of 0.5 inch.
13. The Contractor shall anticipate encountering obstructions during micropile drilling, man-made and natural, and shall utilize equipment/methods necessary to advance through or remove obstructions.

14. The Contractor shall control and properly dispose of micropile drill flush and other related construction waste, including excess grout in accordance with permits, project Contract Documents and all applicable local codes and regulations.
15. Micropile Verification Testing: Perform a minimum of two (2) Verification Tests on preproduction sacrificial micropiles, a minimum of one Verification Test for each abutment/wing-wall. All Verification Testing shall be performed and accepted by the Engineer prior to the start of any production micropile construction. Each Verification Test shall incorporate a minimum of two (2) telltales or bar reinforcing strain gauges for test monitoring purposes. Telltales/strain gauges shall be located at top and bottom of the test micropile bond zone. The maximum Verification Test load shall be 200% of the DL. The Contractor shall propose Verification Test locations within 10 feet of project abutment/wing-wall boring locations for Engineer review and approval.
16. Micropile Proof Testing: Perform a minimum of four (4) micropile Proof Tests on production micropiles, a minimum of two Proof Tests for each abutment/wing-wall. The maximum Proof Test load shall be 160% of the DL. The Contractor shall propose Proof Test locations for Engineer review and approval.
17. Battered micropiles shall be constructed with the same criteria and resistance requirements as vertical micropiles.

MICROPILE CONTRACTOR, EXPERIENCE SUBMITTALS:

The Contractor shall be experienced in micropile construction and load testing. The Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions. The Contractor shall submit micropile construction details, structural details, load test report results and current client contact information for at least five (5) previous successful micropile projects, of similar scope to this project, completed during the past five (5) years.

The Contractor shall assign a full-time Quality Control (QC) inspector/supervisor to supervise the work, who has experience on at least five (5) micropile projects of similar scope to this project completed over the past five (5) years. The QC person shall be responsible for Quality Control of the micropiles during all phases of construction and will monitor and document all QC inspection and testing activities required by the specifications and outlined in the accepted Contractor procedures and Working Drawings. The QC supervisor shall be a certified NETTCP Concrete Technician. The Contractor shall not use consultants or manufacturers' representatives to satisfy the supervising QC inspector requirements.

The Contractor's onsite foremen and drill rig operators shall have experience on at least three (3) projects over the past five (5) years installing micropiles of equal or greater capacity than required for this project.

The micropiles shall be designed by a Registered Professional Engineer licensed by the State of Rhode Island with experience in the design of at least five (5) successfully completed micropile projects over the past five (5) years, with micropiles of similar capacity to those required for this project. The micropile design engineer may be either an employee of the Contractor or a separate consultant design engineer meeting the stated experience requirements.

At least 45 calendar days before the planned start of micropile construction, the Contractor shall submit four (4) hard copy sets and an electronic copy of the completed Project Reference List and a proposed Personnel List. The project reference list shall include a brief project description with the owner's name, current contact information, and project load test report(s). The proposed Personnel List shall identify the micropile system design engineer, supervising Quality Control inspector, and on-site foremen to be assigned to the project. The Personnel List shall contain a summary of each individual's experience and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications.

The Engineer will approve or reject the Contractor's qualifications within 45 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension, impact or delay claims. All costs associated with incomplete or unacceptable submittals shall be borne by the Contractor.

Work shall not be started, nor materials ordered, until the Engineer's written approval of the Contractor's experience and qualifications is given. The Engineer may suspend the Work if the Contractor uses non-approved personnel. If Work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

MICROPILE DESIGN SUBMITTALS:

At least 45 calendar days before the planned start of micropile construction, the Contractor shall submit complete micropile design and construction calculations/details and Working Drawings to the Engineer for review and evaluation. This submittal shall include an installation narrative, all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropiles. The installation narrative shall provide details of the specific method of construction, the proposed procedure(s) for by-pass or

remove of obstructions, the proposed equipment for micropile installation, means and methods for measuring grout quantities and pressures during micropile installation. The proposed records keeping format shall be described and a sample installation form(s) provided for approval. The Contractor shall verify micropile locations and ground survey data before preparing the detailed Working Drawings.

The micropile design drawings and calculations shall be signed and sealed by the Contractor's Rhode Island Registered Professional Engineer or by the Consultant Designer's Rhode Island Registered Professional Engineer, as applicable, previously approved by the Engineer. If the micropile Contractor uses a consultant design engineer to prepare the design, the micropile Contractor shall still have overall contract responsibility for both micropile design and construction.

MICROPILE DESIGN CALCULATIONS:

The micropile design calculations shall include, but not be limited to, the following items:

1. A written narrative summary report describing the overall micropile design in detail.
2. Applicable code requirements and design references.
3. Graphic of micropile key design cross-section(s) and longitudinal geometries including soil/rock strata, piezometric level(s) and magnitude and direction of design applied load(s).
4. Design criteria including soil/rock shear strengths (friction angle and cohesion), unit weights, bedrock-to-grout bond values used, and micropile drill hole diameter assumptions.
5. Resistance Factors and factored loads used in the design of (bedrock-to-grout) bond zone values; material unit weight(s) for bedrock, steel and grout if used in the calculations.
6. Design calculation sheets shall contain the contract number, micropile location designation, date of preparation, initials of designer and checker. Provide an index page referencing page numbers for the design calculations. All calculation sheets shall be numbered.
7. Design notes including an explanation of symbols used and particularly the detailed technical annotation of any computer program output including the software developer name and version used.
8. Micropile to bridge substructure connection materials, details, graphics and design calculations.
9. References used for all key calculations, factors and data employed.

WORKING DRAWINGS:

The Contractor's Working Drawings shall include all information required for the design and quality control of the micropile construction. Working Drawings shall include, but not be limited to, the following items unless provided in the Plans:

1. A plan view of the micropile layout identifying:
   a. A reference baseline and elevation datum.
   b. An offset from the bridge construction center-line or baseline to the center-line of the micropile at all changes in horizontal alignment.
   c. Beginning and end of micropile work stationing.
   d. Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned utilities, adjacent structures or other potential interferences.
   e. Subsurface exploration locations with reference base lines to fix the location of the explorations relative to the proposed micropiles.
   f. A micropile identification numbering system.
   g. Proposed Verification and Proof Test micropile locations.
2. Elevation view(s) of key micropile section(s) identifying:
   a. Micropile locations and elevations, vertical and horizontal spacing, batter and alignment.
   b. Existing and finished grade profiles both behind and in front of the micropiles.
3. Micropile design parameters, applicable codes and references.
4. General notes for constructing the micropiles including construction sequencing or other special construction requirements.
5. A summary listing of micropile pay item quantities on the elevation drawing(s).
6. Micropile typical sections including component lengths and inclination; minimum drill hole diameter; casing pipe and reinforcing bar sizes, steel strengths and details; splice types and locations; centralizers; micropile bond zone and casing plunge lengths; corrosion protection details; bridge substructure connection details including casing pipe, bar reinforcing, plates, nuts, washers, etc. and micropile to bridge substructure embedment length.
7. Details of the pre-production, non-production Verification Test and production Proof Test micropiles, identifying the micropile length; minimum drill hole diameter; reinforcing steel and reinforcing centralizer locations; bond zone, plunge and total casing lengths; estimated soil/bedrock strata locations; instrumentation; splice types and locations; corrosion protection details; grout mix and casing/bar reinforcing steel design strength.
8. Additional details, dimensions, and construction schedule for all micropiles.
9. Details of constructing micropiles around utilities, as applicable.

The Working Drawings and design calculations shall be signed and sealed by the Contractor's Rhode Island Registered Professional Engineer, previously pre-qualified by the Engineer. If the micropile Contractor uses a Consultant Design Engineer to prepare the design, the micropile Contractor shall still have overall contract responsibility for both the micropile design and construction.

The Contractor shall submit four (4) hard copy sets and an electronic copy of the Working Drawings with the initial submission. One set will be returned with any indicated corrections and/or comments. The Engineer will evaluate (approve or reject) the Contractor's submittal within 45 calendar days after receipt of a complete submission. If revisions are necessary, the Contractor shall make the necessary corrections and resubmit four (4) hard copy sets and an electronic copy.

The Contractor will not be allowed to begin micropile construction or incorporate materials into the work until all submittal requirements are satisfied and found acceptable to the Engineer. Changes or deviations from the approved micropile submittal(s) must be re-submitted for approval. No adjustment in contact time or delay or impact claims will be allowed due to incomplete submittals.

The Working Drawings shall be revised when plan dimensions are changed due to field conditions or for other reasons. Within 14 days after completion of the Work, the Contractor shall submit micropile As-Built drawings to the Engineer. The Contractor shall provide revised design calculations signed and sealed by the Contractor's approved Rhode Island Registered Professional Engineer for all design changes made during micropile construction.

CONSTRUCTION SUBMITTALS:

The Contractor shall prepare and submit to the Engineer, for review and evaluation, four (4) hard copy sets and an electronic copy of the following, for the micropile system or systems to be constructed:

1. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the Working Drawings in sufficient detail to allow the Engineer to monitor micropile construction and quality control procedures.
2. Proposed micropile construction start date, detailed micropile installation schedule and a plan with proposed micropile layout including a micropile identification numbering system.

3. If welding of casing is proposed, the Contractor shall submit the proposed welding procedure, certified by a qualified welding specialist. All welding shall be performed in accordance with the current AWS Structural Welding Code.
4. Information on the proposed laydown area, and space requirements for installation equipment that verifies the proposed equipment can perform at the site.
5. Plan with notes describing how surface water, drill flush, and excess waste grout will be controlled and disposed.
6. Proposed Quality Control Plan: The Quality Control Plan should sufficiently document the Quality Control processes of all Contractor parties (i.e. Prime Contractor and Subcontractor(s)) performing work required under this specification. The Quality Control Plan shall include complete descriptions, details, and supporting calculations for the following:
    a. Grout mix design and type of materials to be used in the grout including certified test data (e.g. per AASHTO T 106 or T 22) and recent trial batch reports representative of the proposed production micropile grout mix. The micropile Contractor shall also provide specific gravity and density of the wet mix design (per API RP-13B-1).
    b. Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.
    c. Grouting rate calculations, when requested by the Engineer. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.
    d. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of project micropile grouting may be submitted for grout mix initial verification and evaluation prior to the start of production work. During micropile production work, grout shall be tested in accord with this specification.
    e. Procedure and equipment for Contractor monitoring of grout quality. At a minimum, the micropile Contractor shall verify the specific gravity of the mixed grout prior to placement of grout into each drilled micropile.
7. Detailed plans for the proposed micropile static load testing methods and locations, for Verification and Proof testing. This information shall include drawings, details, and structural design calculations necessary to clearly describe the proposed test methods; reaction load systems capacity and equipment setup; types and accuracy of apparatus to be used for applying and measuring the test loads; and procedure/equipment for micropile top and tip movement monitoring during and post testing in accordance with this specification.

8. Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Micropile testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.
9. Certified mill test reports for the central bar reinforcing and permanent casing steel, or coupon test results for permanent casing steel without mill certification. For micropile reinforcing bar and casing steel include the ultimate strength, yield strength, elongation, and material properties composition. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
10. Installed micropile drill hole theoretical volume and actual micropile grout volume. All micropile actual grout volumes shall exceed their theoretical drill hole volumes by more than 110% to be acceptable. The Contractor shall provide theoretical and actual micropile volume calculations to the field Engineer at completion of each micropile.

Micropile work shall not begin until all construction submittals have been received, reviewed, and accepted in writing by the Engineer. Provide submittal items 1 – 7 at least 45 calendar days prior to initiating micropile construction, item 8 at least seven (7) calendar days prior to the start of micropile load testing, and items 9 and 10 as the work progresses for each materials delivery. The Contractor shall allow the Engineer forty-five (45) calendar days to review the construction submittals after a complete set has been received. Additional time required due to incomplete or unacceptable submittals shall not be cause for delay or impact claims. All costs associated with incomplete or unacceptable Contractor submittals shall be the responsibility of the Contractor.

PRE-CONSTRUCTION MEETING:

A Pre-construction Meeting will be scheduled by the Contractor and held prior to the start of micropile construction. The RIDOT resident Engineer; Geotechnical Consulting Engineer; Prime Contractor; Micropile Specialty Contractor personnel including their QC inspector/supervisor; Excavation Contractor, geotechnical instrumentation specialist (if applicable) shall attend the meeting. Attendance is mandatory. The Pre-construction Meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors - specifically those pertaining to excavation and dewatering for micropile construction, anticipated subsurface

conditions, dealing with obstructions, micropile installation and testing, micropile survey control, drill spoil and other construction waste removal/disposal, site drainage control, dewatering and temporary excavation support.

MATERIALS:

The Contractor shall furnish materials new and without defects. Any defective materials shall be removed from the jobsite at no additional cost to the State. Materials for micropiles shall consist of the following:

Admixtures for Grout: Admixtures shall conform to the requirements of ASTM C 494/AASHTO M194. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations and anchorage covers, if used. Accelerators are not permitted. Admixtures containing chlorides are not permitted.

Cement: All cement shall be Portland cement conforming to ASTM C 150/AASHTO M85, Types I/II or II.

Fine Aggregate: If sand-cement grout is used, sand shall conform to ASTM C144/AASHTO M45.

Fillers: Inert fillers such as sand (conforming to AASHTO M 45) may be used in the grout in special situations, such as in the presence of large voids in the ground or when grout take and travel are to be limited, with prior written approval by the Engineer.

Water. Water used in the grout mix shall conform to AASHTO T 26 and shall be potable, clean, and free from substances that may be injurious to cement and steel.

Grout: RIDOT approved neat cement or sand/cement mixture with a minimum 3-day compressive strength of 2,500 psi (50% of the 28 day unconfined compressive strength) and a minimum 28-day compressive strength of 5,000 psi per AASHTO T106/ASTM C109. The grout shall be proportioned and mixed so as to provide a fluid grout capable of maintaining the solids in suspension without appreciable bleed. Preparation and placement of grout shall be in accordance with the recommendations of "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," ACI 304.

A minimum of 45 calendar days prior to the start of micropile construction, the grout mix design shall be submitted to the Engineer along with the results of representative trial batch mix testing performed. The trial batch shall be representative of the production grout proposed and shall utilize the same materials, equipment, methods of mixing, sample preparation and curing methods. The trial batch results submittal is required to verify that the material meets all grout criteria specified, e.g. 3, 7 and 28 day unconfined compressive strength (per AASHTO T 106 or T 22) and grout consistency within 10%± of the density proposed for the production grout mix design (per API RP-13B-1).

Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used.

Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement to provide the minimum grout cover specified of one (1) inch over the galvanized central bar and bar couplers; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing.

Galvanization: Steel galvanization shall meet the requirements of ASTM A-153.

Permanent Casing Pipe: Permanent steel casing/pipe shall have the diameter and at least minimum wall thickness shown on the approved Working Drawings and as indicated below. The permanent steel casing/pipe shall be a domestic product and meet the following requirements:

1. The tensile requirements of ASTM A252, Grade 3 except the yield strength shall be a minimum of 80,000 psi. The minimum micropile casing/pipe wall thickness shall be 0.5 inch.
2. Micropile casing/pipe may be new “structural grade” (a.k.a. “mill secondary”) steel pipe meeting the above requirement but without mill certification, free from defects (dents, cracks, tears) and with two coupon tests per truckload delivered to the fabricator and provided to the Engineer.

Micropile permanent steel casing shall consist of ERW (Electric Resistance Welded) and/or seamless steel casing and shall be designed to withstand the design loadings determined by the Engineer or shown on the Plans and the Verification/Proof Test loading described in this specification. Joints shall develop the full axial capacity, and at least 60% of the moment capacity of the casing. The top of casing shall extend a minimum of one (1) foot above

the bottom of bridge substructure concrete. The bottom of casing shall extend a minimum of three (3) feet into competent bedrock, referred to as the plunge depth.

The permanent steel casing shall have certified mill test reports, which shall be submitted for record purposes as the materials are delivered to the site. Casing steel shall be traceable back to the mill certifications, and be free from defects (dents, cracks, tears, etc.).

New “mill secondary” steel casing pipe will not be accepted regardless if they are accompanied by coupon test results as indicated above.

For permanent casing pipe that will be welded for structural purposes, the following material conditions apply:

1. The carbon equivalency (CE) as defined in AWS Dl.l, Section XI5.1, shall not exceed 0.45, as demonstrated by mill certifications.
2. The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications.
3. The steel pipe shall not be joined by welded lap splicing.
4. Welded seams and splices shall be complete penetration welds.
5. Partial penetration welds may be restored in conformance with AWS D1.1.
6. The proposed welding procedure certified by a welding specialist shall be submitted for Engineer approval.

Threaded casing joints shall develop at least the required compressive, tensile, and/or bending strength used in the design of micropiles.

Plates and Shapes. Structural steel plates and shapes for micropile to bridge substructure connections shall conform to minimum ASTM A709/AASHTO M270, Grade 50.

Reinforcing Bars. Reinforcing steel shall be galvanized deformed bars in accordance with ASTM A 6l5/AASHTO M31, Grade 80 or 100, as shown on the Plans or approved Contractor shop drawings. When a bearing plate and nut are required to be threaded onto the top end of micropile reinforcing bars for the bridge substructure connection, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous thread bars) or may be cut into a reinforcing bar. Micropile hardware for bridge substructure connection, e.g. plates, nuts, washers, etc. shall be galvanized.

Reinforcing bar couplers shall develop at least the ultimate tensile strength of the bars without evidence of any failure and shall be galvanized.

CONSTRUCTION METHODS:

Drill Spoil/Construction Waste and Site Drainage Control. The Contractor shall control and properly dispose of micropile drill flush and other construction related waste, including excess grout, in accord with Project permits, the Rhode Island Standard Specifications and all applicable local codes and regulations. The Contractor shall provide positive control and legal discharge of all surface water that will affect construction of micropiles and project construction in general, and maintain all pipes or conduits used to control surface water during construction. Micropiles shall be constructed from a dry and stable subgrade base. The Contractor shall repair damage caused by surface water at no additional cost. Upon substantial completion of the work, the Contractor shall remove surface water control pipes or conduits from the site. Alternatively, with the approval of the Engineer, pipes or conduits that are left-in-place may be fully grouted and abandoned or left in a way that protects new construction and all adjacent facilities from migration of fines through the pipe or conduit, and potential ground loss.

Excavation. The Contractor shall coordinate the project work and specifically the excavation, so that micropiles can be safely constructed. The micropile construction and related excavation shall be performed in accordance with the Plans and approved submittals. No excavation side slopes steeper than those specified herein or shown on the Plans will be made above or below the micropile locations without written approval of the Engineer.

Obstructions. When obstructions are encountered during the installation of micropiles, the Contractor shall make all reasonable efforts to install the micropiles at the location shown on the Plans and to the proper depth. The Contractor shall excavate to remove the obstruction or shall resort to all usual methods to install micropiles including rotary drilling and down-the-hole hammer use. Micropiles shall not be relocated unless and as directed by the Engineer.

Construction Tolerance: Unless otherwise stated on the Plans, the following shall be the maximum construction tolerances for micropiles:

1. The center-of-gravity of the entire group of micropiles at an abutment and/or wing wall shall not be more than 2 inches from the center-of-gravity location for the group as indicated on the Plans.
2. Centerline of each micropile shall not be more than 3 inches from the indicated Plan location.
3. Micropiles shall be plumb within 2 percent of total-length Plan alignment.

4. Battered micropiles inclined up to 1H:6V shall be within 4 percent of design plan alignment.
5. Battered micropiles inclined greater than 1H:6V shall be within 7 percent of design plan alignment.
6. Top elevation of micropiles (cut-off) shall be 1 inch plus or minus maximum from the elevation indicated.
7. Centerline of reinforcing steel shall not be more than ¾ inch from the indicated location.
8. Micropiles that are damaged or defective due to defective materials, improper installation procedure, or micropiles that have an installed volume of cement grout not exceeding a volume equal to 110% of the theoretical volume of the drill hole (micropile cut-off to tip length used) will not be accepted. Micropile acceptance will be by the sole judgment of the Engineer.

Micropiles that are damaged or defective as determined by the Engineer shall be cut-off a minimum of one foot below bottom of bridge substructure invert elevation, or as directed by the Engineer, and located on the Contractor's developed As-Built Drawing. These micropiles shall be replaced by additional micropile(s) installed adjacent thereto or as directed by the Engineer, at no additional cost to the State. The replacement micropile(s) must be installed at a location which results in the center-of-gravity of the group meeting the location criteria stated above. Any modification that necessitates change to the substructure shall require the Engineer's prior review and acceptance. Any modifications shall be at the Contractor's expense. Micropiles which are mis-located beyond the specified tolerances shall be corrected by installing additional micropile(s), as directed by the Engineer. The location of additional micropile(s) shall be such that the center-of-gravity of the combination of the original and add micropile(s) fall within the allowable location tolerance for the abutment or wing-wall. The Contractor shall develop and provide to the Engineer for review all micropile modifications including center-of-gravity calculation information in a timely manner.

Micropile Installation.

General. The micropile Contractor shall select the drilling method, the grouting procedure, and the grouting pressure used for the installation of micropiles. The micropile Contractor shall also determine the micropile casing size, final drill-hole diameter, bond length, and central reinforcement steel size necessary to develop the specified resistance capacity and load testing requirements. The construction method shall incorporate any special construction requirements specified on the Plans and this Special Provision Specification. The production micropiles and their construction method shall be identical to the accepted Verification Test micropiles for each bedrock

type and thus bond zone design (length). The micropile Contractor is responsible for estimating and calculating the micropile grout take (from cut-off to tip elevation) for comparison with the theoretical drill hole volume. There will be no extra payment for grout overruns. Micropile grout calculations shall be provided to the field Engineer at the completion of each micropile.

When the Plans or site conditions require uncased drilling of the micropile into bedrock, the permanent and/or temporary casing shall be drilled a minimum three (3) feet below the bedrock surface to competent bedrock or to that deeper depth within the bedrock so as to prevent subsidence of overburden into the uncased bedrock bond zone portion of the drill hole (i.e. rock socket) and to construct the micropile bedrock bond zone within competent bedrock.

Micropiles shall be constructed only in the presence of the Engineer.

Location and Elevation. Micropiles shall be located and marked using survey methods and a template by the Contractor, who shall maintain and be responsible for all location and elevation stakes.

Drilling. The drilling equipment and methods used shall be suitable for drilling through the conditions to be encountered, without causing damage to overlying or adjacent structures or services. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to placing reinforcement and grout.

Permanent or temporary casing or other accepted method of micropile drill hole support is required, to permit the micropile shaft to be formed to the minimum design drill hole diameter and depth for reinforcement and grout placement. The casing shall be of the type and thickness that can be installed without damage. Casings that fail, fracture, or otherwise are damaged during drilling or after drilling shall be, unless otherwise directed, withdrawn and replaced at the Contractor's expense. The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures, in order to maintain site conditions as determined by the Engineer. Do not initiate a new drill hole, pressure-grout, or post-grout, within a radius of five (5) micropile diameters or 5 feet, whichever is greater, of a micropile until the grout for that micropile has set for a minimum of 24 hours or longer. Do not allow vibration or excessive equipment wheel or other loads to influence micropiles during installation and construction.

Use of drilling fluid containing bentonite or any other non-reverting drilling fluid is not permitted. Use of polymer slurry to remove cuttings from the cased hole shall be approved by the Engineer.

Micropiles shall be installed using equipment capable of penetrating boulders, cobbles, bedrock, dense glacial till material, granite blocks, timber, concrete and/or other man-placed materials that hinder or obstruct the advance of the micropile.

Use of drop-type impact hammers and blasting are not permitted. Prior to the use of down-the-hole air hammer drilling methods the Contractor shall provide temporary fencing or barriers as necessary to prevent cuttings from leaving the work area and entering adjacent traffic lanes.

Micropiles shall not be installed using auger cast methods.

Permanent casing must be installed in a manner which will not loosen the adjacent soils and will result in intimate contact between the casing and the soil/bedrock. Driving of casing will not be allowed. Drilling shall be performed such that cuttings and/or wash fluid return will be through the inside of the casing, duplex drilling. External flush will not be allowed. The method of drilling used shall prevent the loss of ground due to erosion, jetting, or blow-in at the bottom of the casing. No open-hole drilling will be allowed unless accepted by the Engineer.

Ground Heave/Subsidence. During construction, the Contractor shall observe the conditions in the vicinity of the micropile construction site on a daily or more frequent basis for signs of ground heave or subsidence. The Contractor shall immediately notify the Engineer if signs of ground movement are observed. The Contractor shall immediately suspend or modify drilling or grouting operations, if ground heave or subsidence is observed, if the micropile is adversely affected, or if there is imminent damage or damage to adjacent structures from micropile drilling or grouting. If the Engineer determines that the ground movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement and/or perform repairs, at no additional cost to the State.

Casing Pipe and Reinforcing Bar. Reinforcement shall be placed into the drill hole prior to grouting and before temporary casing (if used) is withdrawn. Reinforcement shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Micropile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings, if required, without damage or

disturbance. Reinforcement in the bedrock bond zone [i.e. rock socket] shall extend to the minimum required length.

The Contractor shall construct all micropiles to the planned elevations.

Centralizers and spacers shall be provided at 10 foot centers maximum spacing in order to provide a minimum of 1 inch of grout cover over all steel reinforcing, including couplers. The upper and lower most centralizer shall be located a maximum of 5 feet from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bar(s) with centralizers shall be lowered into the stabilized drill hole/casing and set per Plan locations/elevations. The reinforcing steel shall be inserted into the drill hole/casing to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The Contractor shall re-drill and reinsert reinforcing steel when necessary to facilitate insertion.

Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two steel lengths to be spliced. Splices and threaded joints shall meet the requirements of this specification. Threaded pipe casing joints shall be located at least two casing outside diameters (O.D.s) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 12 inches.

Grouting. Micropiles shall be primary grouted the same day the load transfer bond length is drilled, or the bond length shall be flushed prior to commencement of grouting procedures. The Contractor shall use a stable neat cement grout or a sand/cement grout with a minimum 28-day unconfined compressive strength of 5,000 psi. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations and this specification. The grouting equipment used shall produce a grout free of lumps and undispersed cement. The Contractor shall have an approved means and methods of measuring the grout quantity and pumping pressure during micropile grouting operations. The grout pump shall be a positive displacement pump equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the top of the micropile. The pressure gauges shall be capable of measuring pressures of at least 150 psi or twice the actual grout pressures used, whichever is greater. The grout shall be kept in constant agitation prior to placement. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each micropile to be grouted in one continuous operation. The grout volume being pumped shall be measured to an accuracy of 10 percent.

Immediately prior to grouting, the drill hole shall be flushed with clean water to remove all contaminated water and cuttings. The drill hole shall be flushed with the grout pipe located at the bottom of drill hole. The flush water shall be pumped at a high velocity until the water flowing from the top of casing is visually clear/clean. After flushing, the depth of the hole shall be measured to confirm that the hole is clean and no sediment exists at the bottom of the drilled rock-socket/bond length. Installation of the steel reinforcing and grouting shall be performed immediately after flushing. In case of delay, the hole shall be re-flushed and rechecked prior to grouting and as directed by the Engineer.

The grout shall be injected from the lowest point of the drill hole. Grout injection shall continue until uncontaminated grout flows from the top of micropile. The grout may be pumped through tubes, casing or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to ground level/top of casing before the next length of casing is removed. The use of compressed air to directly pressurize the fluid grout is not permissible. The tremie pipe or casing shall always extend below the level of the grout surface within the drill hole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of bedrock or soil formations. The entire micropile shall be grouted to the design cut-off level. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

Grout within the micropiles shall be allowed to attain the required design strength prior to being loaded. If the Contractor elects to use a post-grouting system, Working Drawings and relevant details including grouting pressure, volume, location and mix design, shall be submitted to the Engineer for review and evaluation. Grout for the micropile Verification and Proof Test piles shall attain the minimum 3-day compressive strength of 2,500 psi, or as indicated in the approved Contractor submittal, prior to load testing. During production micropile construction, grout shall be tested regularly by the Contractor for consistency (density) and compressive strength.

Contractor Quality Control (QC), Grout Testing. The Contractor's Quality Control personnel will perform QC inspections, sampling, and testing to ensure that the processes in-place are providing work conforming to the contract requirements. Inspection, sampling, and testing shall be documented on appropriate forms and provided to the Engineer. The Engineer will not sample or test for Quality Control or assist in controlling the Contractor's operations.

A. Grout Testing

1. Grout consistency: As measured by grout density shall be determined by the Contractor per API RP-13B-1 at a frequency of at least one test per micropile, conducted just prior to start of micropile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be within 10%± of the density specified in the grout mix design submittal.
2. Compressive Strength: Grout within the micropiles shall be tested by the Contractor's Quality Control Inspector to ensure that it attains the minimum required compressive strength.

   Micropile grout shall be sampled and cured in accordance with AASHTO R 64 (for 2 inch by 2 inch cubes) or T 23 (for 3 inch by 6 inch cylinders) and tested for compressive strength in accordance with AASHTO T 106 (for cubes) or T 22 (for cylinders). Grout samples shall be taken directly from the grout plant (on-site mixer and pump).

   The QC Technician will take the following grout samples for QC testing:

   a. Verification Test Micropiles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing. The grout compression strength shall be the average of the three tests.
   b. Proof Test Micropiles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing. The grout compression strength shall be the average of the three tests.
   c. Production Micropiles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation; whichever occurs more frequently.

   The Contractor shall provide grout cube/cylinder compressive strength and grout density results to the Engineer within 24 hours of testing.

Grout Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2,500 psi
7 days		For information only
28 days		≥ 5,000 psi
Consistency	API RP-13B-1	within ± 10% of the density specified in the approved mix design
Volume		> 110% theoretical volume-of-hole

Micropile Installation Records. The Contractor shall prepare and submit to the Engineer full-length installation records for each micropile. The records shall be submitted within one (1) work shift after each micropile installation is completed. The data shall be recorded on the approved micropile installation log. A separate log shall be provided for each micropile. The Contractor shall submit for approval a micropile numbering plan identifying a unique designation number for each micropile. The Engineer shall keep an independent record of each micropile installation. Each micropile installation log shall include the following information as a minimum:

1. Project name, structure name, micropile number, and contract number.
2. Date and time of drilling, grouting, and completion.
3. Micropile top elevation immediately after installation to the nearest 0.1 foot.
4. Micropile cut-off elevation, as installed, and bottom of bridge substructure elevation to the nearest 0.1 foot.
5. Bottom of micropile casing elevation and top of bedrock elevation to the nearest 0.1 foot.
6. Micropile tip elevation as installed to the nearest 0.1 foot.
7. Micropile plumbness and batter information.
8. Deviation from specified Plan location to the nearest ½ inch.
9. Micropile length immediately after installation to the nearest 0.1 foot.
10. Micropile as-built information such as inclination, casing diameter and wall thickness, reinforcement size and length, casing length below/above bridge substructure bottom elevation, taped measurement inside casing to check cleanout depth, casing plunge length, casing bond zone length, total micropile length from cut-off to tip. All dimensions shall be provided to the nearest 0.1 feet.
11. Drilling method, drill bit type and size, and drill operator's name.
12. Table showing the descriptions and approximate top and bottom elevation of each soil or rock layer encountered during micropile drilling.
13. Grout mix, density, and quantity used, for initial grout and post-grout (if any) including cement type and admixtures.
14. The theoretical micropile drill hole volume from cut-off to tip elevation and the actual in-placed grout volume pumped, information to be provided by the Contractor. Actual in-placed grout volume shall be greater than 110% of the theoretical hole volume to be acceptable.
15. Maximum and average grout pressure used during installation.
16. Damage (if any) to micropile along with any corrective action taken, description of any deviations from the design location, installation procedures, and description of any unusual occurrences during drilling (e.g. obstruction encounters).

The example micropile installation log in the, “Micropile Design and Construction Guidelines Manual,” Report No. FHWA-NHI-05-039 or FHWA-SA-97-070 can be used as a guide in developing the micropile installation log.

The Contractor shall also submit within two (2) weeks after installation of all micropiles is complete, an As-Built Plan certified by a Rhode Island Registered Land Surveyor or Professional Engineer, showing the as-installed location of all micropiles to the nearest ½ inch from intended center-line location. Micropile location deviations from plan location shall also be provided to the Engineer in spread sheet format.

Micropiles shall be installed under the full-time inspection of the Engineer. The Contractor shall notify the Engineer a minimum of 48 hours prior to any operations in this section. Any micropile installed when the Engineer is not present to obtain the necessary records shall not be accepted for payment and the Contractor shall install additional micropile(s) as directed by the Engineer at no additional cost to the State.

MICROPILE LOAD TESTING

A. General

The Contractor shall perform pre-production Verification load tests on sacrificial micropiles, a minimum of one (1) successful test for each abutment/wing-wall substructure for a total minimum of two (2) sacrificial micropile Verification Tests. The location of the Verification Tests shall be within 10 feet of bridge substructure footprints, in close proximity to project boring(s), at least 5 feet from any production micropile location, proposed by the Contractor, approved by the Engineer and in conformance with the approved Contractor Working Drawings submittal.

Micropile Proof Tests shall be performed on production micropiles, a minimum of two successful micropile Proof Tests per abutment/wing-wall substructure, for a total minimum of four (4) production micropile Proof Tests to be performed in conformance with the approved Contractor Working Drawings submittal. The location of production Proof Test micropiles shall be selected by the Contractor and approved by the Engineer.

The load tests shall conform to the requirements of ASTM D1143 (vertical compression load testing) or ASTM D3689 (vertical tension load testing) except as modified herein. For the Verification Tests, the maximum test loads shall be 200% of the micropile’s Factored Design Resistance of 129 kips, termed the design load or “DL” for testing purposes and for the Proof Tests 160% of the DL. The maximum test loads shall be as specified above, but not more than 80% of the structural capacity of the micropile elements, to include steel yield in tension,

steel yield or buckling in compression, or grout crushing in compression. The structural elements of the Verification Test micropiles (non-production micropiles) may be modified for testing purposes, as acceptable to the Engineer. The Alignment Load (AL) should not be more than 0.04 DL.

Micropile load testing shall be performed to verify design and construction methods used prior to and during production micropile construction meet project requirements. The test micropiles shall be constructed and load tested in conformance with the approved Contractor Working Drawings submittal or as directed by the Engineer. Load test results shall be reviewed and acceptable to the Engineer.

As part of the Contractor's Working Drawings submittal, the Contractor shall submit a micropile Load Test Plan which includes a detailed written narrative description of the equipment and methods proposed for use. The equipment and methods must be acceptable to the Engineer. The micropile load test plan and description shall be prepared and stamped by a Registered Professional Engineer in the State of Rhode Island.

The Contractor shall provide all personnel and equipment needed to perform the testing, measure loads and movements, and record test data. The Engineer will observe, witness, the tests and record data independently. No testing shall be performed unless adequate Contractor personnel and equipment, and the Engineer are present.

The drilling-and-grouting method; casing length, wall thickness and outside diameter; reinforcing bar diameter and length; and depth of embedment for the test micropiles shall be identical to those specified for the production micropiles. The test micropile structural steel shall be sized to safely resist the maximum test load.

Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and for the Verification Tests - telltales or reinforcing bar strain gauges, and a reaction frame. The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required. The Contractor shall provide a description of the test setup; and jack, pressure gauge and load cell calibration data in accordance with this specification.

The Contractor shall design the test reaction frame(s) to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Provide a reaction frame capable of safely supporting at least 125 percent of the maximum test load. The jack, bearing plates, and stressing anchorage shall be aligned such that unloading and repositioning of the equipment will not be required during the test.

The test load shall be applied and measured using a hydraulic jack, pressure gauge and load cell. The pressure gauge shall be graduated in 100 psi increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be accomplished without resetting the equipment. The Contractor shall monitor the creep test load hold period during testing with both the pressure gauge and the electronic load cell. The load cell shall be used to accurately maintain a constant load hold, during the creep test load hold increment of the test.

Calibrate the test load jacking system including the hydraulic jack couplings, pump, pressure gauge, and hydraulic load cell prior to the test so that the load applied is controlled to within 3 percent of actual. Submit calibration reports to the Engineer prior to the start of the micropile load testing, a minimum of seven (7) calendar days prior to testing.

The Contractor shall provide an independently supported reference beam with supports firmly embedded in the ground at a distance of at least 10 feet from the test micropile, and independent from the jack, micropile, and reaction frame. One end of the reference beam must be free to move laterally as the length of the beam changes due to temperature variations.

Micropile top movement shall be measured utilizing three (3) dial gauges mounted equidistant from the center of the test micropile at 120° intervals around the micropile. The dial gauges shall be rigidly attached to the reference beam. The gauge stems shall be aligned vertically and visually parallel with the axis of the micropile, and on a smooth glass horizontal bearing surface. The dial gauges shall be capable of measuring to 0.001 inch and shall have a travel sufficient to allow the test to be accomplished without having to reset the gauge(s). Readings shall be taken at intervals specified in the Verification Test and Proof Test section of this specification.

Survey reference points shall be established on the test micropile, at each end and/or at the center of the reference beam, and on critical points of the reaction frame as approved by the Engineer. The reference points shall consist of graduated scales machine divided into 0.02 inch and attached securely to the micropile, reference beam, and other locations. The reference points shall be monitored by survey equipment methods during each micropile load increment.

The micropile movement measuring system shall be protected against rain, wind, frost, and any other disturbances that could affect the reliability of the movement measurements. Sun shading shall be provided for the measuring system for the duration of the test and for a minimum of 1 hour prior to the start of the test.

B. Micropile Verification Tests

The micropile Verification Test program, a minimum of one (1) successful test for each abutment/wing-wall bedrock condition for a total minimum of two tests. All Verification Testing shall be completed successfully and approved by the Engineer prior to the start of production micropile construction.

The Contractor shall perform pre-production micropile Verification Testing on sacrificial micropiles at locations selected by the Contractor and approved by the Engineer. The location of the Verification Tests shall be within 10 feet of the footprint of bridge substructures, in close proximity to project boring(s), and at least 5 feet away from any production micropile location. Verification Test locations will be proposed by the Contractor and approved by the Engineer. Testing shall be performed in compression or tension in accordance with ASTM D1143 or ASTM D3689, respectively, except as modified herein.

Verification Tests shall be performed to verify that the Contractor installed micropiles will meet the required DL load test acceptance criteria and to verify that the length of micropile bond zone is adequate for the bedrock type encountered. The driller shall coordinate/communicate continually with the field Engineer during micropile drilling relative to the “type and condition” of bedrock encountered and observed in the drill fluid return. The Engineer shall be the sole judge of bedrock type determination for each micropile and thus micropile bond zone design (length) required. For the test micropiles, the drilling and grouting method and casing outside diameter shall be identical to those used for production micropiles.

The Verification Test micropile reinforcing may need to be modified from that proposed for production micropiles, i.e. have a higher steel strength and/or a larger diameter, to accommodate the test loads.

Verification Test micropiles shall include at least two (2), ¾-inch diameter PVC Schedule 40 pipes cast into the test micropile to allow telltales to be installed for load testing. The pipes shall be securely fastened in straight alignment to prevent displacement during grouting. The pipes shall be sealed at the bottom with threaded steel caps and at the top with threaded PVC plugs. The pipes shall extend to the top and bottom of the bedrock bond zone. Micropile reinforcing bar strain gages may be substituted for telltales, as approved by the Engineer.

The micropile Verification Test results shall confirm that the micropile design and installation methods meet project requirements and shall be reviewed and accepted by the Engineer prior to any production micropile construction. The Verification Test micropile and reaction micropiles (if used) shall be cut-off and

abandoned per the approved Contractor Working Drawings submittal and/or as directed by the Engineer.

Verification Test micropiles shall be load tested to a maximum of 200% of the Factored Design Resistance, termed the design load (DL) defined previously. The Verification Test shall be performed by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Apply AL	AL	-
2	Cycle 1	0.15 DL	4
		0.30 DL	4
		0.45 DL	4
		AL	1
3	Cycle 2	0.15 DL	1
		0.30 DL	1
		0.45 DL	1
		0.60 DL	4
		0.75 DL	4
		0.90 DL	4
		1.00 DL	4
		AL	1
4	Cycle 3	0.15 DL	1
		1.00 DL	1
		1.15 DL	4
5	Creep Test	1.30 DL	10 to 60
6	Cycle 3 cont'd.	1.45 DL	4
		AL	1
7	Cycle 4	0.15 DL	1
		1.45 DL	1
		1.60 DL	4
		1.75 DL	4
		1.90 DL	4
		2.00 DL	4
		1.50 DL	4
		1.00 DL	4
		0.50 DL	4
		AL	15[1]
8	Load Removal	0.00 DL	--

AL = Alignment Load, DL = Design Load

[1] And until all pile movement has stopped.

Micropile top and tip movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The test micropile shall be monitored for creep at the 1.30 Design Load (DL).

Micropile movement during the creep test shall be measured and recorded at 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes.

The alignment load shall not exceed 4 percent of the DL load. Dial gauges shall be reset to zero after the initial AL is applied.

The micropile Verification Test Acceptance Criteria are:

1. If the micropile is tested in compression, acceptance will be based on the Davisson Criteria. For this Criterion, the ultimate load is defined as the load at which settlement measured relative to the top of the micropile prior to the start of testing exceeds the sum of:

    a. The theoretical elastic compression of the micropile assuming the load applied at the top of the micropile acts over the full length of the micropile, and
    b. 0.15 inches plus 1 percent of the micropile tip diameter.

2. If the micropile is tested in tension, the ultimate load is defined as the load that produces an upward movement under load of 0.5 inch at the micropile tip. The movement at the micropile tip is:

    a. Measured directly by tell-tale/strain gauge, or
    b. Computed by deducting the theoretical elastic elongation of the micropile from the upward movement measured relative to the top of the micropile prior to the start of testing.

3. At the end of the 1.3 DL increment, the test micropile shall have a creep rate not exceeding 0.04 inch/log cycle time (1 to 10 minutes) or 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the creep load hold period.

4. Failure does not occur at any load increment up to and including the maximum test load, 2.0 x DL. Failure is defined as load where the slope of the load versus head settlement curve first exceeds 0.025 in/kip.

At the completion of Verification Testing, test micropiles shall be removed down to the elevation specified on the Plans or as directed by the Engineer.

The Contractor’s Verification Test summary reports (one per Verification Test) must be written and submitted to the Engineer within 3 working days of the load test completion. This Report will either confirm the micropiles’ resistance and bond length indicted on the approved Contractor’s Working Drawings submittal or reject the micropile based upon the test results. The Report shall be reviewed and

acceptance by the Engineer prior to production micropile construction. The contents of the Verification Test Reports shall include:

1. Brief project description.
2. Description of site and subsurface conditions including information on the ground conditions anticipated at the location of the load test, with a comparison to actual conditions encountered.
3. Key personnel including the drill rig operator, the superintendent, the grout plant operator, and any other personnel involved in the installation and testing of the micropile.
4. Micropile installation data including information such as length of the micropile (cased and uncased), number of bags of cement used to construct the micropile, size and type of casing and bar reinforcement, geology encountered during drilling (e.g. soil and rock materials, groundwater level), grouting mix used, test micropile grout record and grout testing results, theoretical drill hole volume and actual grout take volume (cut-off to tip elevation).
5. Load test results including load-movement curves/figures and completed data sheets.
6. Statement of load test requirements and acceptance criteria.
7. Comparison of load test requirements and acceptance criteria.
8. Summary statement regarding the load test results and the micropile design and construction procedure used.

If a tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include but not be limited to modifying the installation methods, increasing the bond length, re-grouting the micropile via preplaced regrout tubes or changing the micropile type. Any modification that necessitates changes to the micropile design or construction shall be submitted as a revision to the Working Drawings and require the Engineer's review and acceptance.

Additional micropile load testing may be required, at no additional cost to the State, until an acceptable Verification Test meets the designated load test requirements, as directed by the Engineer.

C. Micropile Proof Tests

The Contractor shall perform micropile Proof Testing on production micropiles at locations selected by the Contractor and accepted by the Engineer. Proof Testing shall be performed in compression or tension to a maximum test load of 1.60 DL, in accordance with ASTM D1143 or ASTM D3689 respectively, except

as modified herein. Proof Tests shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Apply AL	AL	--
2	Load Cycle	0.15 DL	4
		0.30 DL	4
		0.45 DL	4
		0.60 DL	4
		0.50 DL	4
		0.60 DL	4
		0.75 DL	4
		0.90DL	4
		1.00 DL	4
		1.15 DL	4
3	Creep Test	1.30 DL	10 or 60
4	Load Cycle cont'd.	1.45 DL	4
		1.60 DL	4
5	Unload Cycle	1.30 DL	4
		1.00 DL	4
		0.75 DL	4
		0.50 DL	4
		0.25 DL	4
		AL	4[1]
6	Load Removal	0.00 DL	--

AL = Alignment Load, DL = Design Load

[1] And until all pile movement has stopped.

Creep Test: Micropile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The micropile proof test shall be monitored for creep at the 1.30 DL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.30 DL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the micropile top movement between 1 and 10 minutes exceeds 0.04 inches, the 1.30 DL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes.

Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance Criteria for micropile Proof Testing are the same as those for the micropile Verification Tests, except as modified below:

1. The creep test shall be held at the end of the 1.30 DL increment.
2. Failure does not occur at any load increment up to and including the maximum test load, 1.60 DL

Within 3 days of the completion of each Proof Test, the Contractor shall submit a report confirming the micropiles' resistance and bond zone lengths specified on the plans/specifications or reject the micropile based upon the test results. The contents of the Proof Test Report shall be the same as those in the report for the micropile Verification Tests.

If a micropile Proof Test fails to meet the acceptance criteria, the Contractor shall immediately Proof Test another micropile within that substructure, test location to be approved by the Engineer. For failed micropile Proof Test(s) further construction of other micropiles shall be modified by the Contractor as approved by the Engineer. Failed micropiles shall be replaced at the Contractor's expense. Any modification that necessitates changes to the structure/micropile design or construction procedures, or cost of additional micropiles and load testing shall require the Engineer's prior review and acceptance and shall be at no additional cost to the State. If the micropile type is changed, Verification and Proof Tests will be re-performed at no additional expense to the State.

Proof Tested micropiles may be considered for use as production micropiles provided no failure has occurred. Micropiles that are not used as production micropiles shall be cut-off and removed a minimum of one (1) foot below bottom of bridge substructure elevation, or as directed by the Engineer, and located on the Contractor's developed micropile As-Built Drawing.

NON-CONFORMING PILES

Non-conforming micropiles include micropiles that are installed out of tolerance, are damaged, the volume of grout placed is less than the theoretical volume of the hole, or the grout tests do not indicate the specified strength has been achieved. The Contractor shall submit a written Remedial Action Plan to the Engineer for approval. The Remedial Action Plan shall indicate how to correct the problem and prevent its reoccurrence. To mitigate or remediate non-conforming micropiles, the Contractor may be required to provide additional micropiles or supplement micropiles to meet Engineer specified requirements at no additional cost to the State.

METHOD OF MEASUREMENT

Mobilization & Demobilization of Micropile Equipment will be measured for payment on a Lump Sum Basis.

Drilled Micropiles will be measured for payment Per Each.

Micropile Verification Tests and Micropile Proof Tests will be measured for payment Per Each.

BASIS OF PAYMENT

Mobilization & Demobilization of Micropile Equipment will be paid for at the contract Lump Sum Price stated in the Proposal. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment necessary for the handling, drilling and grouting of micropiles and for the removing of same upon completion of the work.

Drilled Micropiles shall be paid at the contract unit price Per Each, complete in-place and accepted by the Engineer. Payment for drilled micropiles shall be considered complete compensation for providing all design, materials, labor, tools, equipment, proper disposal of drilling spoil and other related construction waste, drilling, furnishing and placing bar reinforcing steel and casing, micropile to bridge substructure connection and all other incidentals to complete the Work. There will be no payment for temporary casing, if used. The micropile Contractor is also responsible for estimating and calculating the actual micropile grout take for each micropile, for comparison with the theoretical drill hole volume. There will be no extra payment for grout volume overruns.

The Contractor shall anticipate encountering obstructions, man-made and natural, as noted herein and shall utilize equipment and methods necessary to advance through or remove the obstructions. The presence of obstructions, any lost production, replacement micropiles, and the removal of obstructions, if necessary, shall not be measured or paid for separately. Any costs associated with the presence of obstructions shall be considered incidental to the Drilled Micropiles Item.

Drilling tools that are lost during the drilling shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. If removal will degrade the hole, the hole shall be abandoned with a new hole located by the Engineer. All costs due to lost tool removal, drilling a new hole and filling the abandoned hole shall be borne by the Contractor.

Micropile Verification Tests and Proof Tests shall be paid at the contract unit price Per Each completed and accepted by the Engineer, for which payment shall be considered complete compensation for providing all design, materials, labor, equipment, instrumentation, load test report, and all other incidentals required to complete the work including the installation and materials for the test micropiles and test reaction systems. This payment shall also include full compensation for cutting the micropile to the elevation necessary to properly incorporate the micropile into the structure. If a micropile is not to be incorporate in the structure, this payment

item includes cutting the micropile to the grade necessary to avoid its interference with the proposed construction. Payment for the Verification and Proof Tests shall also include full compensation for installing the test micropiles and testing. Proof Tested micropiles, if incorporated into the final structure shall be paid for Per Each of Drilled Micropiles.

Payment Items

804.9901	Drilled Micropiles	Per Each
804.9911	Mobilization and Demobilization	Lump Sum
804.9913	Micropile Verification Test	Per Each
804.9914	Micropile Proof Test	Per Each

CODE 805.99 TEMPORARY EARTH RETAINING AND DEWATERING SYSTEMS

DESCRIPTION

This work shall be in accordance with State of Rhode Island, Department of Transportation, Standard Specifications for Road and Bridge Construction, Amended 2018, and specifically Part 200 and Section 805, and as modified herein by these Special Provisions.

All Temporary Earth Retaining and Dewatering Systems project wide are the responsibility of the Contractor, including but not limited to their need assessment, selection, design, construction, maintenance, operation and removal of systems, as defined herein. This work includes:

1. Contractor selection of the temporary works systems needed to undertake the work: Temporary Earth Retaining and Dewatering Systems, herein considered to be synonymous. This shall include designing, constructing, maintaining, removing and legally disposing as applicable the temporary earth retaining and dewatering systems required to construct, protect and maintain all new and adjacent facilities project wide. These include, but are not limited to, new and existing structures, drainage and water quality areas, demolition work, utilities, roadways, and the Limits of Disturbance identified on the Plans and as stipulated by the permit agencies.

   The Contractor shall determine the locations where Temporary Earth Retaining and Dewatering Systems are required in order to undertake the proposed work, and submit shop drawings in accordance with this Special Provision and the Contract Documents. At a minimum and at any location where the excavation and/or dewatering extends into the zone of influence of a facility, the Contractor shall submit a design for the proposed systems or submit supporting calculations and/or evidence that clearly demonstrate that Temporary Earth Retaining and Dewatering System(s) is/are not required. The zone of influence is defined as an imaginary line extending horizontally two feet from the bottom edge of the facility and down on a 2Horizontal:1Vertical (2H:1V) slope.

   The Contractor shall be fully responsible for the safety and stability of excavations and/or slopes, including at locations where the Contractor determines that no Temporary Earth Retaining and Dewatering System(s) is/are needed. The Contractor shall be fully responsible for the safety and stability of all earthwork excavations and slopes.

2. Coordinating the installation, maintenance, and removal, as applicable, of the Temporary Earth Retaining and Dewatering Systems with all Contractor below-grade construction activities. The Contractor's activities in these areas shall be consistent with the approach and methodology outlined in their submittals that have been reviewed and approved by the Engineer.

3. Performing any and all preparatory work to explore, protect, maintain, relocate, underpin and restore all existing underground utilities as necessary.

4. Performing monitoring of Temporary Earth Retaining and Dewatering Systems performance during all phases of installation, during and post construction, removal and/or left-in-place and cut-off below grade, as directed by the Engineer.

5. Pre-trenching and/or probing along the alignment of the Temporary Earth Retaining System walls or implementing other procedures to remove obstructions in advance of Temporary Earth Retaining System construction.

MATERIALS

There are no additional material requirements.

CONSTRUCTION METHODS

1. Submittals: The following submittals shall apply to Temporary Earth Retaining and Dewatering Systems and shall be made by the Contractor for review by the Engineer prior to start of Temporary Earth Retaining and Dewatering Systems construction. The Contractor shall conform to all submittal requirements of the Contract, including submitting the information specified herein to the Engineer for comment and approval.

   All temporary works submittals under this Special Provision, including any permanent features of the earth retaining structures, shall be designed and stamped by a Registered Professional Engineer in the State of Rhode Island who is currently in good standing and shall include:

   a. Detailed calculations of analyses and designs for each system to be employed (one set for each location).

   b. A detailed narrative describing the proposed construction and construction sequence for the temporary works systems. The narrative shall detail the sequencing of the retaining and dewatering systems construction, including the installation phase, pre-excavation, mass excavation, permanent below-grade structure construction and dewatering process for each temporary works system.

   c. Plans of the Contractor’s proposed monitoring system to survey horizontal and vertical movements, indicating proposed monitoring materials,

equipment, schedule, procedures and movement mitigation options. Refer to Special Provision Code 805.9909, Geotechnical Instrumentation.

d. Qualifications: The Contractor shall submit:

i. Qualifications and relevant experience of the Contractor's designer(s) proposed for the Temporary Earth Retaining and Dewatering Systems. The designer(s) shall be a currently licensed Rhode Island Professional Engineer in good standing and have a minimum of 10 years of relevant design experience for the work proposed.

ii. Qualifications and experience of the Contractor and Subcontractor personnel doing the work, including the supervisory personnel who shall be assigned to the project and be responsible for the construction, maintenance and removal of the designed systems. The supervisory personnel shall have a minimum of 10 years of relevant construction experience and shall have successfully constructed a minimum of 10 projects with similar work.

e. Following installation, the Contractor shall submit electronic as-built plans and elevations for each of the Temporary Earth Retaining and Dewatering Systems used.

2. Design Criteria: Temporary Earth Retaining and Dewatering Systems, where used, shall be located in close proximity to the facilities which they are intended to protect.

The following criteria shall be used to design the Temporary Earth Retaining and Dewatering Systems:

a. The Contractor shall include in the design of these temporary works all loads that shall be applied to the system including project specific construction surcharge.

b. The Contractor shall design Temporary Earth Retaining Systems to minimize deflections and prevent damage to nearby facilities, not to exceed the Limiting Value for horizontal movement. Underpinning of existing structures if required shall be designed to prevent damage to the facilities being underpinned.

c. Temporary earth retaining systems to augment existing bridge substructure foundations left-in-place for new bridge abutment/wingwall construction are anticipated to be steel sheet pile structures and shall be left-in-place and cut-off below grade when no longer needed, as directed by the Engineer.

c. The Contractor shall design Temporary Dewatering Systems such that:

i. Bottom of excavation groundwater level is controlled and potentially lowered to the lower of a minimum 2 feet below the lowest excavation level, to that lower level to permit construction work to be performed in-the-dry and on stable subgrade at all times or to that level as directed by the Engineer.
ii. Dewatering discharge employs appropriate filter design to prohibit subgrade soil fines from migrating and potentially degrading excavation subgrade strength and stability, and potentially causing discharge water environmental concerns.
iii. Dewatering discharge is consistent with permit requirements.
iv. Designs are consistent with sound dewatering engineering practice, with back-up redundant components to ensure consistent and continuous operation once initiated and until no longer needed or as directed by the Engineer.
v. Designs can be approved by the Engineer.

3. Obstructions: The Contractor is responsible for the removal or clearing of obstructions along the Temporary Earth Retaining System alignment to the depth of proposed temporary structure, by Engineer approved means and methods.

4. Water-tightness and control: The Contractor shall seal the inside face of any Temporary Earth Retaining System as necessary to provide a reasonably watertight system. The Contractor shall limit water entering through the system joints, tremie seal (if a tremie is used), and/or exposed bottom of excavation so as not to degrade subgrade conditions and damage the permanent work. All water entering the excavation, including water from rainfall, surface water runoff, and from groundwater sources, shall be removed from the excavation to prevent unstable conditions and damage to construction. If water is determined by the Engineer to have damaged the permanent work, the Contractor is required to make repairs to the permanent work, to the satisfaction of the Engineer and at no additional cost to the State. If such repairs cannot be made, then the damaged works shall be removed and replaced with new construction, at no additional cost to the State.

5. Adjacent Facilities: Adjacent above and below grade facilities may be sensitive to ground movement, settlement and/or groundwater lowering.

The Contractor shall be solely responsible for conducting the work in a manner that protects existing, new and adjacent facilities from damage associated with the work. Any damage shall be promptly repaired or replaced by the Contractor to the satisfaction of the Owner of the damaged facility, the Engineer, and the State at no additional cost to the State.

The Contractor shall monitor the existing bridge and nearby commercial and residential structures for movement and vibrations as required in the Special Provisions.

6. If movement of Temporary Earth Retaining Systems reaches or exceeds the specified Limiting Values (refer to Special Provision Code 805.9909), or the Contractor's operations cause any damage to adjacent facilities, the Engineer may direct the Contractor to temporarily terminate the work in the area where such movement is occurring and implement all necessary mitigation measures and/or repairs to the satisfaction of the Owner of the adjacent facility and the Engineer. There shall be no claims for additional payment by the Contractor nor will there be an extension of the project Completion Dates for delays related to stopping work because of movements and/or damages, mitigating movements and/or repairing damages.

7. If in the opinion of the Engineer, the Contractor's excavation is causing distress, settlement or other problems to adjacent facilities, the Engineer may stop work and require the Contractor to provide remedial action to correct the situation. This may include the submittal of additional designs and construction of remedial measures. There shall be no claims for additional payment by the Contractor nor will there be an extension of the project Completion Dates for delays resulting from such work stoppage and/or related submittals and work.

METHOD OF MEASUREMENT

This item will not be measured for payment.

BASIS OF PAYMENT

No separate payment will be made for this item. Payment for this item shall be included in the various appropriate items for which they are required as listed in the Proposal.

CODE 805.9909 GEOTECHNICAL INSTRUMENTATION: INSTALLATION, INITIALIZATION, MONITORING, REPORTING AND PRECONSTRUCTION SURVEYS

DESCRIPTION

General:

The work of this Section shall be performed in accordance with the State of Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, Amended 2018, and includes:

A. CODE 805.9909: Furnishing, calibrating, installing, initializing, maintaining, repairing, and monitoring geotechnical instrumentation; and collecting, reducing and reporting data; and protecting instrumentation from damage including:

1. Perform a Preconstruction Survey of any structure within 200 feet of construction activity and specifically significant vibration producing construction activity, e.g. abutment/wingwall/pier demolition, sheet pile vibratory or impact installation, micropile drilling, vibratory soil compaction, etc. performed by a Rhode Island Registered Professional Engineer employed or retained by the Contractor and to be submitted to the Engineer prior to beginning of construction work.

   The Preconstruction Survey documentation shall include photographs, video, sketches, and a written report of findings. The Preconstruction Survey shall include as a minimum the multi-story facility located at 400 Pleasant Street and the residential facility located at 2 Ledge Road. Attention shall be paid, but not limited to, the following:

   - Locations and sizes of cracks in interior and exterior walls, floors and ceilings; and missing mortar, plaster or other surface materials.
   - Damaged masonry or roofing including evidence of leakage or poor roof/gutter drainage, such as staining.
   - Damaged or out-of-square doorways and windows including tightness of fit and ease of operation.
   - Walls that are not plumb, floors or ceilings that are not level, and walls, floors or ceilings that are uneven and the extent to which they are not planar.

- Condition of the foundation walls and basement floors, especially cracking, differential movements, and signs of dampness or wetness.

- Condition and grading of the ground surface around the exterior of the structure including evidence of drainage towards walls, low spots that pond water, cracks and irregularities in asphalt, concrete, brick or stone pavements, sidewalks, and steps.

- Evidence of previous repairs to the structures.

2. Install movement monitoring and/or vertical monitoring points at locations on the existing Bridge substructure components to remain in-place and temporary earth retaining systems as described herein.

3. Install all movement monitoring points a minimum of four (4) weeks prior to the start of construction work and establishing pre-construction vibration baseline data for comparison with construction and post-construction data.

4. Mobilize and install up to three (3) seismographs at the locations chosen by the Contractor and approved by the Engineer to monitor construction vibration levels at or near nearby structures prior to the existing bridge demolition and other significant vibration-producing construction activities according to the requirements described herein.

5. Perform monitoring of all instrumentation and collect data at the required frequencies described herein.

6. Report instrumentation data at the required intervals described herein and provide a detailed description of construction activities that occurred during the vibration monitoring/reporting interval.

7. Report any Response Value exceedances to the State and Engineer immediately.

8. Providing safe access to the work area and instrumentation locations by the Engineer.

9. Replace any instrumentation damaged in a timely manner.

10. Implement required remedial and precautionary measures based on the instrumentation data and as determined by the Engineer.

11. Furnish all assembly, calibration, and installation tools, materials, equipment, miscellaneous instrumentation components and other hardware required to complete the work as described herein.

12. Replace any damaged or inoperable instrumentation.

The State is not responsible for the safety of the work based on geotechnical instrumentation data.

MATERIALS

General:

A. All materials shall be new.

B. All graduations shall be in U.S. Customary Units.

Movement Monitoring Points and Vertical Monitoring Points:

A. Movement Monitoring Points (MMPs) and Vertical Monitoring Points (VMPs) shall be as described herein.

Seismographs:

A. Provide up to three (3) portable seismographs for monitoring Peak Particle Velocity (PPV) and Frequency of ground vibrations resulting from existing bridge demolition and other significant vibration-producing construction activities as requested by the Engineer. Provide seismograph model: “Micromate” as manufactured by Instantel Inc., Kanata (Ottawa), Ontario, Canada, or approved equivalent. The seismographs shall have the following minimum features:

1. Seismic range: up to 10 inches per second with an accuracy of 5 percent.

2. Flat frequency response: 1 to 315 Hertz.

3. Three axis sensor.

4. Power source: Internal rechargeable lithium battery and charger. Battery shall be capable of supplying power to monitor vibration continuously for up to 10 days when new.

5. Direct data download to an electronic storage device such as a solid state drive, PC computer or equivalent. Provide Instantel Bastware, or equivalent, computer software for the Contractor to perform vibration data amplitude/frequency analyses and plotting.

6. Continuous monitoring mode shall be capable of monitoring/recording vibration PPV and Frequency.

CONSTRUCTION METHODS

Submittals: The following instrumentation submittals shall be made by the Contractor for review by the Engineer prior to start of Instrumentation installation. The Contractor shall conform to all submittal requirements of the Contract Documents, including submitting the information specified herein to the Engineer.

A. Submit resumes of the Contractor's instrumentation personnel and other field and office geotechnical instrumentation personnel to be assigned to the project.

1. Geotechnical instrumentation work involves specialized tasks. The Contractor's instrumentation personnel who are responsible for furnishing and installing all geotechnical instrumentation, and maintaining instrumentation as required shall have at least 10 years of experience in the installation of the types of instruments specified herein. These personnel may be on the staff of the Contractor or may be on the staff of a specialist instrumentation subcontractor retained by the Contractor.

2. The Contractor's instrumentation personnel shall include a qualified Engineer who is a registered Professional Engineer in the State of Rhode Island, who has at least 10 years of experience in the installation and monitoring of the types of instruments specified and shall have supervised instrumentation programs of similar magnitude in similar subsurface conditions. A suitably qualified Rhode Island Registered Land Surveyor may also be acceptable as the Contractor's "Engineer".

B. Submit manufacturers' product data describing all specified instruments to the Engineer for review and approval, including requests for consideration of substitutions, if any, together with product data and instruction manuals for requested substitutions.

Specifications of instrument brand name and model number shall be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. A substituted product shall be the same or better than the product named in the specifications in function, performance, reliability, quality, and general configuration. Any request from the Contractor for consideration of a substitution shall clearly state the nature of the deviation from the product named in the specifications. The Engineer will be the sole judge of the suitability and equivalency of the proposed substitution.

C. Submit to the Engineer a copy of the latest instrumentation factory calibration, as applicable.

D. Submit to the Engineer formal initial readings for each instrumentation monitoring point.

E. Submit to the Engineer a proposed schedule, location plan, and sequence for instrumentation installation including a date for completion of formal initial readings.

F. Submit to the Engineer the following items pertaining to each instrument type, as applicable:

1. An instruction manual which shall include a description of the proposed instrument and explanation of operation.

2. Detailed step-by-step installation procedures. The procedures shall be bound and indexed. The installation procedures shall include:

    a. Pre-installation acceptance test.

    b. Calibration of units including calibration equipment required, and recommended frequency of calibration.

    c. Step-by-step instrument installation procedure including materials, tools, spare parts, and method of attaching monitoring points to structures, walls, pipeline, etc.

    d. Method for conducting post-installation acceptance test.

    e. Method for protecting instruments including any instrument cables, and associated power cords/sources and readout units from damage.

    f. Step-by-step data collection procedure.

    g. Data reduction, processing, and plotting procedures including sample spreadsheet(s) for reporting the instrumentation data collected by the Contractor.

    h. Maintenance procedure.

G. Provide monitoring data reports in accordance with the specified requirements for each instrument.

H. The Contractor shall submit to the Engineer for review, generalized plans of action to be implemented in the event any Response Value is reached, as described herein. The generalized plans of action shall be positive measures by the Contractor to do any or all of the following as applicable:

1. Limit further new, existing structure and/or ground movement.

2. Limit further temporary earth retaining system movement.

3. Control vibrations.

4. Maintain the structural integrity of new and/or adjacent structures and utilities.

5. Modify construction procedures near new and existing structures and utilities.

I. Every four (4) weeks submit to the Engineer an updated as-built instrument location plan, or more frequently if directed by the Engineer.

Pre-Installation Acceptance Tests:

A. When instruments are received at the site, the Contractor's instrumentation personnel shall perform pre-installation acceptance tests to ensure that the instruments are functioning correctly prior to installation. Pre-installation acceptance tests shall include:

1. Check that the instrument model is as specified or are in accordance with the Contractor’s approved submittal.

2. Check all components for signs of damage or malfunction.

B. An instrument that fails the specified pre-installation acceptance test shall be repaired such that it passes a subsequent pre-installation acceptance test or shall be replaced by an identical instrument at no additional cost to the State.

Storage of Instruments:

A. All instrumentation after receipt at the site and prior to installation, shall be stored in an indoor, clean, dry, and secure storage space. Instruments shall not be

exposed to temperatures outside the manufacturer's stated working temperature range.

Contractor’s Personnel Requirements:

A. The Contractor's Instrumentation Engineer shall:

1. Prepare step by step installation procedures for all instruments specified herein.

2. Be on-site and supervise and/or install instrumentation.

3. Conduct the pre-installation and post-installation acceptance tests for each type of instrument specified herein.

4. Be available for consultation at all times for the duration of the Contract.

5. Shall be the Contractor’s person responsible for all instrumentation work – procurement, testing, monitoring, analyses, reporting, etc. and interface with the Engineer.

B. The Contractor’s Construction Superintendent shall:

1. Be on-site and aware of all instrument: locations, installations, pre-installation and post-installation tests, monitoring and construction activities around and near instrument locations at all times. The Construction Superintendent shall work closely with and assist the Instrumentation Engineer and any instrumentation personnel during the course of their on-site work.

Scheduling Work:

A. Installation and Initialization Schedule:

1. All instrumentation monitoring points on existing structures shall be installed a minimum of four (4) weeks prior to start of construction and formal initial readings submitted to the Engineer at least three (3) weeks prior to the start of any work.

2. All instrumentation monitoring points on the existing Bridge that are removed during demolition shall be re-installed on the demolished top-of-structure, or as directed by the Engineer, within one (1) day following demolition completion and prior to sheet pile or pile driving work. Formal pre and post demolition instrument initial readings shall be submitted to the Engineer for review.

3. All instrumentation monitoring points on new structures shall be installed and formal initial readings submitted to the Engineer within one (1) day of substantially completing the new structure as required herein. Instrumentation on new structures shall be installed and initialized prior to any adjacent area work.

4. All instrumentation monitoring points on temporary earth retaining systems shall be installed prior to any area excavation.

5. Seismographs shall be installed one (1) week prior to any significant vibration-producing construction activities to obtain background readings. Initial background reading seismograph numbers and locations shall be coordinated with the Engineer.

B. Variations in the instrumentation schedule require the review and acceptance by the Engineer.

C. Should the Contractor's Preconstruction Survey or instrumentation personnel encounter difficulty or be refused entry to a property, they shall document said refusal in their report and inform the Contractor and Engineer of the incident.

Installation – General:

A. The Contractor's instrumentation personnel shall install instruments in accordance with the Contractor's detailed step-by-step procedures.

B. The Contractor shall notify the Engineer at least 72 hours prior to installing each instrument.

C. If/as necessary, the Contractor shall extend installed instrumentation as grade level changes occur, and similarly revise instrument reference elevations.

D. As each instrument is installed, an installation record sheet shall be prepared by the Contractor's Instrumentation Engineer.

E. For installation on residential/commercial properties, the Contractor shall notify RIDOT of their intent to install two (2) weeks prior to actual installation to allow RIDOT to notify the property owners. The Contractor shall receive confirmation from RIDOT before commencing actual instrument installation(s) on residential/commercial properties.

Installation and Location of Movement and Vertical Monitoring Points:

A. Movement Monitoring Points (MMPs) are optical prisms such as Sokkia Standard Tilt Mount Prisms catalog nos. 724810, 724805, 724814; suitable reflective

targets, or Engineer approved equivalents. The Contractor shall use Total Station survey equipment (automated, motorized or otherwise) to monitor MMPs to provide three (3) axis movement data relative to new and existing structures and temporary earth retaining systems. MMPs shall be installed at the following locations:

1. Four (4) MMPs to be installed on the existing Bridge's North and South Abutments, for a subtotal of eight (8) MMPs. On each Abutment, MMPs shall be installed on top-of-structure at the east, center and west limits of structure, or as directed by the Engineer. MMPs shall be re-installed and formal initial readings obtained and submitted post top-of-abutment structure demolition.

2. Four (4) MMPs to be installed on each of four temporary support of excavation structures (anticipated to be sheet pile structures) as located on the Project Drawing "Bridge General Plan," for a subtotal of sixteen (16) MMPs. On each temporary support of excavation structure, locate MMPs at regular spacing intervals on top of the structure or as directed by the Engineer.

3. The Contractor shall carry in their bid, the ability to accommodate up to six (6) additional MMPs, to be installed and monitored as/if directed by the Engineer.

B. Vertical Monitoring Points (VMPs) are stainless steel pins (refer to the detail herein). On private structures where limiting VMP installation damage is critical or prohibited, the Contractor may propose the use of suitable survey target(s), as directed or as approved by the Engineer. The Contractor shall survey these VMPs by Total Station survey methods for three (3) axis movement data on new and/or existing structures where directed by the Engineer. As indicted, these points are called "vertical" but require three (3) axis data collection and reporting. The Contractor shall carry in their bid, the ability to accommodate up to six (6) VMPs, to be installed and monitored as/if directed by the Engineer.

C. MMPs and VMPs shall typically be installed on vertical or top surfaces of structures. Installation of these points shall utilize means and methods that avoid or minimize damage to the structures.

D. The MMPs and VMPs shall be located such that daily construction activities will not inhibit the Contractor from obtaining readings at any time during the construction.

E. Survey of MMPs and VMPs shall be conducted to an accuracy of 0.0625-inch and shall reference a permanent benchmark, which will be unaffected by construction activities.

Seismographs:

A. Seismographs shall be installed prior to any vibration-producing construction activities to establish the maximum energy which can be used without surpassing acceptable vibration levels at nearby residence(s) and commercial facilities.

B. The Contractor shall monitor vibrations continuously during vibration-producing construction activities. The Contractor shall make vibration data available for immediate Engineer review, if requested. The Contractor shall record and print all vibration data that exceed the Threshold Values indicated in Table 2.

C. The Contractor shall notify the Engineer at least 72 hours prior to starting a new significant vibration-producing construction activity, e.g. micropile drilling, sheet pile installation, demolition, soil vibratory compaction, etc.

Field Calibration and Maintenance:

A. The Contractor's instrumentation personnel shall conduct regular instrumentation maintenance according to the Contractor’s approved submittals.

Data Collection:

A. The Contractor shall collect data at all instrumentation monitoring points on a daily basis at a minimum, during significant vibration producing construction activities, e.g. micropile drilling, sheet pile installation, demolition, soil vibratory compaction, etc. and more frequently if movement of structures is suspected, verified or as directed by the Engineer. At other times during construction, the maximum instrumentation monitoring interval shall be weekly or as modified by the Engineer.

B. The Contractor shall cooperate with the Engineer during the instrumentation installation and data collection periods, including the Engineer’s use of the Contractor’s equipment, if requested by the Engineer. The Contractor shall provide and facilitate safe access to the work areas at all times for the Engineer to collect data from instruments, if required. Safe access shall include, but not be limited to, cessation of work activities, temporary relocation of obstructing materials and equipment and any other needs that, in the opinion of the Engineer, are necessary to ensure the safety of data collection personnel.

Data Reduction, Processing, Plotting, and Reporting:

A. The Contractor shall provide data to the Engineer in accordance with the following schedules:

1. Instrumentation data (other than seismograph data) shall be provided within 48 hours of when the data is collected, or as directed by the Engineer.

2. Seismograph data shall be provided to the Engineer at intervals required by the Engineer, but not greater than weekly.

3. If the data indicates that either a Threshold or Limiting Value is reached, the Engineer may require the Contractor monitor and provide data with greater frequency.

B. When a Response Value is reached, the Contractor shall notify the Engineer and the State immediately and implement response action(s) specified herein.

C. When the Engineer judges from the review of data and other observations that a change has occurred, which is likely to require remedial or precautionary measures, the Engineer will notify the Contractor. The Contractor shall verify the change and shall initiate the response action(s) specified herein.

Instrumentation Maintenance and Operation:

A. The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, vehicle traffic, and vandalism.

B. The Contractor shall notify the Engineer immediately if instrument(s) are damaged.

C. The Contractor shall replace any instruments damaged, destroyed or otherwise rendered inoperative within 48 hours. The Contractor shall replace at no cost to the State any instruments damaged, destroyed, or otherwise rendered inoperative during construction operations. The Engineer will be the sole judge of whether an instrument repair or replacement is required.

Disclosure of Data:

A. The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent of the State.

Interpretation of Data and Implementation of Plans of Action:

A. Instrumentation data will be evaluated and interpreted by the Contractor and submitted to the Engineer for review and evaluation. Interpretation will include making correlations between instrumentation data and specific construction activities.

B. Table 1 indicates Threshold and Limiting Values for selected instruments. These values shall be defined collectively as Response Values. The actions associated with these Response Values are defined below. Plans for such actions are referred to herein as "Plans of Action," and the actual actions to be implemented are referred to herein as "Response Actions." Response Values are subject to adjustment by the Engineer as indicated by prevailing conditions or circumstances.

C. If a Threshold Value is reached the Contractor shall:

    1. Meet with the Engineer within 24 hours of the Threshold Value being reached to discuss the need for Response Action(s). If notified by the Engineer during the above meeting that a Response Action is needed, within 24 hours submit a detailed specific Plan of Action.

        a. If notified by the Engineer, implement Response Action(s) within 24 hours of submitting a detailed specific Plan of Action, so that the Limiting Value is not exceeded.

D. If a Limiting Value is reached, the Contractor shall:

    1. Meet with the Engineer within 24 hours of the Limiting Value being reached to discuss the need for additional Response Action(s).

        a. If notified by the Engineer, implement additional Response Action(s) within 24 hours of submitting a detailed specific Plan of Action, so that the Limiting Value is no longer exceeded.

    2. The Contractor shall take all necessary steps so that the Limiting Value is not exceeded. The Contractor may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid exceeding the Limiting Value.

Disposition of Instruments:

A. Remove salvageable instruments only when directed by the Engineer.

B. All salvaged instruments shall become the property of the Contractor.

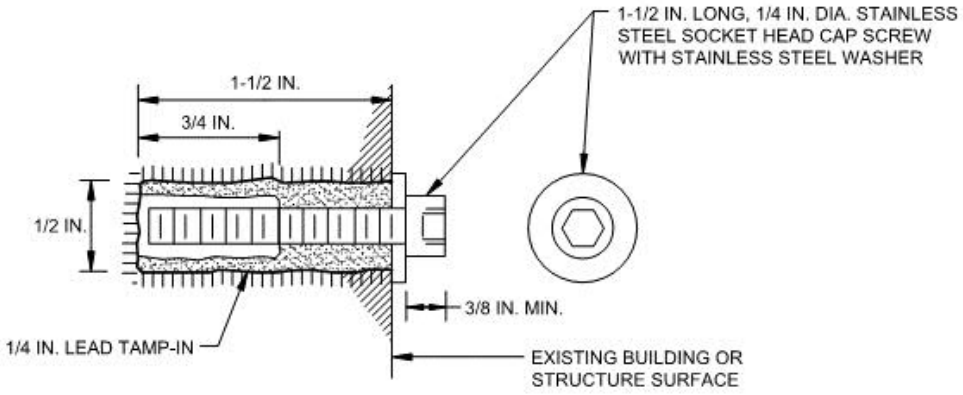
C. Upon completion of the Work, as directed by the Engineer, the Contractor shall remove instruments. Disturbed or damaged surfaces shall be restored to the condition existing before installation of the instrument.

METHOD OF MEASUREMENT

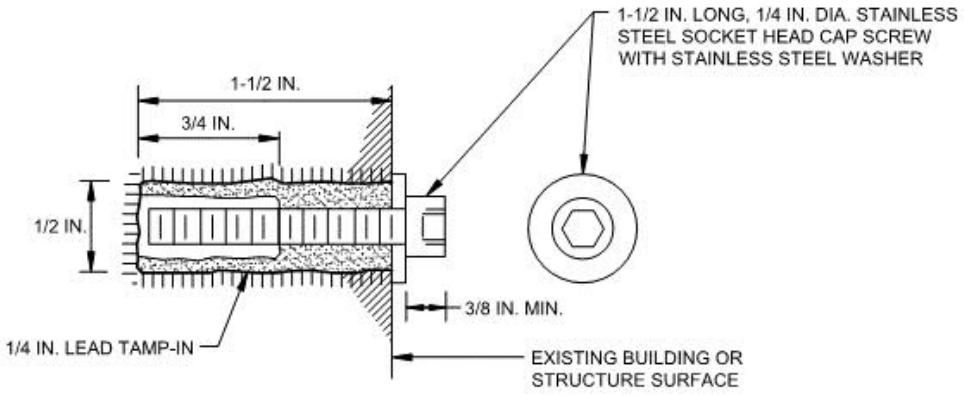
Item Code 805.9909 "GEOTECHNICAL INSTRUMENTATION INSTALLATION, INITIALIZATION, MONITORING, AND REPORTING" will not be measured for payment.

BASIS OF PAYMENT

Item CODE 805.9909 "GEOTECHNICAL INSTRUMENTATION INSTALLATION, INITIALIZATION, MONITORING, AND REPORTING" will be paid for at the contract "Lump Sum" price as listed in the Proposal. The price so stated shall constitute full and complete compensation for all labor, materials, tools, equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.



TYPICAL VERTICAL MONITORING POINT (VMP) DETAIL
NOT TO SCALE



TYPICAL VERTICAL MONITORING POINT (VMP) DETAIL
NOT TO SCALE

TABLE 1. RESPONSE VALUES

INSTRUMENTATION TYPE/LOCATION	INSTRUMENT RESPONSE VALUES	
	THRESHOLD	LIMITING
MONITORING POINTS ON EXISTING BRIDGE AND WATER MAIN STRUCTURES	DEFORMATION (IN ANY DIRECTION) = 0.25-INCH	DEFORMATION (IN ANY DIRECTION) = 0.5-INCH
MONITORING POINTS ON TEMPORARY EARTH RETAINING SYSTEMS	DEFORMATION IN LATERAL DIRECTION TOWARD EXCAVATION = 1.5 INCHES	DEFORMATION IN LATERAL DIRECTION TOWARD EXCAVATION = 2.0 INCHES
SEISMOGRAPHS	REFER TO TABLE 2	REFER TO TABLE 2

TABLE 2. RESPONSE VALUES VIBRATION ACCEPTANCE CRITERIA FOR SEISMOGRAPHS

TYPE	SOURCE M[1]			SOURCE S[2]		
	F(HZ)[6]	PEAK PARTICLE VELOCITIES (PPV)		F(HZ)[6]	PEAK PARTICLE VELOCITIES (PPV)	
		THRESHOLD VALUE (IN/SEC)	LIMITING VALUE (IN/SEC)		THRESHOLD VALUE (IN/SEC)	LIMITING VALUE (IN/SEC)
EXISTING/ PROPOSED BRIDGES	1-30 30-60	0.37 0.37	0.5 0.5-0.7*	10-60 60-90	0.90 0.90	1.2 1.2-1.6**
COMMERCIAL BUILDINGS	1-30 30-60	0.23 0.23	0.3 0.3-0.5*	10-60 60-90	0.53 0.53	0.7 0.7-1.0**
RESIDENTIAL BUILDINGS	1-30 30-60	0.15 0.15	0.2 0.2-0.3*	10-60 60-90	0.37 0.37	0.5 0.5-0.7**

TABLE 2 NOTES:

1. SOURCE M: CONTINUOUS OR STEADY STATE VIBRATIONS SUCH AS: VIBRATORY PILE DRIVERS, HYDROMILLS, LARGE PUMPS AND COMPRESSORS, BULLDOZERS, TRUCKS, CRANES, SCRAPERS AND OTHER LARGE MACHINERY, JACKHAMMERS, RECIPROCATING PAVEMENT BREAKERS AND COMPACTORS.
2. SOURCE S: TRANSIENT OR IMPACT VIBRATIONS SUCH AS: BLASTING WITH EXPLOSIVES, DROP CHISELS FOR ROCK BREAKING, BUCKETS, IMPACT PILE DRIVERS, WRECKING BALLS AND BUILDING DEMOLITION, GRAVITY DROP GROUND COMPACTORS AND PAVEMENT BREAKERS.
3. *DENOTES THAT THE LOWER VALUE APPLIES TO 30 HZ AND THE UPPER TO 60 HZ, WITH INTERPOLATION IN BETWEEN.
4. **DENOTES THAT THE LOWER VALUE APPLIES TO 60 HZ AND THE UPPER TO 90 HZ, WITH INTERPOLATION IN BETWEEN.
5. VIBRATION ACCEPTANCE CRITERIA FOR BUILDINGS BASED ON SWISS STANDARD SN 640312, DATED APRIL 1992. THIS STANDARD ALLOWS ACCEPTANCE CRITERIA, ACCORDING TO BUILDING TYPE AND THE FREQUENCY AND TYPE OF EXPECTED CONSTRUCTION RELATED VIBRATIONS. FOR THE PURPOSE OF THIS PROJECT, THE ACCEPTANCE CRITERIA OF THE SWISS STANDARD WAS CONVERTED TO ENGLISH UNITS (INCHES PER SECOND) AND IS INCORPORATED IN THIS TABLE.
6. F(HZ) = FREQUENCY IN HERTZ.
7. STRICT VIBRATION THRESHOLD AND LIMITING VALUES HAVE BEEN ESTABLISHED FOR STRUCTURES IN THE VICINITY OF THE CONSTRUCTION. THE CONTRACTOR IS ADVISED THAT DUE TO THE CLOSE PROXIMITY OF THE CONSTRUCTION TO SOME OF THESE STRUCTURES, CONSTRUCTION MEANS AND METHODS MAY NEED TO BE ALTERED OR RESTRICTED TO OPERATE WITHIN THE RANGE OF VIBRATION ESTABLISHED.

CODE 809.99
PRECAST COMPONENTS

DESCRIPTION: This item of work shall consist of all work associated with furnishing, storing, handling, preassembling, hauling and delivering, erecting, installing, leveling, providing temporary bracing, all grouting, field survey and monitoring, including but not limited to backer rods, grouting between units, patching of pockets, and all other work associated with the construction of the precast concrete components for the bridge including all necessary materials and equipment to complete the work as detailed on the Contract Drawings and as specified in this Special Provision and elsewhere in the Contract Documents. The precast components for this project include abutment and wingwall stems; arched fascia panels; and parapet balusters and rail caps.

This work shall be performed as shown on the Contract Drawings and in accordance with Section 809 of the RI Standard Specifications and as supplemented or modified in this Special Provision.

The Contractor's operation shall be in accordance with the Maintenance and Protection of Traffic Plan sheets included in the Contract Drawings and the time/holiday/weight restrictions noted in the TMP and CS pages.

MATERIALS: All material shall conform to the requirements of Section 809.02 of the RI Standard Specifications and as supplemented or modified herein.

Mild Steel Reinforcement – All mild steel bar reinforcement shall be galvanized in accordance with ASTM A767 Class I.

Concrete – The concrete for the precast substructure components shall be Class HP having a minimum 28 day compressive strength of 5,000 psi.

Grout – The non-shrink grout used within horizontal or vertical shear keys and joints between the precast units and between the precast units and cast in place elements shall be a flowable, self-leveling, high strength, non-shrink grout capable of achieving a minimum compressive strength of 1500 psi in 1 hour after placement, 3,000 psi in 3 hours after placement, and have a minimum 7 day compressive strength of 5,000 psi. The non-shrink grout shall be capable of filling the joints in their entirety. The non-shrink grout shall be mixed in strict conformance with the manufacturer's instructions. Non Shrink grout shall be sampled and tested in accordance with ASTM C1107.

The Contractor shall pretest all grout proposed for use on this project. Prior to utilization of any grout during construction, the Contractor shall submit to the Engineer for review and approval, the grout mix design and test results showing the grout is in compliance with this Special Provision. All testing shall be performed and certified by an approved, independent testing laboratory.

The Engineer's Acceptance will include: a) casting 6 cubes (2 sets of 3) and b) randomly selecting 3 cubes for testing at 28 days for design strength.

The Quality/Process control sampling and testing shall include casting an appropriate number of cubes for compressive testing to determine when to release bracing and for long term testing, if necessary.

Controlled low strength material (CSLM) shall not be used as the grout material.

Grouted Splice Couplers – Grouted splice sleeves used to mechanically splice steel reinforcing bars within the precast concrete components shall provide 125% of the specified yield strength of the connected reinforcing. The splice couplers shall be epoxy coated capable of joining the reinforcing steel without removal of the galvanized on the spliced reinforcing.

The grout used inside of the couplers is part of the proprietary system and shall be supplied by the coupler manufacturer and shall be the same grout as the certified test reports of the coupler. Substitute grout is not permitted unless additional certified test reports are submitted for the grout/coupler system proposed.

Leveling Devices – Leveling devices shall be as shown on the Contract Drawings. The Contractor may propose alternate leveling devices provided the devices are designed to support the anticipated loads and are submitted to the Engineer for review and approval.

Lifting Devices – Contractor shall design all lifting devices to support the required vertical and horizontal forces with the applicable safety factors according to the Component Handling and Erection Bracing requirements in the PCI Design Handbook

Miscellaneous Steel Items: All miscellaneous steel items permanently cast into structural concrete components shall be galvanized in accordance with AASHTO M232.

CONSTRUCTION METHODS:

SUBMITTALS: The Contractor shall submit shop drawings and design calculations in accordance with the requirements of the Contract Documents and as supplemented or modified herein.

1. The Professional Engineer responsible for preparing and stamping the submittal (including all calculations) shall hold a valid license in the branch of Civil or Structural Engineering in the State of Rhode Island.

2. The Contractor shall design all temporary works according to the current edition of the AASHTO LRFD Bridge Construction Specifications, Section 3 “Temporary Works”, the Rhode Island LRFD Bridge Design Manual, and the latest PCI Design Handbook, Section 8 “Component Handling and Erection Bracing”.

3. Precast Components: The Contractor shall submit all of the requirements as outlined below in one complete package.
   - ☐ All dimensions and details and associated components necessary to complete the construction of the precast components.
   - ☐ Size and weight of all components.
   - ☐ Locations and details of all lifting inserts, hardware, or devices.
   - ☐ Type and amount of any additional reinforcing required for lifting.
   - ☐ Minimum compressive strength attained before handling the precast components.
   - ☐ Details of vertical adjusting hardware (if applicable).
   - ☐ All supporting calculations and documentation.
   - ☐ Complete sequence of construction.
   - ☐ Equipment to be used to lift precast components including cranes, excavators, lifting slings, sling hooks, and jacks. Include crane locations and operation radii and lifting calculations. The Contractor shall also refer to the “General Notes Regarding Temporary Construction Conditions” contained within the Standard Bridge Notes of the Contract Drawings for additional requirements.
   - ☐ A storage, handling, and hauling plan which includes methods for storage, handling procedures, and hauling (shipping) procedures demonstrating all steps taken to ensure no overstress or damage to the precast components at any point.
   - ☐ Details of all equipment to be used for the assembly of the precast components.
   - ☐ The work area plan shall include items such as utilities overhead and below the work area, drainage inlet structures, and protective measures.
   - ☐ A detailed installation procedure for connecting the grouted splice couplers including pre-grout and post-grout operations.
   - ☐ Methods of providing temporary support of the components. Include methods of adjusting and securing the component prior to the grouting of the splice couplers, and during the grouting and curing of the grout for the splice couplers until the minimum grout strength has been achieved.
   - ☐ Procedures for controlling and providing the required elevations and alignment within the horizontal and vertical tolerance limits. Include details of all alignment jigs and temporary supports.
   - ☐ Methods, sequence, and equipment for forming grout voids and installing the grout.

- ☐ Methods for forming and curing grout and closure pours including the use of backer rods. Do not assume that the backer rods will restrain the pressure from the grout in vertical grout joints. Provide additional forming to retain the backer rod.
- ☐ List of a key personnel responsible for the grouting operation of the reinforcing splice couplers. Include proof of a minimum of two successful installations within the last two years. Proof of training of new personnel within three months of the installation by the manufacturer's technical representative is an acceptable substitution for this experience.
- ☐ Preassembly Plan –The plan shall include details of the means of geometry control, tolerances for all precast concrete elements, tolerances for prefabricated bridge units, transportation, hoisting, erection and installation at the preassembly site, details of the disassembly, hoisting and storage of the various precast components following completion of the preassembly in preparation for, and prior to, transporting the components to the bridge site. The Preassembly Plan shall also include details of the Contractor's proposed preassembly site, including its physical location, street address and locus map.

4. Grouted Splice Couplers:
   - ☐ For each coupler size the submittal shall include independent test report(s) confirming the compliance of the coupler with the following requirements:
     - o Develop 125 percent of the specified yield strength of the connected reinforcing.
     - o The amount of time and grout compressive strength (corresponding to the expected ambient temperature at installation) required to achieve a minimum of 100 percent of the specified minimum yield strength of the attached reinforcing. This value will be used to determine when temporary bracing can be released. Provide lab results performed by an approved testing laboratory.
   - ☐ Specifications and requirements for the grout including required strength gain to develop the specified minimum yield strength of the connected reinforcing bar.

FABRICATION: The fabrication, inspection, testing, and installation of the precast components shall be in accordance with Section 809 of the RI Standard Specifications and as supplemented or modified herein.

a. Precast components shall be fabricated to the tolerances shown in the Contract Drawings. Geometry control and erection tolerances shall be measured from a common reference point or line as applicable.

b. The precast components shall be finished as indicated in the Contract Drawings. Where a finish has not been specified, the concrete surfaces shall be finished in accordance with Section 809.03.7 of the Special Provisions.

All surfaces of shear keys and joints between precast components shall be sandblasted and cleaned prior to shipping, and if required, prior to installation.

c. The minimum compressive strength of the concrete prior to removal of the forms shall be 3,500 psi.

PREASSEMBLY: The Contractor shall preassemble the proposed precast bridge components to verify that the various components and prefabricated elements will fit together properly in the final structure. The assembly shall include the precast abutment and wingwall stems and parapet rail cap onto the parapet balusters (dry fit with reinforcing and brought to proper elevation with shims). The preassembly site shall be provided by the Contractor and shall be located within the State of Rhode Island. For the preassembly, all components shall be set to accurately emulate their position in the completed structure in their position relative to each other in the longitudinal, transverse and vertical direction. All aspects of the actual bridge construction shall be considered during the preassembly, and all requirements regarding inspection and approval of the work that applies to in situ construction shall apply to the preassembly. Approval of the completed Preassembly by the Engineer shall be required prior to commencing with any disassembly of the various components of the preassembled structure.

HANDLING, STORING, TRANSPORATION: The handling, storing, and transportation of the precast components shall be in accordance with the applicable sections of Section 809 of the RI Standard Specifications and as supplemented or modified herein.

a. Precast components shall not be transported from the casting facility until the minimum 28 day compressive strength has been achieved.

INSTALLATION:

The general procedure for installation of the precast components shall be as follows:

a. All adjacent precast components shall be dry fit prior to final assembly (refer to PREASSEMBLY Section).

b. Working points, working lines, and benchmark elevations shall be established before placement of components.

c. The condition of the bonding surface shall be inspected just prior to installation. Prior to connecting the components all dust, rust, and debris shall be removed in order to provide the satisfactory bonding required between the protruding reinforcing bars component and the grouted couplers.

d. All components shall be lifted, placed and erected in the sequence and according to the methods outlined in the shop drawings. The lifting devices and equipment used shall be per the approved shop drawings.

e. The height of each component shall be adjusted by means of leveling devices or shims.

f. All debris and foreign material shall be removed and cleaned from the joints before the grout application.

g. The length of rebar anchor dowels shall be checked to make sure they meet the minimum coupler embedment specified in the manufacturer's manual.

h. The elevations and extensions of the dowels shall be verified that they are within specified tolerances.

i. All components shall be set in their proper location and verified that they are in the correct horizontal and vertical alignment within the specified tolerances.

j. All surfaces of shear keys and joints between precast units and between the precast units and the cast in place elements shall be maintained in a Saturate Surface Dry (SSD) condition for a minimum of one (1) hour prior to connecting the components.

k. The shim thickness between the components shall be monitored and maintained to ensure that the reinforcing extensions are within the manufacturers recommended tolerance.

l. All temporary bracing shall be installed as detailed in the approved shop drawings.

m. The minimum grout and sleeve temperature shall be monitored and maintained as recommended by the manufacturer. If required, the Contractor shall provide the necessary environmental containment in order to maintain the recommended minimum temperature of the grouted splice couplers until the temporary bracing is removed.

n. The grout mixing, water to grout ratio, mixing time, and shelf life of the grout shall be monitored for conformance with the manufacturer's written instructions.

o. Grout and coupler grout shall be mixed just before use in accordance with the manufacturer's instructions.

p. The grouting operation shall be monitored to verify that all sleeves have been filled.

q. All sleeves shall be protected from any vibration, shock, or other excessive movement until temporary bracing is removed.

r. The grout in the coupler shall be allowed to cure until the coupler can resist 100 percent of the specified minimum yield strength of the bar before removing the bracing and proceeding with installation of subsequent components or application of external loading. The required grout strength is based on the certified test reports.

s. Horizontal joints (with vertical bar and coupler connection):

- Determine the thickness of shims to provide the specified elevation within the specified tolerances.
- The non-shrink grout shall be mixed according to the manufacturer's recommendations, including its preparation and application.
- The non-shrink grout shall be placed on the interface between the two components being joined prior to setting the precast component. The thickness of the grout shall be crowned toward the center of the joint so that the grout can be displaced outward as the precast component is lowered onto the joint. The non-shrink grout shall be prevented from entering the couplers (e.g. use of grout dams, seals or other approved means).
- The precast component shall be set in place and all couplers in the joint engaged. The non-shrink grout shall be allowed to seep out of the joint.
- Excess non-shrink grout shall be trowelled off to form a neat joint once the precast component is set plumbed, and aligned. The grout shall be packed into any voids around the joint perimeter.
- The coupler shall be flushed out with clean potable water.
- The coupler grout shall be mixed according to the manufacturer's recommendations for methods and proportions of mix and water.
- The coupler grout shall be pumped into the coupler that is cast into the precast component. Start from the lower port. Pump until the grout is flowing freely from the upper port. Cap the upper port first and then remove the nozzle to cap the lower port. Proceed to the next coupler in a defined sequence.
- The joint shall be cured according to the non-shrink grout manufacturer's recommendations.
- Do not apply any external loads to the precast components until the non-shrink grout has reached a strength of 3,000 psi

t. Vertical joints (with or without horizontal bar and coupler connection):

- Approved washers or seals shall be used to prevent mixing of the joint grout and the coupler grout.
- The component shall be placed and couplers in the joint engaged. The precast components shall be temporarily supported at all times per the approved shop drawings.
- The couplers shall be flushed out with clean potable water once the component is set, plumbed, and aligned.
- The coupler grout shall be mixed in strict conformance with the manufacturer's recommendations.
- The coupler grout shall be pumped into the coupler that is cast into the component. Begin from the port closest to the joint. Pump until the grout is

flowing freely from the other port. Cap the port farthest from the joint first and then remove the nozzle to cap the other port.

- After forming the joints, the grout shall be placed into the joints. The non-shrink grout shall be mixed according to the manufacturer's recommendations, including its preparation and application.
- The joint shall be cured according to the grout manufacturer's recommendations.
- Do not apply any external loads to the precast components until the non-shrink grout has reached a strength of 1,500 psi

REJECTION OF UNITS

The requirements for rejection of the precast components shall be in accordance with Section 809.03.12 of the RI Standard Specifications and as supplemented or modified herein.

The Engineer will be the sole judge in establishing rejection or acceptance of damaged precast components. In the event that the Engineer determines that damaged components can be repaired, the following also shall apply:

- All repair work must reestablish the components' structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
- The Contractor shall determine the cause, the additional steps to be taken to eliminate the cause of the condition, and the plan for corrective action. Failure to take corrective action or similar repetitive damage will be cause for rejection of these less severely damaged components.
- All repairs by the Contractor shall be performed at no cost to the State. In addition, there shall be no claims for additional payment by the Contractor nor will there be an extension of the project Completion Dates for any corrective actions required as a result of the rejected components or subsequent corrective measures to address any deficiencies identified by the investigation.
- The Contractor shall submit a repair procedure for review and approval by the Engineer prior to performing repairs. No repairs shall begin until the Engineer has accepted the repair plan.
- Cracks less than 0.006" wide, determined by the Engineer to be non-structural do not require repair.
- Non-overhead horizontal surface cracks greater than or equal to 0.006" wide and less than 0.016" wide may be sealed with an approved methacrylate crack sealing product.
- Overhead or vertical cracks greater than or equal to 0.006" wide and less than 0.016" wide may be sealed with an approved epoxy sealing product.

- All cracks greater than or equal to 0.016” wide shall be sealed using epoxy injection.

METHOD OF MEASUREMENT: This item will not be measured for payment.

BASIS OF PAYMENT: No separate payment will be made for this item. Payment for this item shall be included in the lump sum or unit bid prices of the appropriate items as listed in the Proposal.

CODE 817.9901
REMOVE, SALVAGE AND DELIVER IDENTIFICATION TILES

DESCRIPTION: The work conducted under this item shall include removing all existing remaining porcelain identification tiles, embedded in the existing northwest and southeast concrete bridge parapet end sections; stockpiling the removed tiles in a secure area as approved by the Engineer; and delivering the tiles to the East Providence Historical Society, as described herein and/or as directed by the Engineer.

MATERIALS: Work involved in the salvaging of the tiles shall be conducted using a saw that is capable of cutting completely through all concrete and reinforcing (if present) that surrounds the tiles. The saw blades should be of a type and condition to cut cleanly through the concrete and steel without causing excessive vibration.

CONSTRUCTION METHODS: Prior to beginning the work, the Contractor shall submit a description of the methods and tools he intends to use to remove the tiles and to separate them from the concrete parapet end sections. The Engineer, in consultation with the RIDOT Historic Preservation Specialist must review and approve the Contractor's proposed procedure before removal of the tiles may commence.

The RIDOT Supervising Historic Preservation Specialist (Jacob Begin, 401-563-4540 jacob.begin@dot.ri.gov) shall be notified by the Contractor five (5) business days prior to commencing the work and must be present during the removal of the tiles.

The tiles are to be removed by saw cutting out a block of the existing concrete with the tiles remaining embedded. The Contractor shall carefully saw cut the concrete around each tile no closer than three (3) inches from the tile edges, unless otherwise directed and approved by the RIDOT Historic Preservation Specialist to cut within closer limits. Special care shall be taken to avoid nicking, breaking, scratching, or otherwise damaging the tiles. Should the RIDOT Historic Preservation Specialist determine it feasible to completely separate the final remaining concrete from the edges of the tiles without risk to breaking or damaging them, the Contractor shall then separate the tiles in such a manner as approved.

The tiles shall be securely packaged to prevent damage during transport and storage. Once the removal and salvage process is complete for each tile, they shall be fully protected by wrapping in newspaper and bubble wrap. They then shall be packed into strong cardboard or wooden boxes. The boxes shall be stockpiled in a secure location as approved by the Engineer. When all existing tiles have been boxed and stockpiled, they are to be delivered to the local historic preservation entity:

- East Providence Historical Society, 65 Hunts Mill Road, Rumford, RI 02916

METHOD OF MEASUREMENT: "Remove, Salvage and Deliver Identification Tiles" will be measured for payment by EACH unit actually removed, stockpiled, and delivered, complete and as accepted by the Engineer.

BASIS OF PAYMENT: "Remove, Salvage and Deliver Identification Tiles" will be paid at its contract unit price per EACH as listed in the Proposal. The price so stated shall constitute full and complete compensation for all labor, tools and equipment, materials, saw cutting, separation of the tiles from the concrete as much as determined to be feasible by the RIDOT Historic Preservation Specialist, packaging of the salvaged tiles, stockpiling at a secure location, delivery of the tiles to the listed local historical societies/associations, legal disposal of all concrete materials associated with this item, and for all other incidentals required to finish the work, complete and accepted by the Engineer.

Failure to deliver the undamaged tiles to the location stated in this specification will result in a penalty of $5,000.00 (five thousand dollars) per tile.

CODE 828.99

ELASTOMERIC BEARINGS

DESCRIPTION:

This work shall be in accordance with the applicable provisions of Section 828 of the Standard Specifications and these Special Provisions. In general, the bearing assembly consists of a steel reinforced elastomeric pad to support the precast concrete box beams as detailed on the Plans.

In case of discrepancy, the AASHTO LRFD Bridge Specifications will govern over the Standard Specifications.

MATERIALS:

Materials shall be as specified in subsection 828.02 except as noted below:

Delete Subsection 828.02.1, and replace with the following:

a. Elastomer. The raw elastomer shall be virgin neoprene (polychloroprene). The elastomer compound shall be classified as being of low-temperature Grade 0, 2, 3, 4, or 5. The grades and other material properties are defined in the AASHTO LRFD Bridge Design Specifications, Section 14 and AASHTO m 251.

CONSTRUCTION METHODS:

Construction shall be as specified in subsection 828.03 except as noted below:

- In Subsection 828.03.1b, delete wording “in the Table of Subsection 18.2.5 of the AASHTO Standard Specifications for Highway Bridges (Fifteenth Edition)” and replace with wording “in the applicable provisions of Section 18 of the AASHTO LRFD Bridge Construction Specifications“.

- In Subsection 828.03.1c, delete wording “in accordance Subsection 18.2.7.6; Short-Duration Compression Tests on Bearings, of the AASHTO Standard Specifications for Highway Bridges (Fifteenth Edition)” and replace with wording “in accordance with the applicable provisions of Section 18 of the AASHTO LRFD Bridge Construction Specifications“.

- In Subsection 828.03.1c, delete the second paragraph in its entirety and replace with the following:

“The Contractor shall furnish the number of pads required as shown in the plans, plus two additional pads for testing for each type and size. Two bearing pads will be selected

at random by the Engineer at the project site for testing. Packaging and shipping of the selected pads shall be performed by the Contractor. Shipping will take place from the project site and will be paid for by the Engineer. Testing shall be performed at a facility selected by the Engineer and conducted in accordance with M 251. Of the two samples, one will be randomly selected to meet M 251 including Annexes and the other sample will be tested for Short Duration Compression test (M 251 subsection 8.8.2) The cost of testing will be paid for by the Engineer.

Sample pads used for testing and packaging for shipping shall be provided by the Contractor at no additional cost to the State. Pads will be available for testing at least three weeks in advance of installation."

METHOD OF MEASUREMENT:

This item will not be measured for payment.

BASIS OF PAYMENT

No separate payment will be made for this item. Payment for this item shall be included in the lump sum bid prices of the appropriate items as listed in the Proposal.

CODE 901.9903
GUARDRAIL END TREATMENT MASH COMPLIANT TEST LEVEL 3

DESCRIPTION:

This work consists of furnishing and installing Guardrail End Treatment - MASH Compliant Test Level 3 galvanized steel beam guardrail tangent re-directive and gating single sided systems. All work shall be performed in accordance with the latest AASHTO Manual for Assessing Safety Hardware (MASH) and the Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, (Amended 2018) and all revisions, these Special Provisions, and as described elsewhere in the Contract Documents and as directed by the Engineer

MATERIALS:

All materials shall be in accordance with Section 901.02 of the Standard Specifications.

The Guardrail End Treatment - MASH Compliant Test Level 3 systems shall be products listed on the Department's approved materials list, or approved equal. Any products not included on the approved materials list shall be tested and verified as meeting all the criteria for MASH, Test Level 3.

CONSTRUCTION METHODS:

Installation shall be in accordance with Section 901.03 of the Standard Specifications.

The guardrail end treatments shall be installed per the manufacturer's recommendations. Prior to installation, the Contractor shall furnish three (3) copies of the manufacturer's installation manual to the Engineer.

Shop Drawings for the guardrail end treatments shall be submitted by the Contractor in accordance with the provisions of Subsection 105.02 of the Standard Specifications.

METHOD OF MEASUREMENT:

"ITEM CODE 901.9903 Guardrail End Treatment Mash Compliant Test Level 3" will be measured by the number of units actually installed in accordance with this Special Provision and elsewhere in the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of “ITEM CODE 901.9903 Guardrail End Treatment Mash Compliant Test Level 3” will be paid for at the contract unit price per "Each" as listed in the Proposal. The price so-stated will constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to finish the work as described in this Special Provision and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

CODE 906.9901
CONCRETE BLOCK PAVERS

DESCRIPTION:

This work consists of furnishing all labor, materials, tools and equipment required to install standard (non-permeable) concrete block pavers on washed bedding sand and geotextile, joints filled with fine sand, and incidental items related thereto, as shown on the Plans and as directed by the Engineer.

All work and material shall be in accordance with the Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, 2004 Edition (Amended March 2018) and all revisions, these Special Provisions, and as described elsewhere in the Contract Documents and as directed by the Engineer.

MATERIALS:

The concrete block pavers shall be Unilock “Optiloc” style pavers, L-shape 10-1/4” x 10-1/4” x 3-1/8”D, or approved equal. The finish and color shall be Smooth-Natural, respectively. All bedding sand and geotextile shall be in accordance with the Rhode Island Standard Specifications for Road and Bridge Construction, 2004 Edition (Amended 2018) and all revisions.

CONSTRUCTION METHODS:

The concrete pavers shall be laid in a pattern matching that of the permeable pavers to be installed for this project (refer to JS Code 702.9902). Pavers shall be laid on a sand base to the line and grade indicated on the Plans or as directed by the Engineer. Where necessary to conform to angled edges, concrete paver blocks shall be cut neatly to the necessary shape and size with a concrete saw and fit snugly to the adjacent paver blocks and edging. The joints between the pavers shall be filled with ASTM-C33 fine sand to ensure a firm and stable installation. All applicable manufacturer’s instructions and recommendations shall be followed during installation.

METHOD OF MEASUREMENT:

“ITEM CODE 906.9901 CONCRETE BLOCK PAVERS" shall be measured for payment by the “Square Foot” actually furnished and installed in accordance with this Special Provision and elsewhere in the Contract Documents, and as directed by the Engineer. This measurement shall consist of the entirety of the concrete block paver system surface, bedding sand and geotextile. The measurement shall not include excavation for the installation of the pavers, furnishing and installing the compacted gravel subbase course, or furnishing and installing the precast concrete curbing, all of which shall be measured and paid for separately. It shall also not include the adjacent Permeable

Paver Sand Filter System area, which shall be measured and paid for separately.

BASIS OF PAYMENT:

The accepted quantity of “ITEM CODE 906.9901 CONCRETE BLOCK PAVERS" will be paid for at the contract unit price per “Square Foot” as listed in the Proposal. The price so-stated will constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to finish the work as described in this Special Provision and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

CODE 907.1000
DUST CONTROL

DESCRIPTION:

Subsection 907.05.3; Failure to Comply, of the Standard Specifications, requires that a daily charge be deducted from monies due the Contractor in the event the Engineer decides that dust has not been adequately controlled.

The charge for this Contract will be $1,000.00 per day.

CODE 937.1000
MAINTENANCE AND MOVEMENT TRAFFIC PROTECTION

DESCRIPTION. Subsection 937.05.2; Failure to Comply, part a. Maintenance, of the Standard Specifications, requires that a daily charge be deducted from monies due the Contractor for failure to adequately and safely maintain traffic control devices along any portion of the project.

The charge for this Contract will be $1000.00 per day.

Subsection 937.05.2; Failure to Comply, part b. Movement, of the Standard Specifications, requires that an appropriate charge be deducted from monies due the Contractor for failure to remove and/or relocate traffic control devices for compliance with the traffic-related work restrictions included in the Transportation Management Plan or to otherwise meet changes in traffic conditions, construction operations, or other conditions affecting the safety and/or mobility of the traveling public. Failure to comply with this requirement will result in a charge of $500.00 per half hour per lane (paved shoulders will be counted as lanes) per direction of travel.

CODE 938.1000
PRICE ADJUSTMENTS

DESCRIPTION:

a. Liquid Asphalt Cement. The Base Price of Liquid Asphalt Cement as required to implement **Subsection 938.03.1** of the Standard Specifications is $562.50 per ton as of 8/9/2021.

b. Diesel Fuel. The Base Price of Diesel Fuel as required to implement **Subsection 938.03.2** of the Standard Specifications is $2.1689 per gallon as of 8/9/2021.

c. Steel. The Base Prices of Steel (effective March 2021) as required to implement **Subsection 938.03.3** of the Standard Specifications are as listed in the following table:

05-05-2021

March 2021 Structural Steel & Rebar Base Prices for Contracts

Note 1: This list goes into effect March 1, 2021 and will remain in effect until revised.
Note 2: This list supersedes and replaces any earlier list.
Note 3: This list is based on the March 2021 Worksheet.

ITEM NO.	DESCRIPTION		March 2021 PRICE PER POUND		March 2021 PRICE PER KILOGRAM
1	ASTM A615/A615M Grade 60 (AASHTO M31 Grade 420) Reinforcing Steel	$	0.40	$	0.89
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note (1) below.)	$	0.55	$	1.20
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$	0.55	$	1.20
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$	0.61	$	1.35
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 250 Structural Steel Plate	$	0.66	$	1.46
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 250 Structural Steel Shapes	$	0.47	$	1.04
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 345 Structural Steel Plate	$	0.49	$	1.08
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 345 Structural Steel Shapes	$	0.40	$	0.87
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 345WT Structural Steel Plate	$	0.58	$	1.28
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 345WT Structural Steel Shapes	$	0.44	$	0.97
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 345W Structural Steel Plate	$	0.53	$	1.16
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 345W Structural Steel Shapes	$	0.41	$	0.90
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 345W Structural Steel Plate	$	0.60	$	1.32
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 485W Structural Steel Plate	$	0.63	$	1.39
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 690W Structural Steel Plate	$	0.96	$	2.13
16	ASTM A276 Type 316 Stainless Steel	$	2.86	$	6.31
17	ASTM A240 Type 316 Stainless Steel	$	2.86	$	6.31
18	ASTM A148 Grade 80/50 Steel Castings (See Note (1) below.)	$	0.99	$	2.19
19	AASHTO M270M/M270 Grade 345W Structural Steel Plate - same as Item #11.		Same as Item #11.		
20	AASHTO M270M/M270 Grade HPS 345W Structural Steel Plate - same as Item #13.		Same as Item #13.		
21	AASHTO M270M/M270 Grade 250 Structural Steel Plate - same as Item #5.		Same as Item #5.		
22	ASTM A53 Grade B Structural Steel Pipe	$	0.64	$	1.40
23	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$	0.64	$	1.40
24	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$	0.49	$	1.08
25	ASTM 252, Grade 2 Permanent Steel Casing	$	0.49	$	1.08
26	ASTM A36 (AASHTO M183) H-piles, steel supports and sign supports	$	0.43	$	0.94
27	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$	0.94	$	2.08
28	ASTM A572 / A572M, Grade 50 Sheetpiling	$	0.94	$	2.07
29	ASTM A36/36M, Grade 50	$	0.55	$	1.22
30	ASTM A570, Grade 50	$	0.55	$	1.21
31	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$	0.40	$	0.89
32	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$	0.64	$	1.41

NOTES:

(1) *Steel Castings* are generally used only on moveable bridges. Cast iron frames, grates and pipe are not "steel" castings and will not be considered for price adjustments.

CODE L.02.1000
SEEDING

DESCRIPTION:

Subsection L.02.03.7; Paragraph c, Failure to Perform Care During Construction, of the Standard Specifications requires that a daily charge be deducted from monies due the Contractor in the event the Engineer decides that the Care During Construction has not been adequately performed.

The charge for this Contract will be $500.00 per day.

CODE L09.9901

SELECTIVE CLEARING FOR CONSTRUCTION ACCESS AT BRIDGE NO. 208

DESCRIPTION:

This work consists of the removal and legal disposal of trees, shrubs, vines and/or other vegetative materials within the area shown on the Plans or as directed by the Engineer. Work shall be in accordance with Section L.09 of the RI Standard Specifications for Road and Bridge Construction, Amended 2018, including all revisions except as modified by this special provision.

MATERIALS:

Not Applicable.

CONSTRUCTION METHODS:

Vegetative materials to be selectively cleared shall be cut/trimmed flush with existing grade using equipment appropriate to the vegetative material being cleared. The Contractor shall ensure that no root systems are disturbed or any erodible soil is exposed as a result of the selective clearing.

No equipment or debris from the clearing operation shall be placed in or pass through Ten Mile River.

METHOD OF MEASUREMENT:

ITEM CODE L09.9901 “SELECTIVE CLEARING FOR CONSTRUCTION ACCESS AT BRIDGE NO. 208” will be measured for payment by the “SQUARE YARD” of area actually cleared and cleaned up in accordance with this Special Provision and elsewhere in the Contract Documents and/or as directed by the Engineer. The bounds for such area shall be established on the ground by flagging or as otherwise directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of ITEM CODE L09.9901 “SELECTIVE CLEARING FOR CONSTRUCTION ACCESS AT BRIDGE NO. 208” will be paid for at the contract unit price per “SQUARE YARD” as listed in the Proposal. The price so stated shall constitute full and complete compensation for all labor, materials, tools, equipment, and all incidentals required to complete the work as described in this Special Provision and elsewhere in the Contract Documents, complete and accepted by the Engineer.

CODE T13.9904
SIGNAL TIMING / COORDINATION IMPROVEMENTS

DESCRIPTION:

This item of work shall consist of the adjusting signal timings at various intersections throughout the duration of construction as directed by the Rhode Island Department of Transportation (RIDOT) Resident Engineer and/or Traffic Section. The contractor will be responsible for maintain the operation of the traffic signals for all construction phases.

The Contractor will be responsible for covering signal heads in conflict with phase construction, adjusting the traffic signal timings of the controllers in the cabinets, documenting pre-construction signal timing settings and any other incidental necessary for the signal to be in operation during different construction phases. Phasing and timing plans will be provided by RIDOT, the Contractor will be responsible for all field adjustments that maybe required maintaining traffic flow. The Contractor will restore the pre-construction signal timing settings after the detour terminated. All equipment changes shall conform to applicable sections of the Standard Specifications for Road and Bridge Construction, Latest Edition including all updates.

Intersections anticipated for signal time and coordination improvements are, but not limited to the following:

1. Route US 1A (Pawtucket Avenue) and Pleasant Street
2. Route US 1A (Pawtucket Avenue) and Centre Street
3. Route US 1A (Pawtucket Avenue) and Shopping Plaza (Stop & Shop)
4. Route US 1A (Pawtucket Avenue) and Route 44 (Taunton Avenue)
5. Route 44 (Taunton Avenue) and Route 114A (Fall River Avenue)

The Contractor shall notify and coordinate all signal work with the Rhode Island Department of Transportation (RIDOT) Resident Engineer 48 hours prior to commencement. The Contractor shall NOT remove or modify any equipment without permission from RIDOT Traffic Section and/or Resident Engineer.

METHOD OF MEASUREMENT:

This item will not be measured for payment.

BASIS OF PAYMENT:

“ITEM CODE T13.9904 SIGNAL TIMING / COORDINATION IMPROVEMENTS” will be paid for at the contract “Lump Sum” price as listed in the Proposal. The price so stated shall constitute full and complete compensation for all labor, materials, tools, equipment, and all other incidentals required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.