Wisconsin Department of Transportation

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Bureau of Project Development
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July 5, 2018

NOTICE TO ALL CONTRACTORS:

Proposal #10: 2788-00-71, WISC 2017 512
Waukesha Bypass
Genesee Rd to Fiddlers Creek Dr
USH 018
Waukesha County

Letting of July 10, 2018

This is Addendum No. 02, which provides for the following:

Special Provisions:

Revised Special Provisions	
Article No.	Description
94	Tieback Anchors, Item SPV.0060.20; Tieback Anchor Performance Tests, Item SPV.0060.21.

Plan Sheets:

Revised Plan Sheets	
Plan Sheet	Plan Sheet Title (brief description of changes to sheet)
1402	R-67-129 – Added note for tieback anchor loads

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractor.

Sincerely,

Mike Coleman

Proposal Development Specialist
Proposal Management Section

ADDENDUM NO. 02

2788-00-71

July 5, 2018

Special Provisions

94. Tieback Anchors, Item SPV.0060.20; Tieback Anchor Performance Tests, Item SPV.0060.21.

Replace entire article language with the following:

A Description

A.1 General

(1) The work under this item consists of permanent, pressure-grouted or post grouted, ground anchors designed, furnished, installed, tested, and stressed in accordance to these special provisions and as shown on the plans.

(2) Install ground anchors that shall develop the load carrying capacity indicated on the plans in accordance to the testing subsection of these special provisions.

(3) The contractor has the option to provide an alternate permanent earth anchor system with the approval of the department. The contractor shall then be responsible for selecting the permanent earth anchor type, method of installation, and for determining the bond length and anchor diameter that shall develop the factored design loads indicated on the plans. The analysis, design, construction and testing of the post tiebacks shall conform to the AASHTO LRFD Bridge Design Specifications Seventh Edition with 2015 Interim and the AASHTO LRFD Bridge Construction Specifications Third Edition with 2015 Interim.

A.2 Qualifications of the Contractor

(1) The contractor performing the work described in these special provisions must have installed ground anchors for excavation retaining walls for a minimum of 5 years. Submit a list containing at least five projects where the contractor has installed ground anchors. Specifically, experience must demonstrate competence in the use of pressure or post grouting. At least one project must show evidence of permanence with a 5-year minimum age. The project experience documentation must include a brief project description, construction methods used during installation, local soil conditions, actual construction time and contact information consisting of an individual's name and current phone number. Contacts must be capable of verifying project participation.

(2) Submit staff experience records of the engineer, drill operators, and on-site supervisors who will be assigned to the project. The staff records must contain a summary of each individual's experience and it must be complete enough for the engineer to determine whether each individual has satisfied the following qualifications.

(3) Assign an engineer to supervise the work who has at least four years of experience in the design and construction of anchored earth retaining structures in similar soils. Do not use consultants or manufacturer's representatives in order to meet the requirements of this section. Drill operators and on-site supervisors must have a minimum of one-year experience installing ground anchors with the contractor's organization.

(4) Submit your qualifications and staff experience records at the preconstruction meeting or 21 calendar days prior to the start of ground anchor installation, whichever date is earlier. The engineer will approve or reject the contractor's qualifications and staff experience records within 14 calendar days after receipt of the submission. Do not start work on any ground anchor installation until approval of the contractor's qualifications and staff experience are given by the engineer. The engineer may suspend the ground anchor work if the contractor substitutes unqualified personnel for approved personnel

during construction. If work is suspended due to the substitution of unqualified personnel, the adjustment in contract time resulting from the suspension of work will not be allowed.

A.3 Submittals

(1) Prepare and submit to the engineer for review and approval working drawings and a design submission describing the ground anchor system or systems intended for use. The working drawings and design submission must be submitted thirty business days before the commencement of the ground anchor work. The working drawing and design submission must include certificates of compliance for the following materials, if used. The certificates must state that the material or assemblies to be provided will fully comply with the requirements of the contract.

- Prestressing steel or bar;
- Portland cement;
- Prestressing hardware;
- Bearing plates.

(2) The engineer will approve or reject the contractor's submittals within 30 business days after receipt of the submission.

(3) Submit to the engineer for review and approval or rejection mill test reports for the prestressing steel and the bearing plate steel. The engineer may require the contractor to provide samples of any ground anchor material intended for use on the project. The engineer will approve or reject the prestressing steel and bearing plate steel within five business days after receipt of the test reports. Do not incorporate the prestressing steel and bearing plates in the work without the engineer's approval.

(4) Submit to the engineer for review and approval or rejection calibration data for each test jack, pressure gauge and reference pressure gauge to be used. The engineer will approve or reject the calibration data within 5 business days after receipt of the data. Do not commence testing until the engineer has approved the jack, pressure gauge, and reference pressure gauge calibrations.

(5) Submit to the engineer within 10 calendar days after completion of the ground anchor work, a report containing the following information:

- As-Built plans showing the location and vertical and horizontal orientation of the tiebacks, capacity, tendon type, total length, and unbonded length as installed.
- Steel tendon, corrosion protection elements and grout certifications and/or mill reports.
- Grouting records indicating the following:
    1. Cement type;
    2. Cube test strength results;
    3. Grout volume for bonded and unbonded lengths;
    4. Grout pressure.
- Show on the as-built plans the type of testing performed for each post tieback.
- Tieback tests results (Performance and proof test data with load-anchor elongation curves).
- Other records as required by standard spec 106.

A.4 Definitions

(1) Anchorage Devices. The anchor head wedges or nuts, which grip the prestressing steel.

(2) Bearing Plate. The steel plate, which distributes the ground anchor force to the structure.

(3) Bond Length. The length of the ground anchor, which is bonded to the ground and transmits the tensile force to the soil or rock.

(4) Factored Design Load. The factored design load is the maximum anticipated factored load that will be applied to the ground anchor during its service life after stressing and testing have been

completed. Design loads and applicable load factors are per AASHTO LRFD Bridge Design Specifications, Fifth Edition with 2010 Interim.

(5) Ground Anchor. A system, referred to as a tieback or an anchor, used to transfer tensile loads to soil or rock. A ground anchor includes all prestressing steel, anchorage devices, bearing plates, grout, coatings, corrosion protection, and sheathings and couplers if used.

(6) Minimum Specified Ultimate Tensile Strength. The minimum breaking strength of the prestressing steel as defined by the specified standard.

(7) Tendon Bond Length. The length of the tendon, which is bonded to the anchor grout.

(8) Total Anchor Length. The unbonded length plus the tendon bond length.

(9) Unbonded Length. The length of the tendon, which is not bonded to the grout. The grout surrounding the unbonded length is a void filler and provides corrosion protection.

B Materials

B.1 References

(1) **AASHTO Standards**

- M85 Portland Cement
- M183 Structural Steel
- M275 Threadbar Prestressing Steel
- M203 Seven-wire, low relaxation strands
- M222 High-Strength Low-alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 Inches Thick
- M252 Corrugated Polyethylene Drainage Tubing

(2) **ASTM Standards**

- A-53 Specification for Steel Pipe
- A-252 Specification for Welded and Seamless Steel Pipe Files
- A-500 Specification for Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A-722 Threadbar Prestressing Steel
- A-779 Compact Seven-wire, low relaxation strands
- D-1248 Specification for Welded and Seamless Steel Pipe Files
- D-1784 Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
- D-4101 Specification for Propylene Plastic Injection and Extrusion Materials

(3) **Post-Tensioning Institute Standards**

- "Guide Specification for Post-Tensioning Materials," Post-Tensioning Manual, Post Tensioning Institute, 6th Edition, 2006.
- "Specification for Unbonded Single Strand Tendons," Post-Tensioning Institute, 2nd Edition, 2003.
- "Recommendations for Prestressed Rock and Soil Anchors," Post-Tensioning Institute, 4th Edition, 2004.

B.2 Tieback Anchors

(1) Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to the approval of the engineer. Expansive admixtures may only be added to the grout used for filling sealed encapsulations, trumpets, and anchorage covers. Accelerators are not permitted. Admixtures, if used, must be compatible with the prestressing steels and mixed in accordance to the manufacturer's recommendations.

(2) Fabricate exposed anchorage covers from steel or ductile cast iron with a minimum thickness of 0.10 inches. Securely attach the cover to the anchorage device or bearing plate. If the cover is to be grease filled, then the cover must form a permanent watertight enclosure for the anchorage device.

(3) Use anchorage devices capable of developing 95 percent of the minimum specified ultimate tensile strength of the prestressing steel tendon. The anchorage devices must conform to the static strength requirements of section 3.1.6 (1) and section 3.1.8 (1) of the PTI "Guide Specification for Post-Tensioning Materials".

(4) Fabricate the bearing plate from steel conforming to ASTM A572 Grade 50 or AASHTO M223 Grade 50 specifications.

(5) Fabricate the bondbreaker from a smooth plastic tube or pipe having the following properties:

- Resistant to chemical attack from aggressive environments, grout or grease.
- Resistant to aging by ultra-violet light.
- Fabricated from material nondetrimental to the tendon or bar.
- Capable of withstanding abrasion, impact, and bending during handling and installation.
- Enable the tendon to elongate during testing and stressing.
- Allow the tendon to remain unbonded after lock-off.

(6) Use Type I, II, or III Portland cement conforming to AASHTO M85 for grout. The corrosion inhibiting grease must conform to the requirements of section 3.2.5 of the PTI, "Specification for Unbonded Single Strand Tendons".

(7) Fabricate heat shrinkable tubes from a radiation crosslinked polyolefin tube internally coated with an adhesive sealant. Before shrinking, the tube must have a nominal wall thickness of 24 mils. The adhesive sealant inside the tube must have a nominal thickness of 20 mils.

(8) Fabricate ground anchor tendons from a single bar. Additionally, the ground anchor tendons must conform to the following:

- Steel bars conforming to AASHTO M275, or ASTM A722.
- Seven-wire, low relaxation strands conforming to M203.

(9) Use steel couplers capable of developing 95 percent of the minimum specified ultimate tensile strength of the tendon.

(10) Use a sheath as part of the corrosion protection system for the unbonded length portion of the tendon. Fabricate the sheath from one of the following:

- A polyethylene tube pulled or pushed over the prestressing steel. The polyethylene must be Type II, III, or IV as defined by ASTM D-1248 (or approved equal). The tubing must have a minimum wall thickness of 60 mils plus/minus 10 mils.
- A hot-melt extruded polypropylene tube. The polypropylene must be cell classification PP 210 B5554211 as defined by ASTM D-4101 (or approved equal). The tubing must have a minimum wall thickness of 60 mils plus/minus 10 mils.
- A hot-melt extruded polyethylene tube. The polyethylene must be high density Type III as defined by ASTM D-3350 and ASTM D1248 (or approved equal). The tubing must have a minimum wall thickness of 60 mils plus/minus 10 mils.
- Steel tubing conforming to ASTM A-500, minimum wall thickness of 0.20 inches.
- Steel pipe conforming to ASTM A-53, Schedule 40 minimum.
- Plastic pipe conforming to ASTM A-1185, Schedule 40 minimum.
- A corrugated tube conforming to the requirement of the tendon bond length encapsulation.

(11) Spacers must permit grout to freely flow up the drill hole. Fabricate spacers from plastic, steel, or material that is nondetrimental to the prestressing steel. Do not use wood. A combination centralizer-spacer may be used.

(12) Fabricate the trumpet used to provide a transition from the anchorage to the unbonded length corrosion protection from a steel pipe or tube conforming to the requirements of ASTM A-53 for pipe or ASTM A-500 for tubing. The trumpet must have a minimum wall thickness of 0.125 inches for diameters up to four inches and 0.20 inches for larger diameters.

(13) Use potable water for mixing grout.

(14) Fabricate tendons in accordance to the following specifications.

- The tendons may be either shop or field fabricated from prestressing steel and materials conforming to the requirements of the Materials subsection of these special provisions. Fabricate the tendon as shown on the approved working drawings.
- The cement grout cover must provide corrosion protection of the tendon.
- Position spacers so their center-to-center spacing does not exceed ten feet. In addition, locate the upper spacer a maximum of five feet from the top of the tendon bond length, and locate the lower spacer a maximum of five feet from the bottom of the tendon bond length.
- The minimum unbonded length of the bar tendon must be 15 feet or as indicated on the plans or the approved working drawings, whichever is greater. The unbonded length must extend a minimum of 5 feet beyond the critical failure surface measured from the lowest subgrade level from the back of the retaining wall in the soil mass being retained by the wall. If the entire drill hole (tendon bond length and unbonded length) is grouted in one operation, then for the corrosion protection of the unbonded length provide either a sheath completely filled with corrosion inhibiting grease or grout, or a heat shrinkable tube internally coated with an elastic adhesive. If grease is used under the sheath, make provisions to prevent the grease from escaping at the ends of the sheath. The grease must completely coat the tendon, fill the void between the tendon and the sheath, and fill the interstices between the wires of the seven-wire strands. Provide a transition between the bond length and the unbonded length corrosion protection as illustrated in the working drawings. If the sheath is grout filled, a separate bond breaker must be provided. The bond breaker must prevent the tendon from bonding to the grout surrounding the unbonded length. If a grease-filled sheath corrosion protection is provided and the drill hole above the bond length is grouted after the ground anchor has been locked off, then grout the tendon inside a second sheath.
- The total anchor length must not be less than the minimum length indicated on the plans or the approved working drawings.
- Size the bearing plates so that:
    1. The bending stresses in the plate do not exceed the yield strength of the steel when a load equal to 95 percent of the minimum specified ultimate tensile strength of the tendon is applied;
    2. The average bearing stress on the concrete does not exceed that recommended in section 3.1.7 of the PTI, “Guide Specification for Post-Tensioning Materials”.
- Weld the trumpet to the bearing plate. The trumpet must have an inside diameter equal to or larger than the hole in the bearing plate. The trumpet must be long enough to accommodate movements of the structure during testing and stressing. For strand tendons with encapsulation over the unbonded length, the trumpet must be long enough to enable the tendon to make a transition from the diameter of the tendon in the unbonded length to the diameter of the tendon at the anchor head without damaging the encapsulation. Trumpets filled with corrosion-inhibiting grease must have a permanent Buna-N synthetic rubber or approved equal seal provided between the trumpet and the unbonded length corrosion protection. Trumpets filled with grout must have a temporary seal provided between the trumpet and the unbonded length corrosion protection or the trumpet must overlap the unbonded length corrosion protection by a minimum of one foot and fit tightly over the unbonded length corrosion protection.

(15) Damage to the prestressing steel because of abrasions, cuts, nicks, welds and weld splatter will be cause for rejection by the engineer. Protect the prestressing steel if welding is to be performed in the vicinity. Grounding of welding leads to the prestressing steel is forbidden. Protect the prestressing steel from dirt, rust or deleterious substances. If heavy corrosion or pitting is noted, the engineer will reject the affected tendons.

(16) Use care in handling and storing the tendons at the site. Before inserting a tendon in the drill hole, the contractor and the engineer will examine the tendon for damage to the encapsulation and the sheathing. If, in the opinion of the engineer, the smooth sheathing has been damaged, repair it with ultra-high molecular weight polyethylene tape.

C Construction

C.1 Anchor Installation

C.1.1 General

(1) Unless otherwise directed, select the drilling method, pressure grouting, post grouting, the grouting procedure, and the grouting pressure used for the installation of the ground anchor.

C.1.2 Drilling Method

(1) Unless otherwise directed, the contractor may choose to utilize rotary drilling with casing, duplex or dual rotary drilling method, rotary drilling with stabilizing fluid, percussion drilling with casing, hollow stem auger drilling or driven casing provided that the anchor hole is maintained in a stable condition at all times, preventing collapse or excessive over-excavation of soils. Pervasive hole caving or ground loss problems must be repaired by grouting at the contractor's expense to prevent damage to the adjacent ground mass and supported structures.

(2) Use duplex drilling when drilling anchors in predominately granular soils, soils below the ground water table, or when directed by the engineer to use duplex drilling when other drilling methods do not produce satisfactory results.

(3) At the ground surface, locate the drill hole within twelve inches of the location shown on the plans or the approved working drawings. Locate the drill hole so the longitudinal axis of the drill hole and the longitudinal axis of the tendon are parallel. In particular, do not drill the ground anchor hole in a location that requires the tendon to be bent in order to enable the bearing plate to be connected to the supported structure. At the point of entry, the horizontal angle made by the ground anchor and the structure must be within plus/minus three degrees of a line drawn perpendicular to the plane of the structure unless otherwise shown on the plans or approved working drawings. Do not extend the ground anchors beyond the right-of-way or easement limits shown on the plans.

(4) The tendon must be inserted into the drill hole to the desired depth without difficulty. When the tendon cannot be completely inserted, remove the tendon from the drill hole and clean or redrill the hole to permit insertion. Do not drive or otherwise force partially inserted tendons into the hole.

C.1.3. Grouting Method

(1) Use a neat cement grout. The cement must not contain lumps or other indications of hydration. Admixtures, if used, must be mixed in accordance to the manufacturer's recommendations.

(2) Use grouting equipment that produces a grout free of lumps and undispersed cement. Use a positive displacement grout pump. The pump must be equipped with a pressure gauge in order to monitor grout pressures. The pressure gauge must be capable of measuring pressures of at least 150 psi or twice the actual grout pressures used by the contractor whichever is greater. The grouting equipment must be sized to enable the grout to be pumped in one continuous operation. The mixer must be capable of continuously agitating the grout.

(3) Inject the grout from the lowest point of the drill hole. The grout may be pumped through grout tubes, casing, hollow-stem-augers, or drill rods. The grout may be placed before or after insertion of the

tendon. Record the quantity of the grout and record the grout pressures. The grout pressures and grout takes must be controlled to prevent uncontrolled heave or fracturing.

(4) The grout above the top of the bond length may be placed at the same time as the bond length grout but it may not be placed under pressure. The grout at the top of the drill hole must not contact the back of the structure or the bottom of the trumpet.

(5) Upon completion of grouting and post grouting, the grout tube may remain in the hole but it shall be filled with grout. Do not load the tendon for a minimum of three days after grouting.

C.2 Installation of Trumpet and Anchorage

(1) The corrosion protection surrounding the unbonded length of the tendon must extend up beyond the bottom seal of the trumpet or one foot into the trumpet if no trumpet seal is provided. If the protection does not extend beyond the seal or sufficiently far enough into the trumpet, extend the corrosion protection or lengthen the trumpet.

(2) The corrosion protection surrounding the unbonded length of the tendon must not contact the bearing plate or the anchor head during testing and stressing. If the protection is too long, trim the corrosion protection to prevent contact.

(3) Completely fill the trumpet with corrosion inhibiting grease or grout. Trumpet grease can be placed any time during construction. Place trumpet grout after the ground anchor has been tested and stressed. Demonstrate to the engineer that the procedures selected for placement of either grease or grout will produce a completely filled trumpet.

(4) Cover all anchorages permanently exposed to the atmosphere with a corrosion inhibiting grease-filled or grout-filled cover. Demonstrate to the engineer that the procedures selected for placement of either grease or grout will produce a completely filled cover.

C.3 Anchor Testing

C.3.1 General

(1) Test each ground anchor. Do not apply any load greater than 10 percent of the factored design load to the ground anchor prior to testing. The maximum test load must not exceed 80 percent of the minimum specified ultimate tensile strength of the tendon. The test load must be simultaneously applied to the entire tendon. Stressing of single elements of multi-element tendons is not permitted.

(2) Supply the following testing equipment:

- A dial gauge or veneer scale capable of measuring to 0.01 inches used to measure the ground anchor movement. The movement-measuring device must have a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum test load and it must have adequate travel so the ground anchor movement may be measured without resetting the device.
- A hydraulic jack and pump used to apply the test load. The jack and a calibrated pressure gauge must be used to measure the applied load. The jack and pressure gauge must be calibrated as a unit by an independent firm. The calibration must have been performed within forty-five business days of the date submitted. Testing cannot commence until the engineer has approved the calibration. The pressure gauge must be graduated in 100-psi increments or less. The ram travel of the jack must not be less than the theoretical elastic elongation of the total anchor length at the maximum test load.
- A calibrated reference pressure gauge must also be kept at the site. Calibrate the reference gauge with the test jack and pressure gauge.
- Provide an electrical resistance load cell and readout for use when performing a creep test.
- Place the stressing equipment over the ground anchor tendon in such a manner that the jack, bearing plates, load cells and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.

C.3.2 Performance Tests

(1) Install and conduct the performance tests. The anchors for the performance test must be similar to the production anchors shown on the plans, and must be selected as directed by the engineer. Record the encountered soil information through the entire depth of drilling holes. Submit performance test results and soil information to the engineer for approval. If the tested anchor(s) fail(s) to pass the performance tests, at least five workdays shall be allowed for the engineer to evaluate the test anchor(s) and the soil condition. Additional performance tests may be required upon request from the engineer. The additional performance test(s), as required, and time for the engineer to evaluate the test anchor(s), will be included in the work and will not be paid for separately. Do not order material for production anchors until the approval of the performance test results are given.

(2) Conduct performance tests in accordance to the following procedures on five percent of the ground anchors or a minimum of three ground anchors per wall, whichever is greater. The engineer will select the ground anchors to be performance tested. Test the remaining ground anchors in accordance to the proof test procedures.

(3) Conduct performance tests by incrementally loading and unloading the ground anchor in accordance to the following schedule. Raise the load from one increment to another immediately after recording the ground anchor movement. Measure and record the ground anchor movement to the nearest 0.01 inches with respect to an independent fixed reference point at the alignment load and at each increment of load. Monitor the load with a pressure gauge. Place the reference pressure gauge in series with the pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the pressure gauge differ by more than ten percent, recalibrate the jack, pressure gauge and reference pressure gauge at no expense to the department. At load increments other than the maximum test load, hold the load just long enough to obtain the movement reading.

(4) **Performance Test Schedule**

Load
AL
0.25 FDL*
AL
0.25 FDL
0.50 FDL*
AL
0.25 FDL
0.50 FDL
0.75 FDL*
AL
0.25 FDL
0.50 FDL
0.75 FDL

1.00 FDL*
AL
0.25 FDL
0.50 FDL
0.75 FDL
1.00 FDL
1.20 FDL*
AL
0.25 FDL
0.50 FDL
0.75 FDL
1.00 FDL
1.20 FDL
1.33 FDL* (Max. test load)
Reduce to lock-off load – 0.60 FDL

Where, AL = Alignment Load
FDL = Factored Design Load for Tieback
* = Graph required

(5) Hold the maximum test load in a performance test for ten minutes. Repump the jack as necessary in order to maintain a constant load. Start the load-hold period as soon as the maximum test load is applied. Measure and record at 1, 2, 3, 4, 5, 6, and 10 minutes the ground anchor movement with respect to a fixed reference. If the ground anchor movement between one minute and ten minutes exceeds 0.04 inches, hold the maximum test load for an additional 50 minutes. If the load-hold period is extended, record the ground anchor movement at 15, 20, 25, 30, 45 and 60 minutes.

(6) Plot the ground anchor movement versus load for each load increment marked with an asterisk (*) in the performance test schedule and plot the residual movement of the tendon at each alignment load verses the highest previously applied load.

C.3.3 Proof Tests

(1) Perform the proof test by incrementally loading the ground anchor in accordance to the following schedule. Raise the load from one increment to another immediately after recording the ground anchor movement. Measure and record the ground anchor movement to the nearest 0.01 inches with respect to an independent fixed reference point at the alignment load and at each increment of load. Monitor the load with a pressure gauge. At load increments other than the maximum test load, hold the load just long enough to obtain the movement reading.

(2) Hold the maximum test load in a proof test for ten minutes. Repump the jack as necessary in order to maintain a constant load. Start the load-hold period as soon as the maximum test load is applied. Measure and record the ground anchor movement with respect to a fixed reference at 1, 2, 3, 4, 5, 6, and 10 minutes. If the ground anchor movement between 1 minute and 10 minutes exceeds 0.04 inches, hold the maximum test load for an additional 50 minutes. If the load-hold period is extended, record the ground anchor movements at 15, 20, 25, 30, 45 and 60 minutes.

(3) **Proof Test Schedule**

Load
AL
0.25 FDL
0.50 FDL
0.75 FDL
1.00 FDL
1.20 FDL

1.33 FDL (Max. test load) Reduce to lock-off load – 0.60 FDL

Where, AL = Alignment Load
FDL = Factored Design Load for Tieback

(4) Plot the ground anchor movement versus load for each load increment in the proof test.

(5) Submit proof tests for review by the engineer within 7 days of testing.

C.3.4 Ground Anchor Load Test Acceptance Criteria

(1) A performance- or proof-tested ground anchor with a 10-minute load-hold period is acceptable if the:

- The tieback resists the maximum test load with less than 0.04-inches of movement between 1 minute and 10 minutes.
- The total elastic movement of the tendon measured at the anchor head obtained from a proof or performance test must exceed 80 percent of the theoretical elastic elongation of the stressing or unbonded length for load increments 0.25 DL and above.
- The total movement of tendon must not exceed 100 percent of the theoretical elastic elongation of the unsupported length plus 50 percent of the supported length.

(2) A performance- or proof-tested ground anchor with a 60-minute load-hold period or a creep-tested ground anchor is acceptable if the:

- Ground anchor carries the maximum test load with a creep rate that does not exceed 0.08 inches/log cycle of time; and
- Total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

(3) If the total movement of the ground anchors at the maximum test load does not exceed 80 percent of the theoretical elastic elongation of the unbonded length, replace the ground anchor at no additional cost to the department.

(4) Ground anchors that have a creep rate greater than 0.08-inches/log cycle of time can be incorporated in the finished work at a load equal to one-half its failure load. The failure load is the load carried by the ground anchor after the load has been allowed to stabilize for ten minutes.

(5) When a ground anchor fails, modify the design and/or the construction procedures. These modifications may include, but are not limited to, installing replacement ground anchors, reducing the factored design load by increasing the number of ground anchors, modifying the installation methods, increasing the bond length or changing the ground anchor type. Any modifications of design or construction procedures including installing additional anchors shall be at the contractor's expense and at no additional charge to the department.

(6) Upon completion of the test, reduce the load to the lock-off load indicated on the plans and transfer the load to the anchorage device. The ground anchor may be completely unloaded prior to lock off. After transferring the load and before removing the jack, record a lift-off reading. The lift-off reading must be within ten percent of the specified lock-off load. If the load is not within ten percent of the specified lock-off load, reset the anchorage and record another lift-off reading. Repeat this process until the desired lock-off load is obtained.

D Measurement

(1) The department will measure Tieback Anchors by each individual tieback anchor acceptably completed that are capable of carrying the load specified on the plans, which includes a proof test of each anchor.

(2) The department will measure Tieback Anchor Performance Tests by each individual performance test, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.20	Tieback Anchors	Each
SPV.0060.21	Tieback Anchor Performance Tests	Each

Payment is full compensation for drilling; grouting; furnishing all steel, bearing plates and corrosion-protection materials required; tensioning; testing; and for designing and providing additional or remediation anchors for failed ground anchors.

Plan Sheets

The following 8½ x 11-inch sheets are attached and made part of the plans for this proposal:
Revised: 1402

END OF ADDENDUM

STATE PROJECT NUMBER
2788-00-71

POST NUMBER	℄ POST STA.	OFFSET TO ℄ OF POST	POST ✱ WALL STA.	POST SHAPE	POST LENGTH	TOP OF POST EL.	BOTTOM OF POST EL.	TOP OF FOOTING EL.	FOOTING HEIGHT	TOP OF COPING EL.	TIEBACK EL.	TIEBACK DESIGN LOAD
1	A 260+49.56	76.75 RT	00+00.42	W12X53	9.77	877.78	868.01	875.01	7.0	878.58	N /A	N /A
2	A 260+38.41	75.93 RT	0+11.70	W12X53	11.38	879.14	867.76	874.76	7.0	879.95	N /A	N /A
3	A 260+30.51	75.36 RT	0+19.70	W12X53	12.60	880.11	867.51	874.51	7.0	880.91	N /A	N /A
4	A 260+22.60	74.80 RT	0+27.70	W12X72	18.85	881.09	862.24	874.24	12	881.89	N /A	N /A
5	A 260+14.70	74.24 RT	0+35.70	W12X72	20.12	882.10	861.98	873.98	12	882.9	N /A	N /A
6	A 260+06.79	73.69 RT	0+43.70	W12X72	21.39	883.10	861.71	873.71	12	883.9	N /A	N /A
7	A 259+98.88	73.15 RT	0+51.70	W12X72	22.53	883.95	861.42	873.42	12	884.75	N /A	N /A
8	A 259+90.97	72.62 RT	0+59.70	W12X72	22.93	884.07	861.14	873.14	12	884.82	N /A	N /A
9	A 259+83.06	72.09 RT	0+67.70	W12X72	23.28	884.14	860.86	872.86	12	884.9	N /A	N /A
10	A 259+75.15	71.58 RT	0+75.70	W12X72	23.68	884.22	860.54	872.54	12	884.97	N /A	N /A
11	A 259+67.25	71.09 RT	0+83.70	W12X72	24.06	884.29	860.23	872.23	12	885.04	N /A	N /A
12	A 259+59.34	71.20 RT	0+91.70	W12X72	24.46	884.37	859.91	871.91	12	885.12	N /A	N /A
13	A 259+51.41	71.35 RT	0+99.70	W12X72	24.84	884.44	859.60	871.60	12	885.19	N /A	N /A
14	A 259+43.48	71.50 RT	01+07.70	W12X72	25.23	884.52	859.29	871.29	12	885.27	N /A	N /A
15	A 259+35.56	71.66 RT	01+15.70	W12X72	25.62	884.59	858.97	870.97	12	885.34	N /A	N /A
16	A 259+27.63	71.83 RT	01+23.70	W12X53	23.99	884.66	860.67	870.67	10	885.42	879.66	45
17	A 259+19.70	72.00 RT	01+31.70	W12X53	24.41	884.74	860.33	870.33	10	885.49	879.74	45
18	A 259+11.78	72.19 RT	01+39.70	W12X53	24.95	884.96	860.01	870.01	10	885.72	879.96	45
19	A 259+03.85	72.38 RT	01+47.70	W12X53	25.51	885.19	859.68	869.68	10	885.95	880.19	45
20	A 258+95.92	72.58 RT	01+55.70	W12X53	25.95	885.29	859.34	869.34	10	886.05	880.29	45 ☆
21	A 258+88.00	72.79 RT	01+63.70	W12X53	26.27	885.27	859.00	869.00	10	886.02	880.27	45
22	A 258+80.07	73.00 RT	01+71.70	W12X53	26.60	885.25	858.65	868.65	10	886	880.25	45
23	A 258+72.15	73.22 RT	01+79.70	W12X53	26.97	885.27	858.30	868.30	10	886.02	880.27	45
24	A 258+64.22	73.43 RT	01+87.70	W12X53	27.42	885.36	857.94	867.94	10	886.12	880.36	45
25	A 258+56.30	73.63 RT	01+95.70	W12X53	27.88	885.46	857.58	867.58	10	886.22	880.46	45
26	A 258+48.37	73.83 RT	02+03.70	W12X53	28.34	885.55	857.21	867.21	10	886.3	880.55	45
27	A 258+40.45	73.03 RT	02+11.70	W12X53	28.73	885.56	856.83	866.83	10	886.31	880.56	45
28	A 258+32.52	74.22 RT	02+19.70	W12X53	29.10	885.56	856.46	866.46	10	886.31	880.56	45

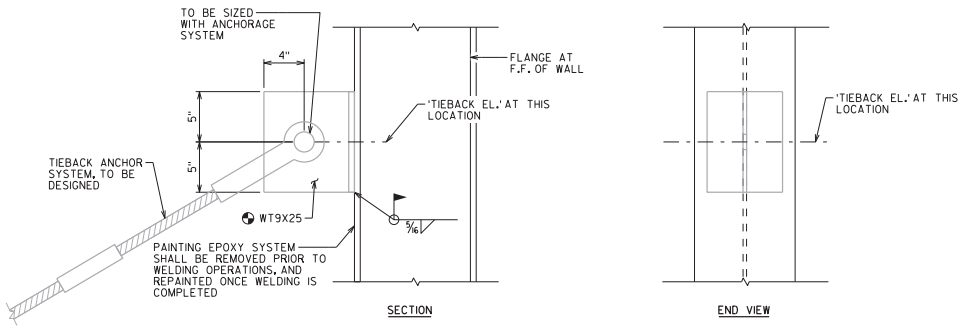
POST NUMBER	℄ POST STA.	OFFSET TO ℄ OF POST	POST ✱ WALL STA.	POST SHAPE	POST LENGTH	TOP OF POST EL.	BOTTOM OF POST EL.	TOP OF FOOTING EL.	FOOTING HEIGHT	TOP OF COPING EL.	TIEBACK EL.	TIEBACK DESIGN LOAD
29	A 258+24.60	74.41 RT	02+27.70	W12X53	29.44	885.52	856.08	866.08	10	886.29	880.52	45
30	A 258+16.67	74.59 RT	02+35.70	W12X53	29.29	884.99	855.70	865.70	10	885.77	879.99	45 ☆
31	A 258+08.75	74.76 RT	02+43.70	W12X53	29.11	884.46	855.35	865.35	10	885.24	879.46	45
32	A 258+00.82	74.93 RT	02+51.70	W12X53	28.99	883.93	854.94	864.94	10	884.71	878.93	45
33	A 257+92.90	75.10 RT	02+59.70	W12X53	28.76	883.32	854.56	864.56	10	884.11	878.32	45
34	A 257+84.97	75.26 RT	02+67.70	W12X53	28.53	882.71	854.18	864.18	10	883.49	877.71	45
35	A 257+77.05	75.42 RT	02+75.70	W12X53	28.28	882.08	853.80	863.80	10	882.87	877.08	45
36	A 257+69.13	75.57 RT	02+83.70	W12X53	27.83	881.25	853.42	863.42	10	882.04	876.25	45
37	A 257+61.20	75.72 RT	02+91.70	W12X53	27.31	880.35	853.04	863.04	10	881.15	875.35	45
38	A 257+53.28	75.86 RT	02+99.70	W12X53	26.79	879.45	852.66	862.66	10	880.25	874.45	45
39	A 257+45.35	76.00 RT	03+07.70	W12X53	26.23	878.52	852.29	862.29	10	879.32	873.52	45 ☆
40	A 257+37.43	76.14 RT	03+15.70	W12X53	25.66	877.58	851.92	861.92	10	878.38	872.58	45
41	A 257+29.50	76.27 RT	03+23.70	W12X53	25.06	876.62	851.56	861.56	10	877.43	871.62	45
42	A 257+21.58	76.39 RT	03+31.70	W12X53	24.37	875.58	851.21	861.21	10	876.39	870.58	45
43	A 257+13.66	76.51 RT	03+39.70	W12X53	23.58	874.44	850.86	860.86	10	875.25	869.44	45
44	A 257+05.73	76.62 RT	03+47.70	W12X53	22.77	873.29	850.52	860.52	10	874.1	868.29	45
45	A 256+97.81	76.73 RT	03+55.70	W12X53	21.96	872.14	850.18	860.18	10	872.95	N /A	N /A
46	A 256+89.88	76.84 RT	03+63.70	W12X53	21.12	870.97	849.85	859.85	10	871.78	N /A	N /A
47	A 256+81.96	76.94 RT	03+71.70	W12X53	20.29	869.81	849.52	859.52	10	870.62	N /A	N /A
48	A 256+74.04	77.04 RT	03+79.70	W12X53	19.41	868.62	849.21	859.21	10	869.44	N /A	N /A
49	A 256+66.11	77.13 RT	03+87.70	W12X53	18.40	867.30	848.90	858.90	10	868.12	N /A	N /A
50	A 256+58.19	77.21 RT	03+95.70	W12X53	17.39	865.98	848.59	858.59	10	866.8	N /A	N /A
51	A 256+50.26	77.28 RT	04+03.70	W12X53	11.38	864.67	853.29	858.29	5	865.47	N /A	N /A
52	A 256+42.34	77.37 RT	04+11.70	W12X53	10.72	863.72	853.00	858.00	5	864.52	N /A	N /A
53	A 256+34.42	77.44 RT	04+19.70	W12X53	10.08	862.78	852.70	857.70	5	863.58	N /A	N /A
54	A 256+26.49	77.51 RT	04+27.70	W12X53	9.41	861.84	852.43	857.43	5	862.64	N /A	N /A
55	A 256+18.57	77.57 RT	04+35.70	W12X53	8.72	860.87	852.15	857.15	5	861.67	N /A	N /A
56	A 256+10.42	77.63 RT	04+43.93	W12X53	7.72	859.86	852.14	857.14	5	860.66	N /A	N /A

POST DATA

ALL GIVEN DIMENSIONS AND ELEVATIONS ARE IN FEET

✱ POST WALL STATIONS MEASURED ALONG F.F. OF WALL

DESIGN LOAD IS GIVEN IN KIPS



TIEBACK ANCHOR CONNECTION DETAIL

CONCRETE PANEL NOT SHOWN IN DETAIL

Addendum No. 02
ID 2788-00-71
Revised Sheet 1402
July 5, 2018

NOTES

POST LENGTHS AND PANEL HEIGHTS MAY BE FABRICATED TO THE NEAREST WHOLE INCH VALUE AT THE CONTRACTORS OPTION.

TIEBACKS TO BE DESIGNED BY CONTRACTOR UTILIZING DESIGN LOAD NOTED IN TABLE.

☆ TIEBACK ANCHOR PERFORMANCE TEST REQUIRED AT THIS LOCATION AND IS TO BE PAID FOR UNDER "TIEBACK ANCHOR PERFORMANCE TESTS".

2 PER THE SPECIAL PROVISIONS, WHERE TIEBACK ANCHORS ARE REQUIRED, THE LOCK LOAD IS 27 KIPS, AND THE MAXIMUM PROOF TEST LOAD IS 60 KIPS.

ALTERNATE ANCHORAGE MAY BE ALLOWED WITH ACCEPTANCE OF WALL ANCHORAGE SYSTEM.

✱ STRUCTURAL STEEL USED FOR TIEBACK ANCHOR DETAIL CONNECTION INCIDENTAL TO "TIEBACK ANCHORS".

William C. Dreher LLS 7/5/18

NO.	DATE	REVISION	BY
2	7/3/18	UPDATE TIEBACK ANCHOR NOTES	MJK

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN SECTION

STRUCTURE R-67-129

DRAWN BY MJK | PLANS CK'D. LLS

WALL DATA 1

SHEET 4

1402

SCALE = 1.0