

ADDENDUM #03

Project Name: Central County Fire & Rescue House #06

Project Number: 24057

Date: July 15, 2026

PLEASE NOTE

The following clarifications, deletions, additions, and supplemental instructions have been incorporated into the Project Manual, Construction Drawings and represent a portion of said Construction Documents.

*In the event of a conflict between this Addendum, Project Manual and/or Construction Drawings, **this Addendum shall supersede** all previous instructions, pertaining to said items.*

PRODUCT SUBSTITUTIONS

- **No documents issued within this Addendum.**

PROJECT MANUAL

1. 00 01 10 – Table of Contents
 - a. **Updated Revision column.**
 - b. **Reference attached Revised Section.**
2. 01 21 00 - Allowances
 - a. **Removed 2.04.A, B, & C.**
 - b. **Reference attached Revised Section.**
3. 31 46 80 – Ground Improvement
 - a. **Remove 1.5 – Unit Prices section.**
 - b. **Reference attached Revised Section.**

CONSTRUCTION DRAWINGS

- **No documents issued within this Addendum.**

END OF ADDENDUM #03

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SECTION 01 21 00 ALLOWANCES

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Allowances.

2.02 RELATED REQUIREMENTS

- A. Section 01 20 00 - Price and Payment Procedures.

2.03 INSPECTIONS & TESTING ALLOWANCES

- A. Those costs incurred, as required to engage an independent Inspections and Testing Firm, previously selected and approved by Owner. Execution of said Inspections, Testing and Reporting of all results.
- B. Payment Procedures:
 - 1. Submit copy of Inspections and Testing Firms Invoice's for Owner ~ Architect review, within next scheduled Pay Application Package.
 - 2. Pay said Invoice's, **only upon receipt of approval from Architect**, Owner.

2.04 ALLOWANCES SCHEDULE

- A. **Allowance for Inspections and Testing:** Contractor shall include Sum of **\$50,000.00 dollars** within their Bid Package, for those Payments relating to Independent Firm's Inspections and Testing as required, this particular Project Site. This Work shall be performed in conjunction with all recommendations for Scope of Work required via **"yet to be issued"** Geotechnical Report. Reference Section 00 41 01 - Supplemental Bid Information for additional Content. All non-utilized Allowance funds shall be reimbursed to Owner via Architect's Project Change Order.
- B. **Allowance for Vehicular Traffic Light Structure:** Contractor shall include Sum of **\$85,000.00 dollars** within their Bid Package, for those Payments relating to entire Scope of Work, as required to provide, install Vehicular Traffic Light Structure. All non-utilized Allowance funds shall be reimbursed to Owner via Architect's Project Change Order.
- C. **Allowance for Unforeseen Existing Conditions:** Contractor shall include Sum of **\$100,000.00 dollars** within their Bid Package, for those Payments relating to previously Unforeseen Existing Conditions, that were not anticipated. All non-utilized Allowance funds shall be reimbursed to Owner via Architect's Project Change Order.

PART 2 PRODUCTS - "NOT APPLICABLE, THIS PARTICULAR PROJECT"

PART 3 EXECUTION - "NOT APPLICABLE, THIS PARTICULAR PROJECT"

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**SECTION 31 46 80
GROUND IMPROVEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes designing, furnishing, and installing aggregate piers used to locally or globally reinforce the ground to increase bearing capacity and reduce settlement of the structure. Various proprietary design and installation methods may be employed, including, but not limited to, down-hole vibrator and down-hole tamper.
- B. The aggregate piers shall meet the minimum performance criteria of these specifications.
- C. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls."
 - 2. Division 1 Section "Closeout Procedures."
 - 3. Division 1 Section "Quality Requirements."
 - 4. Division 3 Section "Cast-in-Place Concrete."
 - 5. Division 31 Section "Earthwork."
 - 6. Geotechnical Report and Recommendations

1.3 DEFINITIONS

- A. Vibrated Aggregate Pier: A pier element consisting of a column of displaced soil that is replaced by vibrated and compacted aggregate. The aggregate and surrounding soil is compacted by means of a special down-hole vibrator.
- B. Rammed Aggregate Pier: A pier element constructed by compacting aggregate in an excavated hole using a special down-hole tamper.
- C. Down-Hole Vibrator: Specially-designed, high-energy vibrator. Horizontal vibrations are created by a motor and eccentric weight located near the tip of the vibrator. Extension tubes are bolted to the vibrator to allow it to be lowered to the necessary treatment depth.
- D. Bottom Feed Vibrator: Down-hole vibrator which is equipped with a tremie pipe through which the aggregate is fed to the tip of the vibrator.
- E. Down-Hole Tamper: Specially designed, round, beveled tamping plate attached to vibratory equipment at the surface. The vertical vibration energy is provided by a vibratory hammer which is connected to the tamper. The apparatus is lowered into a pre-drilled hole to the required treatment depth.

1.4 LUMP SUM

- A. Installer shall design, install, and monitor the aggregate pier foundation system, including required load tests, as a lump sum price.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide aggregate pier foundation system capable of supporting the loads of the designed structure. The design submitted by the Installer shall consider the bearing capacity and settlement of all footings, walls, slabs, and other structural elements supported by aggregate piers and shall be in accordance with acceptable engineering practice and the Contract Documents.
- B. The design life of the structure shall be assumed to be 100 years.
- C. Aggregate piers shall be designed in accordance with generally accepted engineering practice.
- D. For sites with highly variable subsurface conditions, consideration shall be given to varying the design parameters or the installation procedures to account for actual site characteristics.
- E. Construct appropriate aggregate piers with granular backfill material beneath all column foundations, load-bearing wall foundations, and other structural elements as indicated to provide the following criteria upon completion:
 - 1. A minimum allowable uniform soil bearing capacity of 3,500 pounds per square foot (psf) under service dead plus live load for spread or continuous footings.
 - a. Bearing capacity of 500 psf at slabs on grade.
 - 2. A maximum estimated total long-term settlement of one inch of any one structural element.
 - 3. A maximum estimated differential settlement of 0.002 times the adjacent bay spacing or a maximum of one half inch between adjacent elements.
 - 4. A minimum allowable coefficient of sliding friction between the bottom of footing and soil bearing strata of 0.5.

1.6 SUBMITTALS

- A. Authorization: Signed and sealed letter from the project Geotechnical Engineer of Record that authorizes the use of the proposed ground improvement system as an appropriate system for this site.
- B. Documentation: A ground improvement design based on information contained in the project geotechnical report and acceptable engineering practice that demonstrates that the proposed system can achieve the specified performance requirements. The design shall be prepared, signed and sealed by the Installer's qualified Professional Engineer. Documentation may be in the form of calculations, supporting literature, technical documentation, etc.
- C. Settlement Analysis: Detailed geotechnical settlement analysis data signed and sealed by the Installer's qualified engineer.
- D. Aggregate Pier Layout Plan: Referenced to the structural grid system including a numbering system capable of identifying each individual pier. Details of piers including quantity, size, depth, and locations at each foundation location shall be included.
- E. Pier Load Test Procedure: A dimensioned sketch of the loading arrangement, including sizes of primary members, data on testing and measuring equipment including required jack and/or gauge calibrations, load increments, load decrements, and load durations.
- F. Qualification Data: Installer shall provide a list of at least five previously completed projects of similar scope and purpose. The list shall include a description of the project, relative size, and contact person with phone number.

- G. Material Certificates: Signed by the supplier certifying that the aggregate complies with requirements.
- H. Warranties: Special warranties specified in this Section.
- I. Record drawings at Project closeout according to Division 1 Section "Closeout Procedures."

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is legally licensed to install the proposed system. Installer must be experienced in the construction of similar size and types of projects. Installer shall have successfully completed a minimum of 5 aggregate pier supported structures within the past three years. The Installer's superintendent shall have successfully completed a minimum of 3 aggregate pier projects.
- B. Survey Work: Installer shall engage a qualified land surveyor to perform surveys, layouts, and measurements for aggregate piers. Before excavating, lay out each aggregate pier to lines and levels required. Record actual measurements of each aggregate pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 - 1. Record and maintain information pertinent to each aggregate pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.
- C. Professional Engineer Qualifications: A Professional Engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- D. Land Surveyor Qualifications: A land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing layout services of the kind indicated.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- F. Source Limitations: Obtain aggregate from one source.
- G. Aggregate Pier Load Tests: Prior to installation of production aggregate piers, provide pier load tests as specified.
 - 1. The tested aggregate piers shall be installed at locations coordinated with and approved by the General Contractor so as not to interfere with other Project site activities.
 - 2. The load tests shall be performed on the Project site in soil representative of the actual soil conditions at the final locations of the aggregate piers.
 - 3. The load tests shall be observed by the Owner's Geotechnical Representative.
 - 4. Installer shall provide all necessary equipment to perform the aggregate pier load tests.
 - 5. Test piers shall not become part of the permanent foundation system.
 - 6. Modulus test procedures, load increments, load decrements, and load duration, shall be determined using ASTM D 1194 as a general guideline.
 - a. Minimum number of Modulus tests: two for each different installation method to be used on the project.
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.8 PROJECT CONDITIONS

- A. Existing Utilities: Contractor shall locate existing underground utilities before installing aggregate piers. If utilities are to remain in place, provide protection from damage during aggregate pier installation operations.
 - 1. Should uncharted or incorrectly charted piping or other utilities be encountered during installation, adapt installation procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption.
 - 2. Repair damaged utilities to satisfaction of utility owner.
- B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only.

1.9 WARRANTY

- A. Installer shall provide a warranty as follows:
 - 1. Installer warrants that the ground improvement system for this Project will limit long term consolidation settlements from structural loads to the design settlement or less if actual structural loads are equal to or less than those provided in the design. In the unlikely event that long term consolidation settlements from structural loads are greater than the design settlement, and if such settlements result in structural distress to supported structure(s), then Installer shall pay for the cost of structural remediation. Installer shall have the right of first refusal to subcontract any such remediation work. This warranty does not include possibly vertical or lateral displacements of the structure as a result of other causes such as tornadoes, floods, landslides, nearby excavations, explosions, etc.
- B. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate
 - 1. Down-Hole Vibrator Method: Backfill aggregate should consist of hard, angular to sub-angular durable rock fragments; with the majority of particles in the range of 1/8 inch to 1-1/2 inches such as ASTM C33 size No. 57.
 - 2. Down-Hole Tamper Method: Aggregate used for piers constructed above the water table shall be Type I Gradation B in accordance with ASTM D 1241. It shall be compacted to a densification and strength, which provides resistance to the dynamic penetration test (ASTM STP 399) of a minimum average of 15 blows per 1.75-inch vertical movement.
 - a. The number of tests performed during a workday by the Testing Agency shall depend on the consistency of achieving this minimum penetration resistance. Penetration tests need not be performed on every pier. If average penetration resistances measured exceed 15 blows, and less than 10 percent of tests fall below 15 blows, then testing may be reduced to spot checks at the discretion of the Testing Agency. A pattern of successful tests is sufficient to reduce testing to several tests per day. Observation of questionable aggregate moisture content or questionable

aggregate gradation appearance may determine the need for additional dynamic penetration testing to verify that proper densification and strength are being achieved.

3. Aggregate used for piers constructed below the water table shall be Type I Gradation B in accordance with ASTM D 1241, except that particles passing the No. 40 sieve shall be eliminated.

- a. Dynamic penetration resistance testing is inappropriate for this material.

- B. Water: Potable.

PART 3 - EXECUTION

3.1 GENERAL

- A. If an adjacent building is within 15 ft of the aggregate pier work area, a relevant building examination shall be performed prior to initiating work to document preexisting cracks/damage. The adjacent building must also be monitored for movement during any work within 15 ft of the structure. The work shall be stopped and the Architect notified if any building settlement or damage is observed.

3.2 EXCAVATION

- A. Obstructions.

1. Should any obstruction be encountered during drilling or excavation for piers, the Contractor shall be responsible for removing such obstructions, or the pier shall be relocated or abandoned. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, utility lines, etc., which shall prevent placing the piers to the required depth, or shall cause the pier to drift from the required locations. Dense natural rock or weathered rock layers shall not be deemed obstructions, and piers may be terminated short of design lengths on such materials.

- B. Footing Subgrade: All excavations for footing subgrade supported by the aggregate pier foundations shall be prepared in the following manner:

1. Over-excavation below the bottom of the footing shall be limited to 3 inches. This includes limiting the teeth from excavators from over-excavation beyond 3 inches below the plan footing elevation.
2. Footing excavations shall be made shortly before concrete is placed in the footing excavation. Footing concrete shall be placed on the same day as footing excavation.
3. Prior to placing footing concrete, the top of the excavated soil and aggregate pier elements shall be compacted with a standard, hand-operated impact compactor ("Whacker-Packer" or equivalent). Vibrating plate type compactors should not be used to compact aggregate pier tops installed in predominantly fine-grained soils. Compaction shall be performed over the entire footing bottom to compact any loose surface soils or surface pier aggregate.

3.3 INSTALLATION TOLERANCES

- A. Horizontal Alignment: Deviation from center of pier as indicated on the approved Shop Drawing at top of aggregate pier shall not be more than 6 inches.

- B. Level Alignment: Deviation of top of pier elevation as indicated on the approved Shop Drawing shall not be more than +/-2 inches.
 - 1. The final measurement for the top of pier elevation shall be the lowest point on the aggregate in the last compacted lift.

3.4 REJECTED AGGREGATE PIER ELEMENTS

- A. Aggregate pier elements improperly located or installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers, unless other remedial measures are suggested and designed by the Installer.
- B. All material and labor required to replace the rejected piers shall be provided at no additional cost to the Owner, unless the cause of rejection is due to an obstruction.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
- B. Modulus Test: Testing will consist of at least one modulus test of an aggregate pier. The Modulus Test shall generally follow ASTM D-1194 and the following criteria:
 - 1. The geotechnical engineer shall approve of the location of the Modulus Test.
 - 2. Deflections shall be measured by means of a telltale installed at the bottom of the test aggregate pier. Performance will be deemed acceptable when, at the specified design stress, deflection at the bottom of the pier does not exceed 20% of the deflection at the top of the pier.
 - 3. Hold-time for load increments shall be a minimum of 15 minutes. Maximum hold-time shall not exceed 1 hour. Loads shall be held until the deflection rate has reduced to a maximum of 0.01 inch per hour.
 - 4. For the load increment which reflects approximately 115% of the design maximum stress, the minimum hold-time shall be 15 minutes. The maximum hold-time need not be greater than 4 hours. Loads shall be held until the deflection rate reduces to a maximum of 0.01 inches per hour.
 - 5. Surficial disturbance shall be compensated for by applying a seating load equal to 5% of the total load to the loaded steel plate before applying load increments.
 - 6. Verification that the modulus test results meet or exceed the specified performance requirements shall be reported. If the specified performance requirements are not met by the modulus test, the cause of failure shall be investigated and new modulus tests shall be performed until the requirements are met. No production piers shall be installed until the test proves that the specified performance requirements are met.
- C. Down-Hole Tamper Method:
 - 1. After completion of the bottom pier bulb, or at anytime during the process of constructing the pier, the energy source may be turned off, and bottom stabilization verification test may be performed. These tests shall be performed when a new soil formation is encountered, or at the beginning of a project to provide quantitative information on pier stabilization.
 - 2. A reference bar is placed over the cavity, and a mark is made on the tamper shaft that rests on top of the compacted aggregate. The energy to the tamper is restarted. If the measured vertical movement exceeds 150 percent of the value achieved during the load tests, added energy is applied to re-densify the bulb. The procedure for measure is then repeated. If there is still movement greater than 150 percent of that achieved during the

load test and greater than ½ inch, a lift of loose aggregate may be placed on top of the compacted aggregate, and the verification test may be performed on this next lift after it is densified. If there is excessive movement on this lift, another lift may be placed and tested.

3. Movement must be limited to below 150 percent of the values achieved for the load test before completion of 2/3 of the pier depth.

D. Down-Hole Vibrator Method:

1. Down-hole vibrator shall be capable of providing at least 80 HP of rated energy and a centrifugal force of 15 tons. An appropriate metering device should be provided at such a location that inspection of amperage increase may be verified during the operation of the equipment. The metering device may be an ammeter directly indicating the performance of the vibrator tip.
2. The vibrator shall be lowered to the design depth, and aggregate added as necessary to construct the aggregate pier. The vibrator will be raised and lowered repeatedly, such that on each re-penetration, the tip of the vibrator advances to within 12 inches of the previous penetration depth.

- E. Daily Aggregate Pier Progress Reports: Testing Agency shall furnish a complete and accurate record of aggregate pier installation. The record shall indicate the pier location and number, length, average lift thickness, final elevations of the base and top of piers, the type and size of the densification equipment used, and reports of any unusual conditions encountered during installation.
- F. Footing Subgrade: Testing Agency shall inspect each compacted footing bottom and approve it in writing on the same day that the concrete is poured in the footing excavation. The approval shall state that the footing bottom and exposed aggregate pier tops have been reasonably densified.
- G. Test results will be reported in writing to Architect, Contractor, and Installer within 48 hours of testing.
- H. Remove and replace applications of Work where test results indicate that it does not comply with specified requirements.
- I. Additional testing and inspecting, at Installer's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 DISPOSAL OF MATERIALS

- A. Remove surplus excavated material and legally dispose of it off Owner's property.

END OF SECTION 31 46 80

SECTION 31 46 80
GROUND IMPROVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes designing, furnishing, and installing aggregate piers used to locally or globally reinforce the ground to increase bearing capacity and reduce settlement of the structure. Various proprietary design and installation methods may be employed, including, but not limited to, down-hole vibrator and down-hole tamper.
- B. The aggregate piers shall meet the minimum performance criteria of these specifications.
- C. Related Sections include the following:
 - 1. Division 1 Section "Unit Prices."
 - 2. Division 1 Section "Temporary Facilities and Controls."
 - 3. Division 1 Section "Closeout Procedures."
 - 4. Division 1 Section "Quality Requirements."
 - 5. Division 3 Section "Cast-in-Place Concrete."
 - 6. Division 31 Section "Earthwork."
 - 7. Geotechnical Report and Recommendations

1.3 DEFINITIONS

- A. Vibrated Aggregate Pier: A pier element consisting of a column of displaced soil that is replaced by vibrated and compacted aggregate. The aggregate and surrounding soil is compacted by means of a special down-hole vibrator.
- B. Rammed Aggregate Pier: A pier element constructed by compacting aggregate in an excavated hole using a special down-hole tamper.
- C. Down-Hole Vibrator: Specially-designed, high-energy vibrator. Horizontal vibrations are created by a motor and eccentric weight located near the tip of the vibrator. Extension tubes are bolted to the vibrator to allow it to be lowered to the necessary treatment depth.
- D. Bottom Feed Vibrator: Down-hole vibrator which is equipped with a tremie pipe through which the aggregate is fed to the tip of the vibrator.
- E. Down-Hole Tamper: Specially designed, round, beveled tamping plate attached to vibratory equipment at the surface. The vertical vibration energy is provided by a vibratory hammer which is connected to the tamper. The apparatus is lowered into a pre-drilled hole to the required treatment depth.

1.4 LUMP SUM

- A. Installer shall design, install, and monitor the aggregate pier foundation system, including required load tests, as a lump sum price.

1.5 UNIT PRICES

- A. Basis for Payment: Payment for aggregate pier elements will be made on a per pier basis for actual number of piers in place and approved.
 - 1. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, aggregate, load tests, and other items for complete aggregate pier installation meeting the specified performance requirements.
 - 2. Quantities of aggregate piers may be increased or decreased at the direction of the Owner's Geotechnical Representative, based on construction procedures and actual site conditions.
 - 3. See Division 1 Section "Unit Prices" for list of unit prices.

1.6 PERFORMANCE REQUIREMENTS

- A. General: Provide aggregate pier foundation system capable of supporting the loads of the designed structure. The design submitted by the Installer shall consider the bearing capacity and settlement of all footings, walls, slabs, and other structural elements supported by aggregate piers and shall be in accordance with acceptable engineering practice and the Contract Documents.
- B. The design life of the structure shall be assumed to be 100 years.
- C. Aggregate piers shall be designed in accordance with generally accepted engineering practice.
- D. For sites with highly variable subsurface conditions, consideration shall be given to varying the design parameters or the installation procedures to account for actual site characteristics.
- E. Construct appropriate aggregate piers with granular backfill material beneath all column foundations, load-bearing wall foundations, and other structural elements as indicated to provide the following criteria upon completion:
 - 1. A minimum allowable uniform soil bearing capacity of 3,500 pounds per square foot (psf) under service dead plus live load for spread or continuous footings.
 - a. Bearing capacity of 500 psf at slabs on grade.
 - 2. A maximum estimated total long-term settlement of one inch of any one structural element.
 - 3. A maximum estimated differential settlement of 0.002 times the adjacent bay spacing or a maximum of one half inch between adjacent elements.
 - 4. A minimum allowable coefficient of sliding friction between the bottom of footing and soil bearing strata of 0.5.

1.7 SUBMITTALS

- A. Authorization: Signed and sealed letter from the project Geotechnical Engineer of Record that authorizes the use of the proposed ground improvement system as an appropriate system for this site.
- B. Documentation: A ground improvement design based on information contained in the project geotechnical report and acceptable engineering practice that demonstrates that the proposed system can achieve the specified performance requirements. The design shall be prepared, signed and sealed by the Installer's qualified Professional Engineer. Documentation may be in the form of calculations, supporting literature, technical documentation, etc.
- C. Settlement Analysis: Detailed geotechnical settlement analysis data signed and sealed by the Installer's qualified engineer.

- D. Aggregate Pier Layout Plan: Referenced to the structural grid system including a numbering system capable of identifying each individual pier. Details of piers including quantity, size, depth, and locations at each foundation location shall be included.
- E. Pier Load Test Procedure: A dimensioned sketch of the loading arrangement, including sizes of primary members, data on testing and measuring equipment including required jack and/or gauge calibrations, load increments, load decrements, and load durations.
- F. Qualification Data: Installer shall provide a list of at least five previously completed projects of similar scope and purpose. The list shall include a description of the project, relative size, and contact person with phone number.
- G. Material Certificates: Signed by the supplier certifying that the aggregate complies with requirements.
- H. Warranties: Special warranties specified in this Section.
- I. Record drawings at Project closeout according to Division 1 Section "Closeout Procedures."

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is legally licensed to install the proposed system. Installer must be experienced in the construction of similar size and types of projects. Installer shall have successfully completed a minimum of 5 aggregate pier supported structures within the past three years. The Installer's superintendent shall have successfully completed a minimum of 3 aggregate pier projects.
- B. Survey Work: Installer shall engage a qualified land surveyor to perform surveys, layouts, and measurements for aggregate piers. Before excavating, lay out each aggregate pier to lines and levels required. Record actual measurements of each aggregate pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 - 1. Record and maintain information pertinent to each aggregate pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.
- C. Professional Engineer Qualifications: A Professional Engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- D. Land Surveyor Qualifications: A land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing layout services of the kind indicated.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- F. Source Limitations: Obtain aggregate from one source.
- G. Aggregate Pier Load Tests: Prior to installation of production aggregate piers, provide pier load tests as specified.
 - 1. The tested aggregate piers shall be installed at locations coordinated with and approved by the General Contractor so as not to interfere with other Project site activities.
 - 2. The load tests shall be performed on the Project site in soil representative of the actual soil conditions at the final locations of the aggregate piers.

3. The load tests shall be observed by the Owner's Geotechnical Representative.
4. Installer shall provide all necessary equipment to perform the aggregate pier load tests.
5. Test piers shall not become part of the permanent foundation system.
6. Modulus test procedures, load increments, load decrements, and load duration, shall be determined using ASTM D 1194 as a general guideline.

- a. Minimum number of Modulus tests: two for each different installation method to be used on the project.

- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.9 PROJECT CONDITIONS

- A. Existing Utilities: Contractor shall locate existing underground utilities before installing aggregate piers. If utilities are to remain in place, provide protection from damage during aggregate pier installation operations.

1. Should uncharted or incorrectly charted piping or other utilities be encountered during installation, adapt installation procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption.

2. Repair damaged utilities to satisfaction of utility owner.

- B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only.

1.10 WARRANTY

- A. Installer shall provide a warranty as follows:

1. Installer warrants that the ground improvement system for this Project will limit long term consolidation settlements from structural loads to the design settlement or less if actual structural loads are equal to or less than those provided in the design. In the unlikely event that long term consolidation settlements from structural loads are greater than the design settlement, and if such settlements result in structural distress to supported structure(s), then Installer shall pay for the cost of structural remediation. Installer shall have the right of first refusal to subcontract any such remediation work. This warranty does not include possibly vertical or lateral displacements of the structure as a result of other causes such as tornadoes, floods, landslides, nearby excavations, explosions, etc.

- B. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate

1. Down-Hole Vibrator Method: Backfill aggregate should consist of hard, angular to sub-angular durable rock fragments; with the majority of particles in the range of 1/8 inch to 1-1/2 inches such as ASTM C33 size No. 57.

2. Down-Hole Tamper Method: Aggregate used for piers constructed above the water table shall be Type I Gradation B in accordance with ASTM D 1241. It shall be compacted to a densification and strength, which provides resistance to the dynamic penetration test (ASTM STP 399) of a minimum average of 15 blows per 1.75-inch vertical movement.

a. The number of tests performed during a workday by the Testing Agency shall depend on the consistency of achieving this minimum penetration resistance. Penetration tests need not be performed on every pier. If average penetration resistances measured exceed 15 blows, and less than 10 percent of tests fall below 15 blows, then testing may be reduced to spot checks at the discretion of the Testing Agency. A pattern of successful tests is sufficient to reduce testing to several tests per day. Observation of questionable aggregate moisture content or questionable aggregate gradation appearance may determine the need for additional dynamic penetration testing to verify that proper densification and strength are being achieved.

3. Aggregate used for piers constructed below the water table shall be Type I Gradation B in accordance with ASTM D 1241, except that particles passing the No. 40 sieve shall be eliminated.

a. Dynamic penetration resistance testing is inappropriate for this material.

B. Water: Potable.

PART 3 - EXECUTION

3.1 GENERAL

A. If an adjacent building is within 15 ft of the aggregate pier work area, a relevant building examination shall be performed prior to initiating work to document preexisting cracks/damage. The adjacent building must also be monitored for movement during any work within 15 ft of the structure. The work shall be stopped and the Architect notified if any building settlement or damage is observed.

3.2 EXCAVATION

A. Obstructions.

1. Should any obstruction be encountered during drilling or excavation for piers, the Contractor shall be responsible for removing such obstructions, or the pier shall be relocated or abandoned. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, utility lines, etc., which shall prevent placing the piers to the required depth, or shall cause the pier to drift from the required locations. Dense natural rock or weathered rock layers shall not be deemed obstructions, and piers may be terminated short of design lengths on such materials.

B. Footing Subgrade: All excavations for footing subgrade supported by the aggregate pier foundations shall be prepared in the following manner:

1. Over-excavation below the bottom of the footing shall be limited to 3 inches. This includes limiting the teeth from excavators from over-excavation beyond 3 inches below the plan footing elevation.

2. Footing excavations shall be made shortly before concrete is placed in the footing excavation. Footing concrete shall be placed on the same day as footing excavation.

3. Prior to placing footing concrete, the top of the excavated soil and aggregate pier elements shall be compacted with a standard, hand-operated impact compactor ("Whacker-Packer" or equivalent). Vibrating plate type compactors should not be used to compact aggregate pier tops installed in predominantly fine-grained soils. Compaction shall be performed over the entire footing bottom to compact any loose surface soils or surface pier aggregate.

3.3 INSTALLATION TOLERANCES

- A. Horizontal Alignment: Deviation from center of pier as indicated on the approved Shop Drawing at top of aggregate pier shall not be more than 6 inches.
- B. Level Alignment: Deviation of top of pier elevation as indicated on the approved Shop Drawing shall not be more than +/-2 inches.
 1. The final measurement for the top of pier elevation shall be the lowest point on the aggregate in the last compacted lift.

3.4 REJECTED AGGREGATE PIER ELEMENTS

- A. Aggregate pier elements improperly located or installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers, unless other remedial measures are suggested and designed by the Installer.
- B. All material and labor required to replace the rejected piers shall be provided at no additional cost to the Owner, unless the cause of rejection is due to an obstruction.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
- B. Modulus Test: Testing will consist of at least one modulus test of an aggregate pier. The Modulus Test shall generally follow ASTM D-1194 and the following criteria:
 1. The geotechnical engineer shall approve of the location of the Modulus Test.
 2. Deflections shall be measured by means of a telltale installed at the bottom of the test aggregate pier. Performance will be deemed acceptable when, at the specified design stress, deflection at the bottom of the pier does not exceed 20% of the deflection at the top of the pier.
 3. Hold-time for load increments shall be a minimum of 15 minutes. Maximum hold-time shall not exceed 1 hour. Loads shall be held until the deflection rate has reduced to a maximum of 0.01 inch per hour.
 4. For the load increment which reflects approximately 115% of the design maximum stress, the minimum hold-time shall be 15 minutes. The maximum hold-time need not be greater than 4 hours. Loads shall be held until the deflection rate reduces to a maximum of 0.01 inches per hour.
 5. Surficial disturbance shall be compensated for by applying a seating load equal to 5% of the total load to the loaded steel plate before applying load increments.
 6. Verification that the modulus test results meet or exceed the specified performance requirements shall be reported. If the specified performance requirements are not met by the modulus test, the cause of failure shall be investigated and new modulus tests shall be performed until the requirements are met. No production piers shall be installed until the test proves that the specified performance requirements are met.

C. Down-Hole Tamper Method:

1. After completion of the bottom pier bulb, or at anytime during the process of constructing the pier, the energy source may be turned off, and bottom stabilization verification test may be performed. These tests shall be performed when a new soil formation is encountered, or at the beginning of a project to provide quantitative information on pier stabilization.
2. A reference bar is placed over the cavity, and a mark is made on the tamper shaft that rests on top of the compacted aggregate. The energy to the tamper is restarted. If the measured vertical movement exceeds 150 percent of the value achieved during the load tests, added energy is applied to re-densify the bulb. The procedure for measure is then repeated. If there is still movement greater than 150 percent of that achieved during the load test and greater than ½ inch, a lift of loose aggregate may be placed on top of the compacted aggregate, and the verification test may be performed on this next lift after it is densified. If there is excessive movement on this lift, another lift may be placed and tested.
3. Movement must be limited to below 150 percent of the values achieved for the load test before completion of 2/3 of the pier depth.

D. Down-Hole Vibrator Method:

1. Down-hole vibrator shall be capable of providing at least 80 HP of rated energy and a centrifugal force of 15 tons. An appropriate metering device should be provided at such a location that inspection of amperage increase may be verified during the operation of the equipment. The metering device may be an ammeter directly indicating the performance of the vibrator tip.
2. The vibrator shall be lowered to the design depth, and aggregate added as necessary to construct the aggregate pier. The vibrator will be raised and lowered repeatedly, such that on each re-penetration, the tip of the vibrator advances to within 12 inches of the previous penetration depth.

E. Daily Aggregate Pier Progress Reports: Testing Agency shall furnish a complete and accurate record of aggregate pier installation. The record shall indicate the pier location and number, length, average lift thickness, final elevations of the base and top of piers, the type and size of the densification equipment used, and reports of any unusual conditions encountered during installation.

F. Footing Subgrade: Testing Agency shall inspect each compacted footing bottom and approve it in writing on the same day that the concrete is poured in the footing excavation. The approval shall state that the footing bottom and exposed aggregate pier tops have been reasonably densified.

G. Test results will be reported in writing to Architect, Contractor, and Installer within 48 hours of testing.

H. Remove and replace applications of Work where test results indicate that it does not comply with specified requirements.

I. Additional testing and inspecting, at Installer's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 DISPOSAL OF MATERIALS

- A. Remove surplus excavated material and legally dispose of it off Owner's property.

END OF SECTION 31 46 80