MARCH 13, 2013
RECONSTRUCTION OF FLATBUSH AVENUE CONNECTOR (STATE ROAD 504)
AND
NEW BRITAIN – HARTFORD BUSWAY WETLAND MITIGATION CONTRACT 9

STATE PROJECT NO. 63-601
AND
FTA FEDERAL AID PROJECT NO. CT - TBD
STATE PROJECT NO. 63-674

HARTFORD

ADDENDUM NO 1.

SPECIAL PROVISIONS
REVISED SPECIAL PROVISIONS
The following Special Provisions are hereby deleted in their entirety and replaced with the attached like-named Special Provisions:

- ITEM NO. 0203321A - GEOTECHNICAL MONITORING AND TESTING
- ITEM NO. 0611010A - EXTERIOR INSULATION FINISH SYSTEM

CONTRACT ITEMS
NEW CONTRACT ITEMS

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0507051	TYPE 'C' CATCH BASIN OVER 10' DEEP	EA	1
0507454	TYPE 'CM-2' CATCH BASIN OVER 10' DEEP	EA	1
0651001	BEDDING MATERIAL	CY	67
0651835	12" C.C.M. PIPE	LF	18
0751711	6" UNDERDRAIN	LF	526
0751831	6" OUTLET FOR UNDERDRAIN	LF	98

REVISED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0205001	TRENCH EXCAVATION 0' – 4' DEEP	390 CY	321 CY

0205003	TRENCH EXCAVATION 0' – 10' DEEP	240 CY	394 CY
0507001	TYPE 'C' CATCH BASIN	15 EA	14 EA
0507453	TYPE 'CM-2' CATCH BASIN	7 EA	6 EA
0950036	EROSION CONTROL MATTING TYPE E	1102 SY	1103 SY

DELETED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0651775	12" CORRUGATED ALUMINUM PIPE	18 LF	0 LF
0751827	6" C.C.M. PIPE STRUCTURE UNDERDRAIN	530 LF	0 LF
0751828	6" C.C.M. OUTLET FOR UNDERDRAIN	85 LF	0 LF

The Bid Proposal Form has been revised to reflect these changes.

There will be no change in the number of calendar days due to this Addendum.

The foregoing is hereby made a part of the contract.

ITEM #0203321A – GEOTECHNICAL MONITORING AND TESTING

Description: Work under this item shall consist of furnishing equipment, geotechnical monitoring and testing of embankment and subsurface conditions during construction to verify or modify the theoretical consolidations predicted in the geotechnical report. This work shall also consist of furnishing equipment and monitoring of designated structures and utilities to assess effects of adjacent and/or surrounding construction operations.

This work includes surveying, furnishing, installing, protecting, reading, reporting, maintaining and removing instrumentation as part of a Geotechnical Monitoring Program required for evaluation of ground movements during Construction, and their effects on adjacent structures and utilities. The purpose of this program is to provide data which, when used with other observations and measurements, will be the basis of:

A. Evaluation of installed Temporary Earth Support systems and any required modifications of such systems, if and as necessary;

B. Evaluation of effects of construction work on adjacent structures and utilities. Construction operations to be monitored include, but are not limited to sheet pile installation, pile driving, demolition, excavation, dewatering, fill and fill preload placement, and new construction;

C. Evaluation of settlements (both magnitudes and rates) and other characteristics of embankment fills, in conjunctions with the required time waiting periods, construction schedule and sequence of related construction.

Work in connection with the Geotechnical Monitoring and Testing Program shall include, but not necessarily he limited to the following:

A. Providing a Land Surveyor, Licensed in the State of Connecticut, for layout and subsequent verification of all instrument locations and elevations, and certification of Deformation Monitoring Point, Tiltmeter, and Settlement Platform monitoring data. Provide elevation and location measurements of established points and devices to measure vertical and horizontal movements throughout construction.

B. Provide a qualified vibration monitoring specialist with a minimum of two (2) years of similar experience to be responsible for the seismograph installation, reading, and reporting. The vibration monitoring specialist shall be a geophysicist, seismologist, or geotechnical engineer with not less than two years' experience in the application and use of vibration monitoring devices. The vibration specialist shall submit evidence of satisfactorily monitored construction operations by recording, interpreting, and reporting maximum peak particle velocities and other vibration characteristics for not less than two construction projects of similar size and magnitude to this project in the last two years. Include references and contact information for each project cited.

C. At least six (6) weeks prior to installation of any geotechnical instrumentation, the Contractor shall submit the names, qualifications, and experience record of the personnel or subcontractor(s) who will install the geotechnical instrumentation.

D. Provide and install all geotechnical instrumentation, including all labor, materials, tools, and equipment necessary to install, protect, maintain, and remove instrumentation. At least six (6) weeks prior to installation of any geotechnical instrumentation, the Contractor shall submit manufacturer's product data or catalog cuts and manufacturer's recommended installation and monitoring procedures for said instrumentation. Instrumentation shall be available at least four (4) weeks in advance of construction of an area in which it is to be installed and shall be securely stored where it will not suffer physical damage or damage arising from excessive moisture, extremes of temperatures, or other adverse conditions.

E. Installation of instrumentation shall be performed in the presence of the Engineer, who may also read and record data following installation during the course of the work. No instrumentation installation, or similar activities, shall be conducted unless the State's instrumentation representative is present at the installation location to report pertinent data and observe the work. Work completed without the Engineer present will not be accepted.

F. Within one (1) week following geotechnical instrumentation installation, the Contractor shall submit to the Engineer as-built drawings and installation records for all instrumentation. This submission shall include, but not be limited to:

1. Date of installation;

2. Name of personnel and organization responsible for installation;

3. Surveyed instrumentation plan locations. Locations shall be referenced to the station and offset and the coordinate grid system shown on the Drawings;

4. Details of each installation: elevations, sizes, dimensions, materials, backfill, locations of the various components of the installations relative to ground surface, and ground surface elevation;

5. Records indicating procedures used to verify proper functioning of geotechnical instrumentation following installation.

G. Initial readings shall be obtained for each piece of instrumentation before construction commences.

H. Monitoring and reporting of instrumentation data as specified herein. All submittals and reports shall be prepared and stamped by the Contractor's Geotechnical Instrumentation Engineer.

I. Providing access and lighting sufficient for the Engineer to inspect the instrument and to obtain confirmation readings. Supply to the Engineer readout devices and any necessary cables, connections, accessories, and software required to monitor all instrumentation.

J. Performance and the extent of supplemental monitoring are at the discretion of the Engineer. The supplemental monitoring by the Engineer does not relive the Contractor of responsibility for the instrumentation and monitoring activities described in these Special Provisions.

K. The Contractor may install, monitor, and interpret data from additional instrumentation that the Contractor deems necessary to ensure the safety of personnel and the work, at no additional cost to the State. In the event the Contractor installs instrumentation in addition to that required herein, the Contractor shall coordinate with the Engineer to ensure compatibility of the collected data and shall implement recommendations developed from interpretations of the monitoring program data.

L. All utility monitoring shall be performed in accordance with applicable City of Hartford Metropolitan District Commission (MDC) requirements.

Material: Products and materials shall be in accordance with the following:

A. General

1. All materials and equipment shall be approved by the Engineer.

2. Materials, designs and construction shall provide robust, corrosion and vibration resistant instruments.

3. The Contractor shall select a Manufacturer regularly engaged in the manufacture of monitoring instrumentation of the type specified herein.

4. All instrumentation hardware, protective covers, readout equipment, and equipment and materials necessary to conduct the monitoring program shall be purchased or rented by the Contractor. Prior to installation, all materials and equipment shall be available for inspection by the Engineer to ensure compliance with the intent of these specifications.

B. Deformation Monitoring Points:

Deformation monitoring points (DMPs) will be used to monitor vertical and horizontal deformation of various facilities at selected locations shown on the plans or as required by the Engineer. The following types of DMPs shall be used to monitor deformation:

1. DMP-Type I shall consist of a 1-1/2 to 2-in, long masonry nail with an identification tag. The nail shall be manufactured from hardened, zinc-plated

steel. The nail shall have ribbed threads along its shank and a conical point. It shall also have an indent in the center of its head to receive a surveyor's plumb bob. The identification tag shall be metallic and have a punched number for identification. Deformation monitoring points on concrete or steel shall be marked with permanent paint and stamped or etched with crosshairs. Additionally, for monitoring the top of manhole frames, paint or crayon shall also be used to mark and label the location.

2. DMP-Type 2 shall consist of a 3/8" in. dia. x 4-1/2 in. long (or longer) expandable anchor for masonry or wood structures and 1/2 in. dia bolt with locking nut for sheet piling. These anchors shall typically be installed into vertical surfaces of building or bridge foundations and temporary excavation support structures.

3. DMP-Type 3 shall consist of a 1 foot long No.5 or No. 6 reinforcing bar.

C. Seismographs

Provide portable seismographs for monitoring the velocities of ground vibrations and air overpressures levels resulting form construction activities. Provide model SSU 2000DK as Manufactured by Geosonics Inc., Warrandale, PA, model Blastmate II as manufactured by Instantel Inc., Kanata (Ottawa), Ontario, Canada, model VMS-500 as manufactured by Thomas Instruments, Inc., Spoffold, NH, or model NC53IO/D as manufactured by Nomis Inc., Birmingham, AL or acceptable equivalent. The seismograph shall have the following minimum features:

1. Seismic range: 0.01 to 8 inches per second with an accuracy of 5% and no more than a 3 db roll off at the low frequency end.

2. Flat frequency response: 2 to 200 Hertz.

3. Three component sensor.

4. Two power sources: Internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.

5. Capable of internal dynamic calibration.

6. Direct wiring to printer and to thumb drive or CD ROM. Instruments must be capable of producing strip chart recordings of readings on site within one hour of obtaining the readings. Provide computer software to perform frequency analyses of data obtained on magnetic disks.

7. Continuous monitoring mode must be capable of recording peak velocities.

8. Sound level frequency response: flat within +/-3 db from 2 to 200 Hz.

D. Settlement Platforms

Settlement platforms shall consist of the following:

1. The 2 inch diameter black steel pipe shall conform to ASTM A-120.

2. Pipe couplings of each riser section shall consist of 2” diameter threaded standard black iron pipe couplings, one per riser section, conforming to ASTM A53 or higher grade steel.

3. The pipe flange used to connect the riser to the platform base steel plate shall consist of 2” diameter threaded standard black iron flange conforming to ASTM A53 or higher grade steel.

4. The steel cap at the top of the riser shall consist of 2” diameter threaded standard black iron cap conforming to ASTM A53 or higher grade steel.

5. The settlement platform base shall consist of either minimum 24-inch by 24-inch by 3/4-in. thick marine grade plywood of any species or minimum ¼-in. thick steel plate suitable for welding conforming to ASTM A36 or higher grade steel.

6. Bolts, nuts, and washer shall conform to ASTM A-307.

7. Steel plate washer shall conform to ASTM A36 or higher.

8. Settlement Platform welding material shall conform to AWS Dl.l.

9. Settlement Platform bedding or level pad material shall consist of Compacted Granular Fill as specified in Section 2.13 of Form 816.

E. Piezometers

Piezometers shall consist of the following:

1. Provide vibrating wire piezometers, signal cable, readout unit, software, and protective pipe for signal cable as manufactured by Geokon Inc., Lebanon, NH, Slope Indicator Co., Seattle, WA, Applied Geomechanics, Inc., San Francisco, CA, or approved equal.

2. The piezometer range shall be such that the anticipated initial in-situ hydrostatic pressure is within the middle third of the piezometer’s rated range. Minimum resolution shall be 0.025% full scale (FS) and minimum accuracy shall be ±0.1%

FS. The piezometers shall include thermistors to provide unit temperature at the time of each reading.

3. Provide signal cable from the vibrating wire piezometer manufacturer with sufficient length to extend to the terminal boxes at the readout locations. Cable shall be as specified by the manufacturer of the instrument, and shall be a shielded cable with a waterproof jacket.

4. Provide readout and other terminal units, from the vibrating wire piezometer manufacturer. Readout unit shall be capable of obtaining both the vibrating wire and thermistor readings, Readout unit shall include a battery charger and shall be maintained in working condition for the duration of the monitoring period.

5. Protective pipe shall be schedule 80 PVC conforming to the requirements of Subarticle M.08.01-27.

6. Filter sand shall conform to ASTM C778, 20-30 sand.

7. Granular bentonite shall by Enviroplug Medium, as manufactured by Wyo-Ben, Inc., Billings, MT, or Holeplug, as manufactured by Baroid Division, Petroleum Services, Inc., Houston, TX, or approved equal.

8. Special grout Type A shall include uniform sized fine ground or powdered non-drilling mud grade bentonite, for use in sealing and grouting well casings. A polymer based thixotropic additive may be added to the mix if recommended by the manufacturer. Special grout Type A shall have a mixed specific gravity, prior to placement within the piezometer borehole, between 1.03 and 1.10.

9. PVC protective pipe shall be protected by a flush mounted road box or a locking steel standpipe.

F. Tiltmeters

Tiltmeters shall consist of the following:

1. Tilt of vertical or horizontal surfaces shall be measured by use of in-place tiltmeters as manufactured by Slope Indicator Co., Seattle, WA, Applied Geomechanics, Inc., San Francisco, CA, Geokon, Inc., Lebanon, NH, or approved equivalent. The tiltmeters shall include thermistors to provide unit temperature at the time of each reading to allow compensation of temperature effects including thermoelastic movements. Tiltmeters shall be uni-axial and have a minimum resolution of 10 arc seconds and a minimum full scale range of 610 degrees.

2. Provide cable and necessary connections from the Tiltmeter manufacturer. Cable shall be as specified by the manufacturer of the instrument, and shall be a shielded cable with a waterproof jacket.

3. Tiltmeters shall be installed per the manufacturer's recommendations.

4. Portable readout units shall digitally display both movement (tilt) and temperature data from the tiltmeters and shall be obtained from the Tiltmeter manufacturer. The readout units shall be maintained and calibrated as per the manufacturer's recommendations.

5. Provide protective boxes, NEMA 4, or equivalent, waterproof and locking, of appropriate size to enclose tiltmeter and allow for connection of readout unit to the tiltmeter.

6. Factory calibrations of tiltmeters shall consist of calibrations on a mechanical tilting table within the range +/- 2000 micro-radians, in a minimum of ten equal increments.

Construction Methods:

A. Instrumentation Layout

Locations and type of instruments to be installed shall be as shown on the Plans, described within this specification, or as approved by the Engineer. The Engineer reserves the right to modify the instrument layout as is deemed necessary to monitor the impact of the Contractor's approval proposed method of construction. The instrumentation shall he arranged so that monitoring can continue until completion without interruption. Adequate access for maintenance and reading of the instrumentation shall be provided.

B. Submittals

1. Working Drawings:

Submit Working Drawings of instrumentation location layout and details at least 30 calendar days before installation. The location of all individual monitoring instruments, including DMPs and settlement platforms, must be shown and labeled. Indicate methods of installation and maintenance for instrumentation systems.

2. Documentation:

a. Submit manufacturer's catalogs and printed installation instructions for instruments furnished.

b. Submit, within 24 hours of completion of equipment installation, three copies of installation notes, initial readings, and monitoring data taken immediately after installation to the Engineer.

3. Certification:

a. Submit certification of equipment manufacturers' supervision, installation crews, and monitoring personnel at least 30 calendar days prior to installation.

b. Submit certification equipment calibration.

4. Monitoring Documentation:

a. Unless otherwise provided by the Engineer, submit proposed forms to be used for recording observations, monitoring and reporting data. Submit a sample showing proposed format for recording of readings, calculations and plots.

b. Submit the following within 12 hours after monitoring any instrument:

(1) A copy of the data sheet containing a cumulative history of all readings, including weather conditions at time of each reading.

(2) A copy of the plot of measured value versus time, which also includes a time history of construction activity likely to influence such readings (e.g., depth of excavation, presence of heavy equipment).

c. Submit weekly a brief narrative of instrumentation activity for the preceding week, in a format approved by the Engineer.

d. Maintain records relating to problems encountered, delays, unusual aspects of the installation, and details of any events that may have a bearing on instrument behavior. These records should be submitted along with instrumenting data in "J. Data Reduction. Processing, Plotting, and Reporting," as described herein.

C. Installation Requirements – General

1. Installation procedures acceptable to the Engineer shall he developed for each type of instrumentation. All instrumentation shall be installed in the presence of the Engineer.

2. All instruments shall be securely fixed such that they are capable of resisting movement, or vandalism and adverse climatic conditions at surface locations.

3. Experience or Personnel.

    a. Employ a specialized vibration monitoring firm with experienced personnel for seismographs of the type specified in this Section, to supervise and direct instrument installation technicians and to be responsible for instrument installation monitoring, reduction and interpretation of instrumentation monitoring data.

    b. Employ a Land Surveyor Licensed in Connecticut to assist in the installation and measure the horizontal and vertical location of all DMPs and Settlement Platforms.

4. Tolerances

    a. Establish the initial plan coordinates of each instrument installation to 0.001 feet or less.

    b. Establish the initial elevation of DMPs. Tiltmeters, and Settlement Platforms to 0.001 feet. Record the subsequent elevation of settlement reference points to 0.01 feet. Achieve level circuit closure with an error of closure of 0.1 feet or less.

5. To enable the Engineer to perform supplemental monitoring of instrumentation activities, the Contractor shall:

    a. Make instrument locations available to Engineer as required.

    b. Coordinate activities to minimize interference.

    c. Remove obstruction from line of sight when requested by the Engineer.

    d. Regulate traffic during instrument surveying operations.

    e. Temporarily cease activities which create hazards to instrument monitoring or surveying personnel.

    f. Provide site benchmark and reference point information.

    The performance of and the extent of supplemental monitoring is at the discretion of the Engineer, and any supplemental monitoring performed by the Engineer does not relieve the Contractor of the responsibility for the

instrumentation and monitoring activities described in these Special Provisions.

6. In addition to the instrumentation specified herein, the Contractor shall install, monitor, and interpret data from instrumentation that the Contractor deems necessary to ensure the safety of personnel and the Work, at no additional cost to the State. Data shall be reported to the Engineer as specified in "J. Data Reduction, Processing. Plotting, and Reporting." In the event the Contractor installs instrumentation in addition to that required herein, the Contractor shall:

    a. Coordinate with the Engineer to ensure compatibility of collected data.

    b. Interpret data resulting from both the Engineer's and the Contractor's monitoring programs.

    c. Implement recommendations developed from interpretations of monitoring program data.

D. Responsibilities of the Contractor:

1. The Contractor shall furnish components of instrumentation that are to be installed during construction, portable readout units for the Contractor's use, and install instruments. The Contractor shall protect and maintain installed instruments, repair the damaged, and replace the inoperative instruments.

2. Comply with all MDC requirements, including those attached to this specification and including additional monitoring required by MDC.

3. Collect, reduce, process, plot, and report data to the Engineer.

4. Provide access to the Engineer for data collection upon request. Coordinate with the Engineer to verify the consistency of collected data, Implement remedial measures based on interpretations of monitoring program data.

5. Disclosure of Instrumentation Data:

    a. Do not disclose instrumentation monitoring data to third parties and do not publish Instrument monitoring data without the prior approval of the Engineer.

    b. Be responsible for interpretation of instrumentation data as input to evaluating excavation performance and controlling settlements to prevent damage to structures, facilities and utilities.

c. Independently, the Engineer may also interpret the instrument monitoring data and will make the interpretation available to the Contractor.

6. Determine exact location of the instruments to be installed in the field with approval of the Engineer.

7. Access to Instruments: Provide and facilitate access to each instrument for the Engineer at all times. Access includes ladders, working platforms and other necessary facilities, and the removal thereof.

E. Monitoring Schedule

1. All equipment and installation accessories required for operating the instrumentation system and recording of measurements shall be by the Contractor and shall be available at least 4 weeks in advance of construction of area in which they are to be installed and shall be securely stored where they will not suffer physical damage or damage arising from excessive moisture, extremes of temperature or other adverse conditions.

2. Contractor shall provide and maintain adequate lighting and provide a safe means of access to all instruments to allow installation, repair, and reading of instruments at times selected by the Engineer.

3. If in the opinion of the Engineer, there appears to be excessive movement, the monitoring points shall be surveyed as often as deemed necessary by the Engineer,

4. Background vibrations shall he monitored a minimum of two weeks prior to any pile driving activity, sheet pile installation, excavation, soil compaction, demolition or other construction activity that produces significant ground vibrations to establish the threshold for activating the warning system.

5. The Contractor is responsible for scheduling all monitoring and testing in accordance with Table 1 below.

6. Deformation monitoring points (DMPs) shall be installed and initial readings made at least 2 weeks prior to active construction in the areas being monitored.

F. Installation of Instruments:

Install the equipment according to the manufacturers' recommendations. Testing shall he undertaken as necessary to ensure satisfactory functioning of the equipment at each stage of the installation. In particular, adequate precautions shall be taken to protect the instruments from harmful effects of weather. Instruments found to be malfunctioning at any time shall be replaced as soon as possible but within no more than one week.

1. Installation of Deformation Monitoring Points:

    a. Deformation monitoring points (DMPs) shall be installed at the locations shown on the Plans or where required by the Engineer.

    b. When DMPs are installed on a surface that will be snow plowed. The DMP shall be recessed to prevent damage.

    c. Installation shall utilize means and methods that avoid or minimize damage to building materials in general and in particular to those that are part of landmarks. Holes for DMP, Type 2 anchors shall be drilled, wherever possible, into horizontal mortar joints rather than into solid or hollow block materials. Drilled holes shall be located, if possible, to avoid architecturally significant design features of the structure.

    d. DMP Type 3 shall be driven vertically into the ground surface. The bar shall extend above the ground surface about one inch.

    e. All DMPs shall have a permanent label on a fixed metallic tag visible at all times.

    f. All DMPS shall be installed as indicated in these Specifications at locations indicated on the drawings, but shall be located so that there shall be no interference overhead with the survey rod either due to structure protrusions, wires, or other obstructions.

    g. After installation of a DMP, determine the horizontal position and elevation as follows:

        (1) Establish initial horizontal position and elevation to an accuracy of ±0.001 ft.

        (2) Monitor horizontal position and elevation to an accuracy of ±0.01 ft.

2. Installation of Seismographs:

    a. Monitoring of vibrations by seismographs shall be performed as a minimum at all facilities and structures as indicated on the Plans and within these specifications, and also on other facilities and structures that may be affected by construction activities where the Contractor deems necessary to monitor vibration levels. At each facility or structure, geophones shall be placed as appropriate on the ground at points between three and six feet from the faces of structures, on the structures, on the floor slab or footings near the closest exterior face of the buildings and adjacent to or on manhole

frames. The exact location of the seismographs shall be reviewed by and approved by the Engineer.

b. Geophones shall be firmly mounted on the surface slab of concrete or asphalt, firmly set in undisturbed soil, or rigidly attached to the structure of buildings and shall be left in place for a time adequate to achieve the monitoring schedule specified herein.

c. Monitoring of sound (air overpressure) levels shall he performed by pointing the seismograph microphone toward the sound source. The microphone location shall be approved by the Engineer and shall not exceed 100 ft. from the seismograph.

3. Installation of Settlement Platforms

a. The platforms shall be established after clearing and grubbing, prior to fill placement and grading, and shall be placed on firm ground.

b. The settlement platform base shall be placed on a 6-in, thick bed of sand compacted level at the grades indicated on the plans.

c. Sufficient pipe shall be furnished for each platform to reach at least 4 ft. above the fill at all times during fill placement, or 12 in. above the top surface of the final fill height. The riser pipes shall be plumb within 1% of vertical. Riser pipes shall be permanently marked with file cuts to show heights above the platforms.

d. The settlement platforms shall be protected to prevent disturbance during placement of all fill. Risers shall he painted and/or flagged for high visibility.

e. The Contractor shall take all necessary steps to protect the settlement platforms. Damaged settlement platforms shall be repaired as soon as possible at no cost to the State. The platforms shall be surveyed immediately before and after repair. Additional fill shall not be placed until damaged settlement platforms are repaired.

4. Installation of Piezometers

a. The Contractor shall install the vibrating wire piezometers at the locations and elevations shown on the Contract Drawings.

b. The piezometers shall be installed in 4-inch diameter cased, rotary wash borings drilled without the use of bentonitic drilling mud.

c. A spilt-spoon sample with SPT blow counts shall be taken at the piezometer elevation and submitted to the Engineer. Installation procedures shall be such that all steps in the procedure can be quality assured. Volumes of each increment of backfilling with sand and granular bentonite shall be small enough such that no bridging occurs, and the depth to the top of each increment shall be checked after placement.

d. Prior to insertion of the piezometer in the borehole, the piezometer and cavity between the filter and diaphragm shall be saturated with clean water and a reading shall be taken of the vibrating wire transducer, thermistor and corresponding barometric pressure. Saturation shall be maintained throughout the installation.

e. After insertion of the piezometer a check shall be made to ensure that the piezometer reading agrees with the water head, and the elevation of the diaphragm shall be recorded.

f. The depth to the top of the granular bentonite shall be checked and recorded.

g. The protective PVC pipe extending from the ground surface shall be protected with a flush mount road box or lockable steel standpipe.

h. After completion of installation a post-installation acceptance test shall be performed to verify that the piezometer functions correctly.

i. After completion of installation, the as-built location in horizontal position shall be determined to an accuracy of 1 foot, and the elevation of the piezometer diaphragm to an accuracy of 0.01 feet.

j. The signal cable shall be placed inside protective PVC pipe extending from the ground surface at the piezometer location to the readout location.

k. The Contractor shall take all necessary steps to protect the piezometers, cables, and associated features. Piezometers that are found to be defective, damaged, or malfunctioning shall be replaced as soon as possible at no cost to the State.

5. Installation of Tiltmeters

a. Monitoring of horizontal deformation of the face of the existing bridge abutments and piers at I-84 shall be performed using tiltmeters as a minimum of one on each abutment and pier at exact locations approved by the Engineer. At each existing bridge abutment or pier (3 total), tiltmeters shall be placed to the closest point to the new construction activities. The

exact location of the tiltmeter shall be reviewed by and approved by the Engineer.

b. Monitoring of horizontal deformation of the concrete box culvert shall be performed using tiltmeters as a minimum of one at the inlet and one at the outlet at exact locations approved by the Engineer. Tiltmeters shall be placed to the closest point to the new construction activities. The exact location of the tiltmeter shall be reviewed by and approved by the Engineer.

c. Tiltmeters shall be firmly mounted on to the vertical surface of the structures using appropriate brackets and hardware as specified by the manufacturer and shall he left in place for a time adequate to achieve the monitoring schedule specified herein.

d. Tiltmeters, cables, readout units, and associated equipment shall be securely fixed such that they are protected and capable of resisting damage from construction activities, forces and pressure, vandalism, and adverse weather conditions.

e. The Contractor shall take all necessary steps to protect the tiltmeters, cables, and associated features. Tiltmeters that are found to be defective, damaged, or malfunctioning shall be replaced as soon as possible at no cost to the State.

G. Maintenance of Instrumentation

1. Prevent damage to the instruments and ancillary equipment during handling, installation and subsequent Operation. Maintain all the instruments required for long term monitoring in a satisfactory working order for the duration of the monitoring program. Should an instrument become damaged or become nonfunctional, it shall be the Contractor's responsibility to replace, within 72 hours, the damaged instrument to the satisfaction of the Engineer at no additional cost to the State. The Engineer will be the sole judge of whether repair or replacement is required. The Engineer may impose a work stoppage in the vicinity of the damaged or inoperative instrument until it is again operation, at no additional cost to the State.

2. Ensure that all the instruments in use have been correctly calibrated. Carry out periodic checks to confirm the validity of calibration of equipment in accordance with the manufacturer's instructions and carry out any adjustments that are found necessary. Suspect readings shall be repeated.

3. Keep records of all calibration certificates and, when necessary, send equipment of the site for re-calibration by an independent accredited testing laboratory.

4. Record the location of all instrumentation on as-installed Working Drawings. As-installed drawings shall include the routing of all cables. Hidden electrical instrumentation shall be identifiable by color codes and/or tagged cables. The reference coding shall also be recorded on the as-installed drawings.

5. Ensure that electrical instrumentation is not adversely affected by other temporary or permanent electrical services.

H. Instrument Reading and Records.

1. Instruments shall be read as soon as possible after installation to establish datum readings which shall be established from a minimum of two independent reading operations giving consistent results. The method of reading shall be as specified by the manufacturer. Installed locations and elevations for DMPs and settlement plates (base and riser top) shall be provided within one week of installation.

2. Monitoring Schedule

   a. Monitor instrumentation in accordance with the schedule, location and spacing shown in Table 1.

   b. Monitor instrumentation more frequently, if instrumentation detects significant anomalous or sudden unanticipated changes.

   c. Monitor instrumentation more frequently as required by the Engineer.

3. In the event of any change in circumstances, for example, the influence of the construction of other structures nearby, the program of readings shall recommence.

4. Readings shall, wherever possible, be taken by the same personnel. Should the personnel be replaced for any reason, a series of duplicate readings shall be carried out by the outgoing person and the replacement. DMP readings shall be taken at the same general time of day.

I. Limiting Instrumentation Readings

1. Implement remedial action if instrumentation readings exceed values shown in Table 2.

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

3. If the limiting value is reached. the Contractor shall:

a. Meet with the Engineer to discuss response actions.

b. Implement the reviewed plan of action.

J. Data Reduction, Processing, Plotting and Reporting

The Contractor's instrumentation personnel and surveyors shall collect, reduce, process, plot, and report data for the Contractor's monitoring program.

Each week the Contractor shall submit to the engineer a weekly data report together with all new data on CD-ROM, as specified herein. The weekly data report shall be bound and indexed and shall include:

1. A section for each type of instrument. This section shall include: a brief description of the cumulative changes in instrument readings, a brief description of the changes in readings from the previous weekly data report, a table summarizing instrument's actual readings, and if any Response Values have been reached. Raw and reduced data collected during the week, on summary tables (8-1/2 in. x 11 in. sheets of paper). Plots of data versus time and including key construction activities and other events that could influence changes in the data shall be shown. Plots of like instruments shall be done at the same scale to facilitate graphical comparison.

2. A description of work being performed during the week by the Contractor and any possible activity in the area that may have an effect on instrument readings.

3. For the Settlement Platforms provide a written weekly report to the Engineer that includes the following information:

   a. Elevation of the reference point at the settlement platform riser pipe.

   b. Elevation of the ground surface adjacent to the settlement platform riser pipe.

   c. Date and time of elevation survey.

K. Damage to Instrumentation

1. The Contractor shall protect all instruments, readout units and appurtenant fixtures, leads, connections, and other components of instrumentation Systems from damage due to construction operations, weather, traffic, and vandalism.

2. If an instrument is damaged or inoperative the Contractor's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours, at no additional cost to the State. The Engineer will be the sole judge of whether repair or replacement is required. The Engineer may impose a work

stoppage in the vicinity of the damaged or inoperative instrument until it is again operation, at no additional cost to the State.

3. Contractor shall repair or replace without additional cost to the Department any of the readout devices used for the Contractor's monitoring program which becomes damaged, inoperative, or in the judgment of the Engineer, unreliable.

L. Removal of Instruments

1. Prior to completion of the Contract, the Contractor shall remove all instrumentation installed under this Contract. Protect and maintain all instrumentation until such time as written approval authorizing removal of instrumentation has been received from the Engineer.

2. Settlement Platform risers shall be removed within the top 4 feet of the finished grade. The lower riser and base section shall remain.

3. All instruments or portions thereof removed by the Contractor shall become the property of the Contractor.

4. Instrumentation readout and calibration equipment purchased under this Contract shall become the property of the Contractor.

Method of Measurement: The work covered under this item shall be on a lump sum basis and will not be measured for payment.

Basis of Payment: The work under this item will be paid for on a lump sum basis for "Geotechnical Monitoring and Testing" which price shall be the compensation for furnishing equipment, materials and hardware; installation of instruments and recording equipment; setup and calibration of instruments; monitoring, collecting and interpreting data; maintenance of instruments; and removal of instruments including all tools, labor, power, and telephone for the geotechnical monitoring devices, and incidentals thereto.

PAY ITEM	PAY UNIT
Geotechnical Monitoring and Testing	L.S.

TABLE 1 - MONITORING SCHEDULE

INSTRUMENT	SCHEDULE AND DETAILS
All Instruments	(1) Two confirmatory readings immediately after installation, (2) One reading each workday until, as determined by the Engineer, repeatability indicates that any data changes resulting from the installation process have ceased, (3) Formal initial reading, (4) One reading immediately prior to any construction of the associated facility. Thereafter, reading frequency shall follow the schedule below.
Deformation Monitoring Points	**Frequency (general):** At least one reading every day. Readings will continue to be taken until after active construction in area has ceased, backfilling of any excavation is completed, and the Engineer determines no further readings are necessary for a particular area. **Bridges:** DMP - Type 2, installed on existing bridge substructure at the ground surface at every 20 ft. on all exposed faces. These points shall be monitored for Horizontal and Vertical movements. **Manhole Frames:** DMP – Type 1, installed on the top of the manhole frame (not cover). These points shall be monitored for Horizontal and Vertical movements.
Seismographs	Continuous during sheet pile/soldier beam driving, soil compaction, excavation or other construction activity causing ground vibrations as determined by Engineer. One seismograph should be provided and operated by contractor for each pile or sheet pile driving/soldier beam operation. **Bridges:** Seismographs, installed adjacent to bridge structure on the ground closest to the sheet piling/soldier beam location.
Settlement Platforms	Perform elevation vertical survey prior to placing fill, each day during fill placement, and two times a week during the preload waiting period or as required by the Engineer.
Vibrating Wire Piezometers	Vibrating wire piezometers shall be read each day during fill placement, and two times a week during the preload waiting period or as required by the Engineer. Piezometer readings should occur at the same time as survey of vicinity settlement platforms.
Tiltmeters	Continuous during pile driving, soil backfilling and compaction, excavation or other construction activity that may affect the bridge.
All Instruments near Preload Fill	All instruments shall be read as required above and on any day on which more than 6 inches of fill is placed within 50 ft. of any instrument.

	All instruments within 50 ft. of filled areas shall be read weekly until the Engineer has determined that the preload period has ended. Read DMPs weekly until completion of all construction activities. Frequency of readings may be reduced to bi-weekly or monthly as determined by the Engineer.

TABLE 2 – LIMITING INSTRUMENTATION READINGS

INSTRUMENT		LIMITING VALUE
Deformation monitoring points	Type 1	0.04 ft.
	Type 2	0.04 ft.
	Type 3	0.05 ft.
Seismograph	Building/Structure	1 in./sec.
Tiltmeters		0.1%

ITEM #0611010A – EXTERIOR INSULATION FINISH SYSTEM

Description: Work under this item shall consist installing an Exterior Insulation Finish System (EIFS) over the exposed face of the Expanded Polystyrene (EPS) embankment system. The system shall be a Polymer Based (PB) system developed specifically for exterior use and application over Expanded Polystyrene. The EIFS shall be a proprietary system that has been in use for a minimum of 5 years and has been installed on a minimum of 10 projects with similar environmental conditions.

Materials: Materials shall be those specific materials developed and selected to be part of the proprietary system and shall meet the following requirements:

The Reinforcing Mesh shall be a balanced, open weave, glass fiber fabric treated for compatibility with the Base Coat and EPS and shall meet the requirements of ASTM D578. The mesh shall have a minimum weight of 10 oz./square yard.

The Base Coat shall be a Polymer Based material. It shall have a minimum thickness of 1.5 times the reinforcing mesh thickness but not less than 3/32 inch wet thickness.

The Finish Coat (Top Coat) shall be an Acrylic Based material resistant to weathering, water, mold & mildew and freeze/thaw. It shall have a minimum thickness of 1/8 inch. The Finish Coat shall have a heavy texture to it to help hide irregularities of the EPS face to which it is applied and discourage graffiti. The Finish Coat shall be the color of cured concrete (grey) to match adjacent concrete elements. The Finish Coat shall meet the following physical requirements:

TEST	TEST METHOD	REQUIREMENT
Flame Spread (Test samples shall include base coat, fabric, finish mounted on non-combustible substrate)	ASTM E84	Flame spread of 25 or less. Smoke developed rating 450 or less.
Full Scale Wall Fire Test	ASTM E108	No significant surface flaming or propagation of vertical or lateral flames
Impact Resistance (Sample shall be cured. Finish, base coat and fabric over 6 inch insulation)	EIMA 101.86 (Hemispherical Head Test)	High Impact Resistance 90-150 inch-lbs.
Structural Performance – Wind Load Strength (Test panels 4 feet by 4 feet)	ASTM E330	No permanent deformation, delamination or deterioration for 40 psf positive and 15 psf negative pressure.
Water Vapor	ASTM E96	Not more than 18 grains an hour per square foot.

Tensile Adhesion	EIMA 101.03	No failure in base coat or finish coat. Minimum 5 psi tensile strength before and after freeze/thaw and accelerated weathering tests.
Water Penetration	ASTM E331	No Water penetration beyond the plane of the base coat/EPS interface after 15 minutes at 6.25 psf or 20% of the positive design wind pressure, whichever is greater.
Water Resistance	ASTM D2247	No checking, splitting, cracking or delamination after 14 days of exposure.
Abrasion Resistance	ASTM D968	500 liters of sand-slight smoothing - no cracking, checking or loss of film integrity
Accelerated Weathering	ASTM G90	2000 hours. No deterioration when viewed under 5x magnification.
Salt Spray Resistance	ASTM B117	Withstand 300 hours. No deleterious effects.
Absorption-Freeze-Thaw (Pre-weighed 100 mm x 200 mm (4" by 8") specimens; 25 mm (1") insulation, faced with finish coat cured and stored in air; tested with edges and back open.)	ASTM E2485 50 Cycles: 20 hrs. at -9 deg C ; 4-hr. thaw in water	After 50 cycles – Total weight gain of not more than 6.2 grams. No checking, splitting, cracking or delamination.

The sealant for joints and edges shall conform to the requirements of ASTM C920 and shall accommodate a minimum joint movement of 50% with 100% recovery.

Construction Methods: The EIFS shall be installed by the Company who developed the proprietary system or an independent Installer who has permission from or is licensed by the Company to install the system. Installers shall be trained and certified in the installation of EIFSs by the Association of the Wall and Ceiling Industry (AWCI).

Prior to the commencement of any work the Contractor shall submit 6 sets of an information package from the Installer/Manufacture which describes the system in detail. The package shall include, but not be limited to; Manufacturer's data sheets on each product being used with ASTM references, Material Certificates and Certified Test Reports for materials and system performance, preparation instructions, storage and handling requirements, the composition and thickness of each coat, installation methods and procedures. Also included in the package shall be; two complete sets of color chips representing Manufacturer's full range of available colors and patterns and two samples (6”x6” minimum) representing actual product, color, and patterns. The information package shall also include working drawings showing the full layout of the vertical embankment face indicating the locations of joints and sealants.

Prior to beginning work, verify that the EPS face is; acceptable for use in conjunction the chosen system, flat within ¼" in a 4' radius, sound and dry with tight joints, no surface voids, projections, or other conditions that may interfere with system installation or performance.

Provide a mock-up for evaluation of surface preparation techniques and application workmanship and finished appearance. Install the complete system at a location selected by the Engineer in the field. Do not proceed with remaining work until workmanship, color, texture and appearance the Finish Coat are approved by Engineer. Refinish the mock-up area, as required, to produce acceptable work and allow it to be seamlessly incorporated into the remainder of the EIFS.

The EIFS shall cover the entire exposed face of the EPS embankment system. Vertically, it shall extend from the bottom of the concrete moment slab at the top of the wall to a distance of 2 feet below finished grade at the bottom of the wall. The Base Coat shall consist of a minimum of 3 layers in order to provide more durability and resistance to small differential movement between individual EPS blocks.

A vertical control joint shall be installed, extending upward from the outside corner of the toe of the Abutment 2 footing to accommodate possible differential vertical movement in the EPS blocks. Vertical control joints shall also be located below each Expansion Joint within the parapet along the top of the embankment. A continuous bead of sealant shall be applied to the top of the EIFS where it meets the overhang of the concrete moment slab.

Installation shall only proceed when environmental conditions (temperature, humidity, and ventilation) are within the limits recommended by Manufacturer for optimum results.

Upon the completion and acceptance of the EIFS installation, the Installer shall provide an executed copy of the Manufacturer's warranty against defective material and the Installer's warranty against defective workmanship.

Method of Measurement: The actual area of EIFS installed and accepted, in square yards, shall be measured for payment. The pay limit at the bottom of the EPS face shall be a line 2 feet below finished grade. Any EIFS installed below that line shall not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price, per square yard, for "Exterior Insulation Finish System", complete in place, which price shall include all EPS surface preparation, furnishing and installing the system, quality control tests, and any necessary repairs and remediation work as well as all materials, equipment, tools, labor incidental thereto.

PAY ITEM	PAY UNIT
Exterior Insulation Finish System	S.Y.