

PERRY COUNTY ENGINEER'S OFFICE

BID PROPOSAL FORM

**FOR
MARIETTA ROAD
ABANDONED RAILROAD TUNNEL STABILIZATION
PERRY COUNTY, OHIO**

ITEM	DESCRIPTION	UNIT PRICE	QUANTITY & UNIT	ITEM TOTAL
1.	Mobilization	_____	LUMP SUM	_____
2.	Air Rotary Drill	_____	550 L.F.	_____
3.	Pumpable Flowable Fill	_____	950 C.Y.	_____
4.	Casing	_____	110 L.F.	_____
5.	Grout	_____	60 C.Y.	_____
6.	18-24" Boreholes	_____	216 L.F.	_____
7.	#4 Stone	_____	180 TON	_____
8.	Restoration	_____	LUMP SUM	_____
9.	Demobilization	_____	LUMP SUM	_____
10.	Borehole Camera	_____	LUMP SUM	_____

TOTAL BID PRICE..... \$ _____

NOTE: The Bidder shall complete the labor and material for the bid items listed above. Unit price shall be the price bid per unit. The item total shall be the unit price bid multiplied by the quantity. Bidders shall complete each item in the above bid schedule. Failure to do so may be cause for rejection of the bid. Contractor shall confirm quantities in the bid schedule and provide written notification of concurrence or exception to the Perry County Engineer's office prior to initiation of any construction.

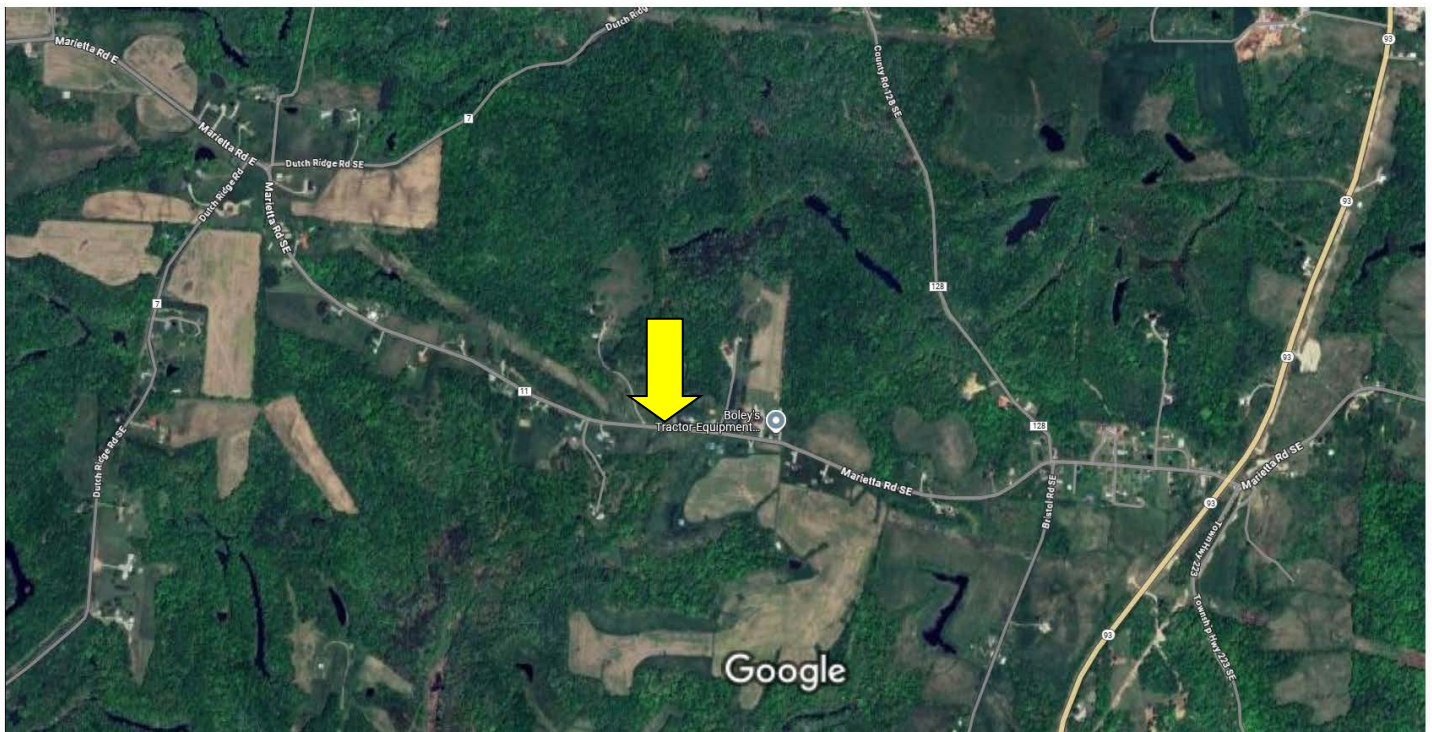
CONTRACTOR NAME: _____

ADDRESS: _____

TELEPHONE NUMBER: (____) _____

**MARIETTA ROAD
ABANDONED RAILROAD TUNNEL STABILIZATION
PERRY COUNTY, OHIO**

Located in Perry County, Pike Township, Section 11 on Marietta Road (CR 11) between intersection of Dutch Ridge Road (CR 7) and State Route 93 (39.669834, -82.242160)



PERRY COUNTY ENGINEER'S OFFICE

MARIETTA ROAD

ABANDONED RAILROAD TUNNEL STABILIZATION

PERRY COUNTY, OHIO

PROJECT DESCRIPTION

Estimated 30 LF of cover to the top of the tunnel, then 20' from the top of the tunnel to the floor of the tunnel. Estimated the tunnel to be 20' wide. Drilling of 8 boreholes at 6" diameter for filling in the void of the tunnel. Each hole to be 50 ft deep (run the drill rods to the floor of the tunnel to the bottom which would equal 50 LF deep) * X 50 = 400 LF of grout hole drilling type 1 drilling (to include a contingency of 150 LF is added in case a few more holes would be required). Use 10' of casing per borehole as a safety factor to prevent cave-in of soft overburden - to be included in above item.

Cofferdam boreholes will be required on each end of the tunnel to contain the grout. Drill 3 holes on each end of the roadway, either an 18" or 24" diameter size. These holes would only be 30 LF deep or thru the top of the tunnel, thus a total of 6 holes at approximately 30 ft (+6' contingency) deep each totaling 180 LF (216 LF total with contingency). We estimate approximately 180 tons of #4 stone to be used on each end to build the grout containment dam.

DETAILED CONDITIONS
MARIETTA ROAD
ABANDONED RAILROAD TUNNEL STABILIZATION

SCOPE AND INTENT OF WORK

The scope of this project includes mobilization; drilling 8 boreholes totaling **400** feet; PVC casing; placement of concrete and/or grout by gravity feed through a tremie pipe with an estimated combined quantity of **1,000** cubic yards; and possible use of a borehole camera. The intent is to stabilize Marietta Road located above the abandoned railroad tunnel.

SEQUENCE AND TIMING OF WORK

The drilling of the roadway and the subsequent material injection shall be done in the sequence noted in the specifications. Working hours, with exception of cleanup, will be limited to Monday –Friday, 8:00 AM to 5:00 PM, or other hours approved by the Perry County Engineer’s office. There will be no weekend or State holiday work performed without specific prior approval.

PROTECTION OF EXISTING UTILITIES

A. The contractor will be responsible for updating the project’s OUPS call ticket in order to keep it current (every ten (10) days) during the time of active construction of the project. Records, either phone or Internet shall be provided to the Perry County Engineer every two weeks.

Existing known utilities are shown on the drawings. Other utilities also exist in the area. The locations of the utilities identified are **approximate** and based on the best information available. Before construction begins, the Contractor shall locate all utilities. The Contractor shall be responsible for complying with all regulations pertaining to utilities in the State of Ohio. The Contractor shall assume all risks for all utilities located in the vicinity of his work, whether above or below the surface of the ground, and he shall be responsible for all damages and assume all expense for direct or indirect injury, caused by his work, to any of the utilities, or any person or property by reason of injury to them, whether such utilities are or are not shown on the drawings, once they have been uncovered by the work. **Two working days before digging call the Ohio Utility Protection Service (Telephone: 1-800-362-2764) and the Ohio’s Oil & Gas Producers Underground Protection Service (1-800-925-0988). The Contractor shall be responsible for contacting all utility owners that the Utility Protection Service does not cover.**

TRAFFIC CONTROL

Traffic control and road closure will be the responsibility of the Perry County Engineer’s office. Traffic control devices shall be provided with suitable supports of sufficient strength and stability.

DETAILED SPECIFICATIONS
MARIETTA ROAD
ABANDONED RAILROAD TUNNEL STABILIZATION

ITEM 1 - MOBILIZATION/ACCESS

- A. This item shall include the transportation of personnel, equipment, and supplies to and from the site; and the development of and later restoration of any and all required access roads. At completion, this item shall include demobilization and cleanup of all areas.
- B. No additional compensation will be made to the Contractor for remobilization after his equipment has been removed from the site.
- C. This item will include the costs, if any, involved with overhead utility modifications required to allow access to boring locations. Any interruptions in service shall be coordinated with the residents affected by the service modifications.
- D. Payment shall be at the lump sum contract price bid for "**Mobilization/Access.**"

ITEM 2 - DRILLING AND STABILIZATION PROGRAM

- A. General: The stabilization program for this project involves drilling a series of 4-inch minimum diameter holes adjacent to and within the roadway. These holes will verify the existence and general condition of the void and will be completed by air rotary equipment. **The use of percussion drilling techniques will not be permitted.** Effective dust control must be utilized by the contractor to minimize dust and debris during all drilling activities. Additional exploratory holes may be completed as directed by the Perry County Engineer to verify extent of grout injection, locate and evaluate the existing conditions of the abandoned railroad tunnel in adjacent areas, and to determine if additional void areas exist. If voids exist or if conditions necessitate, the Perry County Engineer will approve secondary remedial measures to grout these remaining voids.
- B. Drilling of Injection Holes: The injection hole locations and type are shown on the proposed Injection Boring Plan. The drilling of holes is expected to hit the void space within the abandoned railroad tunnel. Drilling must be performed using minimal down pressure to reduce the risk of collapsing the geologic formations above the abandoned railroad tunnel. The locations indicated on the drawings may be modified by the Perry County Engineer as required by particular conditions of the area to be stabilized. The Contractor will be responsible for drilling holes as needed to reach the desired point in the abandoned tunnel as shown by the proposed boring location plan. The holes shall be drilled with bits and stabilizers that will provide full-diameter, straight holes.

The Contractor shall be responsible for removing and replacing any obstructions necessary for drilling and injection work at his own expense.

- C. Drilling and Casing Injection Holes: Each hole drilled shall be protected from caving and/or becoming clogged or obstructed. Injection holes drilled through soil overburden shall have the casing keyed sufficiently into bedrock to exclude all overburden and to be water tight. If no bedrock is encountered, then the casing will extend to the top of the abandoned railroad tunnel or collapsed zone above the tunnel. Any hole that becomes clogged or obstructed for any reason before completion of operations shall be cleaned out in a satisfactory manner, or another hole shall be provided by and at the Contractor's expense. Casing required for injection holes shall have an inside diameter sufficient to accommodate the size of the bit required for drilling the minimum diameter hole in rock. Casing shall be installed as required. All pipe fittings required for casing holes shall be furnished, handled, and

installed by Contractor. Casing for all holes shall extend a minimum of one (1) foot above the ground surface. The casing shall be left in the hole until the completion of injection. Upon completion of the hole, the casing shall be removed to a depth of not less than 12 inches below the natural ground surface and reclaimed in such a manner, which meets contract specifications.

- D. Logs: Drilling logs shall be kept documenting changes in lithology, location of voids, fractures, and water bearing zones. In every hole, special attention shall be given to the conditions at abandoned railroad tunnel roof level (i.e. roof falls, and voids), and location of abnormal loss of air. Drill logs shall also include information as to any communication of injection air, which may vent to adjacent borings.

The fact that the Perry County Engineer, or representative, may be present and keeping a record of the drilling shall not relieve the Contractor from the requirement of keeping an accurate log as described above.

Drilling logs shall be provided to the Perry County Engineer within one day of completion of the hole and prior to the injection of concrete or grout.

- E. Directives: **The Perry County Engineer reserves the right to:**

1. **Specify the sequence of drilling;**
2. **Terminate the drilling of any of the holes at any depth;**
3. **Order the drilling of holes in addition to those specified herein;**
4. **Change the location and inclination of any of the holes.**
5. **Delete holes if the need for the hole/grouting operation no longer exists.**
6. **Control and direct all aspects of the injection operation.**

- F. Grout/Concrete Injection Program:

1. Control of Injection: The Perry County Engineer reserves the right to control and direct all aspects of the injection operation such as concrete and/or grout mixes, pumping rates, and the sequence in which holes are drilled and filled will be determined in the field by the Perry County Engineer. The Contractor shall measure the depth of all drilled holes immediately before injection. **Any hole that becomes clogged or obstructed for any reason before injection shall be cleaned out in a satisfactory manner, or another hole shall be provided by the Contractor at no additional cost to the Perry County Engineer.** Thickening of the mixes by reducing the water content or use of an accelerator will be considered if large voids are encountered. In no case shall a subsequent stage of injection in a given hole commence before a minimum period of 12 hours has elapsed since completion of the previous stage of injection in that hole. No flushing of water down any hole or into the mine will be allowed once injection has commenced. Further, the Contractor will extend the tremie pipe to an elevation within the abandoned tunnel void to inject the concrete and grout in such a way as not to separate the material and water. It is expected the tremie tube shall be placed within the deposited concrete/grout or at the surface of the deposited concrete/grout. The tremie tube shall be smooth walled, high pressure line with a minimum inside diameter of three (3) inches. Flexible walled tremie tubes will not be allowed.

The intent of the different injection mixes is as follows:

- I) The concrete mix is to be used as a barrier mixture placed within the abandoned tunnel. This will facilitate using #8 stone in the mix.
- II) The grout mix will be used for final fill within the abandoned tunnel after the concrete mix has been placed.

The Perry County Engineer reserves the right to utilize, in any borehole, the techniques specified below or variations thereof, for any purpose and in any combination.

2. Grout/Concrete Injection Monitoring: The grout injection process may be monitored by the Contractor using a combination of a borehole television camera and the physical measurement of grout flows in drill holes. The boreholes proposed for injections shall be used for the monitoring.
3. Tunnel Void: The Contractor is expected to intercept a large open void of the tunnel. The volume of concrete injected shall be limited to a daily limit of 100 cubic yards of concrete, or as otherwise directed by the Perry County Engineer. This volume estimation will be used to start the work and may be revised by the Perry County Engineer based upon field conditions. If high injection pressures are encountered, or an indication that the void has been filled, then injection can be stopped prior to achieving the specified total injection volume.

The level of concrete shall be measured in the borehole after the concrete has been permitted to set to insure the level is at or just above the tunnel roof. If the level is at or just above the tunnel roof then injection shall cease. The concrete level shall be measured at 16 hours following completion and recorded for submittal to the Perry County Engineer prior to final closure of the boring.

4. Borehole Backfilling Procedures: Once the level of concrete/grout in the tunnel reaches or extends just above the tunnel roof and following submission of the 16-hour concrete/grout level reading, then a high slump grout shall be used to fill the remainder of the hole to within four (4) inches of the ground surface. After the grout has set, the Perry County Engineer's staff will be responsible for completing the remainder of the hole.
5. Exploratory Holes: If site conditions should deteriorate, the Perry County Engineer reserves the right to require additional borings be performed for the purpose of investigation, additional grout injection, or both. These borings shall be performed under the approved contract unit rates and only upon direction of the Perry County Engineer.

G. INJECTION MATERIALS

1. General The concrete to be injected will be composed of a mixture of cement, sand and flyash, gravel or crushed limestone aggregate, and water, with the possible addition of an accelerator. Concrete will be used to fill large voids. Grout will be composed of a mixture of cement, sand, flyash, and water with the possible addition of an accelerator. The Contractor shall provide ten (10) bags of Portland cement at no cost to the Perry County Engineer. These shall be kept on site at all times and ready for use as directed by the Perry County Engineer.
2. Water. The water used shall be clean and free from injurious amounts of sewage, oil, acid, alkali, salts, organic matter, or any other foreign solids and shall be furnished by the Contractor.
3. Cement. Cement to be used shall conform with the requirements of ASTM C150, "Portland Cement", Type I or ASTM C205, "Portland Blast Furnace Slag Cement", Type IS.
4. Accelerator. The use of an early set accelerator, such as calcium chloride or proprietary products manufactured by Master Builder, Sika, or others, shall be added to the mixes only with the approval of the Perry County Engineer.
5. Sand. Sand shall be in accordance with ODOT Section 703.02. The use of limestone sand will not be permitted.
6. Coarse Aggregate. Coarse aggregate shall be #8 stone in accordance with ODOT specifications.
7. Flyash. Flyash supplied and handled by the Contractor shall produce a resulting grout, which will possess a minimum compressive strength of 500 psi at 28 days. The Contractor will provide written certification that the flyash supplied is capable of meeting the contract requirements. An EP Toxicity Test as defined in CFR 261 will also be required. If written certification is unavailable, a test batch may be required. It is the contractor responsibility to provide the Perry County Engineer with this information prior to receiving

approval for injection operations to commence. The flyash source must be approved by the Perry County Engineer. Bottom ash will not be an acceptable substitute.

8. Concrete Mix. The ratio of water, cement, sand, flyash, and coarse aggregate will be as follows:

370 lb. cement; 1,440 lb. sand; 896 lb. flyash; 647 Type A gravel; 55 gallons of water

Low slump concrete must have four (4) to six (6) inch slump while high slump concrete must have eight (8) to ten (10) inch slump as measured in ASTM Test Designation C143-78. Slump testing shall be conducted at the pump hopper and at the same water content as the material being pumped. Each concrete load shall be tested for slump prior to use. The resultant concrete must always exceed 500 psi in compressive strength as tested by ASTM Test Designation C39-81 after 28 days of curing. The Contractor will be responsible for insuring the concrete mix designed for the work can be pumped through the injection line he intends to utilize for the project.

Twenty-eight-day compressive strength test specimens shall be obtained in accordance with ASTM Test Designation C31-83 for a minimum of every one hundred cubic yards or daily fraction. The Perry County Engineer requires that strength samples be collected and tested from any given truck or trucks loaded with concrete. The contractor shall arrange with a laboratory, approved by the Perry County Engineer, to obtain samples and conduct the required testing.

The Contractor shall be responsible for providing an adequate concrete cylinder curing area, which will maintain a temperature between 60 to 80 degrees Fahrenheit, protect cylinders from direct sunlight and dehydration, and be of sufficient size to house both Contractor and State samples. All samples will remain in the curing area at least 72 hours prior to transporting. Compressive strength test results shall be submitted within 35 days of the sample date on the approved Laboratory Testing Forms bearing the laboratory name, address, sample designation, sample date, test date, and original signature of a certified lab analyst. Sample test results which fail to meet the required strength criteria as set forth in the contract may be subject to nonpayment for the volume of material represented by the sample following a review by the Perry County Engineer.

9. Grout Mix. The water-cement-flyash ratio of the grout mix will be as follows:

340 lb. cement; 1,323 lb. sand; 1,375 lb. flyash; 55 gallons of water

The resultant grout must have a minimum compressive strength of 500 psi after 28 days of curing. The Contractor will be responsible for insuring that the grout will meet the strength requirements and that the mix can be pumped through the injection pipe he intends to utilize on this project. Twenty-eight-day compressive strength test specimens shall be obtained and sampled according to ASTM Test Designation C31-83 for a minimum of each 100 cubic yards or daily fraction. The Perry County Engineer requires samples be taken from any truckload of grout. The Contractor shall arrange with a laboratory, approved by the Perry County Engineer, to obtain samples and perform testing procedures.

Compressive strength test results shall be submitted within 35 days of the sample date on the approved Laboratory Testing Forms bearing the laboratory name, address, sample designation, sample date, test date, and original signature of a certified lab analyst. Sample test results which fail to meet the required strength criteria as set forth in the contract may be subject to nonpayment for the volume of material represented by the sample following a review by Perry County Engineer.

10. Measuring Materials

- 10.1 Except, as otherwise, specifically permitted, cement shall be measured by weight. When mineral admixtures (including ground granulated blast furnace slag, fly ash, silica fume, or other pozzolans) are specified in the concrete proportions, they may be weighed cumulatively with cement, but in a weigh hopper and on a scale, which is, separate and distinct from those used for other materials. Cement shall be weighed before mineral admixtures. When the quantity of

cement exceeds 30% of the full capacity of the scale, the quantity of the cement shall be within $\pm 1\%$ of the required weight, and the cumulative quantity of cement plus mineral admixtures shall also be within $\pm 1\%$ of the required weight. For smaller batches to a minimum of 1 yd³ (1 m³), the quantity of the cement and the cumulative quantity of cement plus mineral admixture used shall be not less than the required amount nor more than 4% in excess. Under special circumstances approved by the purchaser, cement may be measured in bags of standard weight (Note 1). No fraction of a bag of cement shall be used unless weighed.

Note 1-In the United States the standard weight of a bag of Portland cement is 94 lb (42.6 kg) $\pm 3\%$.

- 10.2 Aggregate shall be measured by weight. Batch weights shall be based on dry materials and shall be the required weights of dry materials plus the total weight of moisture (both absorbed and surface) contained in the aggregate. The quantity of aggregate used in any batch of concrete as indicated by the scale shall be within $\pm 2\%$ of the required weight when weighed in individual aggregate weigh batchers. In a cumulative aggregate weigh batcher, the cumulative weight after each successive weighing shall be within $\pm 1\%$ of the required cumulative amount when the scale is used in excess of 30% of its capacity. For cumulative weights for less than 30% of scale capacity, the tolerance shall be $\pm 0.3\%$ of scale capacity or $\pm 3\%$ of the required cumulative weight, whichever is less.
- 10.3 Mixing water shall consist of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures. The added water shall be measured by weight or volume to an accuracy of 1% of the required total mixing water. Added ice shall be measured by weight. In the case of truck mixers, any wash water retained in the drum for use in the next batch of concrete shall be accurately measured; if this proves impractical or impossible the wash water shall be discharged prior to loading the next batch of concrete. Total water (including any wash water) shall be measured or weighed to an accuracy of $\pm 3\%$ of the specified total amount.
- 10.4 Powdered admixtures shall be measured by weight and paste or liquid admixtures by weight or volume. Accuracy of weighing admixtures shall be within $\pm 3\%$ of the required weight. Volumetric measurement shall be within an accuracy of $\pm 3\%$ of the total amount required or plus and minus the volume of dose required for one sack of cement, whichever is greater.

Note 2 - Admixture dispensers of the mechanical type capable of adjustment for variation of dosage, and of simple calibration, are recommended.

11. Batching Plant

- 11.1 Bins with adequate separate compartments shall be provided in the batching plant for fine and for each required size of coarse aggregate. Each bin compartment shall be designed and operated to discharge efficiently and freely, with minimum segregation, into the weighing hopper. Means of control shall be provided so that, as the quantity desired in the weighing hopper is approached, the material may be shut off with precision. Weighing hoppers shall be constructed so as to eliminate accumulations of tare materials and discharge fully.
- 11.2 Indicating devices shall be in full view and near enough to be read accurately by the operator while charging the hopper. The Operator shall have convenient access to all controls.
- 11.3 Scales shall be considered accurate when at least one static load test within each quarter of the scale capacity can be shown to be within $\pm 0.4\%$ of the total capacity of the scale.
- 11.4 Scales for batching concrete ingredients shall meet the accuracy criterion and conform to the applicable sections of the current the edition of the National Institute of Standards and Technology Handbook 44.

- 11.5 Adequate standard test weights shall be available for checking accuracy. All exposed fulcrums, clevises, and similar working parts of scales shall be kept clean. Beam scales shall be equipped with a balance indicator sensitive enough to show movement when a weight equal to 0.1% of the nominal capacity of the scale is placed in the batch hopper. Pointer travel shall be a minimum of 5% of the net-rated capacity of the largest weigh beam for underweight and 4% for overweight.
- 11.6 The device for the measurement of the added water shall be capable of delivering to the batch the quantity required within the accuracy required in 10.3. The device shall be so arranged that the measurements will not be affected by variable pressures in the water supply line. Measuring tanks shall be equipped with outside taps and valves to provide for checking their calibration unless other means are provided for readily and accurately determining the amount of water in the tank.

Note 3- The scale accuracy limitations of the National Ready Mixed Concrete Association Plant Certification meet the requirements of this specification.

12. Mixers and Agitators

- 12.1 Mixers may be stationary mixers or truck mixers. Agitators may be truck mixers or truck agitators.
- 12.1.1 Stationary mixers shall be equipped with a metal plate or plates on which are plainly marked the mixing speed of the drum or paddles, and the maximum capacity in terms of the volume of mixed concrete.
- When used for the complete mixing of concrete, stationary mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed.
- 12.1.2 Each truck mixer or agitator shall have attached thereto in a prominent place a metal plate or plates on which are plainly marked the gross volume of the drum, the capacity of the drum or container in terms of the volume of mixed concrete, and the minimum and maximum mixing speeds of rotation of the drum, blades, or paddles. When the concrete is truck mixed or shrink mixed the volume of mixed concrete shall not exceed 63% of the total volume of the drum or container. When the concrete is centrally mixed, the volume of concrete in the truck mixer or agitator shall not exceed 80% of the total volume of the drum or container. Truck mixers and agitators shall be equipped with means by which the number of revolutions of the drum, blades, or paddles may be readily verified.
- 12.2 All stationary and truck mixers shall be capable of combining the ingredients of the concrete within the specified time or the number of revolutions specified, into a thoroughly mixed and uniform mass and of discharging the concrete so that not less than five of the six requirements shown in Table A1.1 shall have been met.
- Note 4-The sequence or method of charging the mixer will have an important effect on the uniformity of the concrete.
- 12.3 The agitator shall be capable of maintaining the mixed concrete in a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity as defined by Annex A1.
- 12.4 Slump tests of individual samples taken after discharge of approximately 15% and 85% of the load may be made for a quick check of the probable degree of uniformity (Note 5). These two samples shall be obtained within an elapsed time of not more than 15 min. If these slumps differ more than that specified in Annex A1, the mixer or agitator shall not be used unless the condition is corrected, except as provided in 12.5.

Note 5-No samples should be taken before 10% or after 90% of the batch has been discharged. Due to the difficulty of determining the actual quantity of concrete discharged, the intent is to provide samples that are representative of widely separated portions, but not the beginning and end of the load.

- 12.5 Use of the equipment may be permitted when operation with a longer mixing time, a smaller load, or a more efficient charging sequence will permit the requirements of Annex A1 to be met.
- 12.6 Mixers and agitators shall be examined or weighed routinely as frequently as necessary to detect changes in condition due to accumulations of hardened concrete or mortar and examined to detect wear of blades. When such changes are extensive enough to affect the mixer performance, the proof-tests described in Annex A1 shall be performed to show whether the correction of deficiencies is required.

13. Records and Forms

During the progress of the work, the Contractor shall supply, upon the Perry County Engineer's request, two copies of all records and forms pertaining to the quantity and quality of all materials delivered to the site. The Contractor shall submit, to the Perry County Engineer, daily labor and material records for approval by the Perry County Engineer. All such records may be used as the basis for final payments.

- 13.1 The Contractor shall maintain a Daily Log Form for each working day under this contract. These records shall include the project name and number, weather conditions, site supervisor, on-site personnel, work performed, material brought to site, materials used, contract comments or concerns, any disputed or unresolved issues, and the signatures of both the contractor and State, or authorized agents.
- 13.2 The Contractor shall maintain a Materials Log of all materials delivered to and used on the site for each workday. These records will be reported daily and be available for review by the Perry County Engineer. A cumulative report, to the current date, shall be provided to the Perry County Engineer by the end of the workweek or Friday, whichever comes first.
- 13.3 The Contractor shall maintain a Cylinder Test Log that includes test number, sample date, sample time, concrete temperature(F), slump(inches), and injection borehole designation. These records shall be recorded daily and available for review by the Perry County Engineer. A cumulative report, to the current date, shall be provided to the Perry County Engineer by the end of the workweek or Friday, whichever comes first.
- 13.4 The Contractor shall maintain a Borehole Log which shall include the boring designation, date drilled, height of tunnel void, depth to the top of the tunnel void, length of casing, static water level after 24 hours, total depth prior to grouting, grouting date, grout quantities, initial depth to grout, depth to grout at 24 and 48 hours, date backfilled, and material used to backfill. These records shall be reported daily and available for the Perry County Engineer to review. A cumulative report, to the current date, shall be provided to Perry County Engineer by the end of the workweek or Friday, whichever comes first.
- 13.5 The Contractor shall maintain a Pump Stroke Count Log for the pump used to inject concrete and grout that includes the date, beginning count for interval, end count for interval, stroke count for interval, pump cylinder volume, volume of concrete or grout pumped (CY), contractor initials, and inspector initials. Additionally, the Contractor shall supply the manufacturer specifications for the pumping equipment which includes the bore and stroke length of the pump cylinders. These records shall be reported daily and available for the Perry County Engineer to review. A cumulative report, to the current date shall be provided to the Perry County Engineer by the end of the workweek or Friday, whichever comes first.

- 13.6 At the conclusion of the project, the Contractor will submit a complete copy of each log or journal with exception of the boring logs. Receipt of the daily drill logs will be adequate unless additional copies are specifically requested.

14. Quality Control

In the event of failure to meet the specified compressive strength requirements as indicated by the required laboratory testing, the following basis for compensation would be used by the Perry County Engineer. All payments shall be based upon the 28-day compressive strength tests.

- A. Cylinder test results less than 100 psi shall receive no compensation.
- B. Cylinder test results with strengths equal or greater than 100 psi and less than 250 psi shall receive 50% compensation of the unit price.
- C. Cylinder test results with strengths equal or greater than 250 psi and less than 350 psi shall receive 75% compensation of the unit price.
- D. The Perry County Engineer reserves the right to review each laboratory test result and accept an unsatisfactory sample if it can be shown that the sample may have been errant as a result of improper handling or sampling, freeze, or transportation. These cases are expected to be minimal as it is the contractors' responsibility to ensure the proper protection, curing conditions, and transportation of these samples.
- E. Payment adjustments will be made to the concrete or grout volume represented by the sample.

15. Disputes

Any disputes regarding use of specific types of mixing equipment shall be resolved as specified in ASTM C-94.

ITEM 3 - DRILL HOLE, TYPE 1

- A. This specification defines Drill Hole, Type 1 as a minimum four (4) inch diameter injection hole.
- B. Measurement: Measurement for payment will be made from the ground surface to the actual depth drilled as measured along the axis of the hole. The allowable depth will extend one foot into the tunnel void below the roof of the tunnel unless otherwise approved by the Perry County Engineer. This shall include the cost of furnishing all labor, materials, tools, and equipment required for drilling the holes. Measurement for payment also includes maintaining the holes open and clean until no longer required, and all incidental work connected therewith has been completed.
- C. Payment: Payment for all labor, equipment, and materials for this work shall be made based on the contract unit price bid per linear foot for "**Drill Hole, Type 1.**"

ITEM 4 - CASING, TYPE 1

- A. This specification defines Casing, Type 1 as four (4) inch diameter casing and be PVC Schedule 40 threaded casing.
- B. Measurement: Measurement for payment will be made from a point one (1) foot above the ground surface to the bottom of the casing as measured along the axis of the hole. This shall include the cost of

furnishing all labor, materials, tools, and equipment required for casing the holes. The casing is to be removed at the completion of the injection process unless the Contractor is directed by the Perry County Engineer to leave the casing in place for an extended period of time.

- C. Payment: Payment for all labor, equipment, and materials for this work shall be made based on the contract unit price bid per linear foot for "**Casing, Type 1.**"

ITEM 5 - CONCRETE

- A. This work consists of the handling and placement of concrete, supplied by the Contractor, and all associated costs required to inject material into the boreholes as specified. These costs shall include the purchase of concrete, transportation from batch plant to site, injection costs, and labor. Quantities shall be determined by the actual volume injected. Each truck shall provide a batch ticket for their individual load or quantities shall be based on a pump stroke counter multiplied by the cylinder size as specified by the manufacturer. Copies will be provided to the Perry County Engineer by the end of the workday.
- B. This product shall meet all requirements prescribed in ITEM 2- DRILLING AND STABILIZATION PROGRAM, Part F.
- C. Payment: Payment for all labor, equipment, and materials for this work shall be made based on the contract unit price bid per cubic yard for "**Concrete.**"

ITEM 6 - GROUT

- A. This work consists of the handling and placement of grout, supplied by the Contractor, and all associated costs required to inject material into the boreholes as specified. These costs shall include the purchase of concrete, transportation from batch plant to site, injection costs, and labor. Quantities shall be determined by the actual volume injected. Each truck shall provide a batch ticket for their individual load or quantities shall be based on a pump stroke counter multiplied by the cylinder size as specified by the manufacturer. Copies will be provided to the Perry County Engineer by the end of the workday.
- B. This product shall meet all requirements prescribed in ITEM 2 - DRILLING AND STABILIZATION PROGRAM, Part F.
- C. Payment: Payment for all labor, equipment, and materials for this work shall be made based on the contract unit price bid per cubic yard for "**Grout.**"

ITEM 7 - BOREHOLE CAMERA

- A. The work shall consist of the labor, equipment, tools, and supplies required for the operation of a borehole camera for conducting visual examinations of the subsurface conditions of the site. This item may be deducted or a partial deducted line item.
- B. The equipment shall be a torpedo style unit capable of axial viewing and 90-degree views of both short and long ranges. The system must have an integrated lighting system and allow high-resolution viewing. The system shall have the ability to record for permanent records.
- C. This item shall be made available to perform the functions described in ITEM 2 - DRILLING AND STABILIZATION PROGRAM.
- D. Payment: Payment for all labor, equipment, and materials for this work shall be made based on the contract unit price bid per day for "**Borehole Camera.**"