A d d e n d u m

Iowa Department of Transportation
Office of Contracts

Date of Letting: April 15, 2014
Date of Addendum: April 4, 2014, 2014

B.O.	Proposal ID	Proposal Work Type	County	Project Number	Addendum
014	78-0293-097	BRIDGE REPLACEMENT - STEEL GIRDER	POTTAWATTAMIE	IM-NHS-029-3(97)48--03-78 IM-NHS-029-3(98)48--03-78 IM-029-3(99)48--13-78 NHS-029-3(100)48--11-78 IM-NHS-029-3(111)48--03-78 IM-NHS-029-3(128)48--03-78	15APR014.A03

Notice: Only the bid proposal holders receive this addendum and responsibility for notifying any potential subcontractors or suppliers remains with the proposal holder.

Make the following changes to the PROPOSAL SCHEDULE OF PRICES:

Delete Proposal Line No. 1112 2595-0000012 INSURANCE WHEN WORKING IN RAILROAD RIGHT-OF-WAY, MODIFIED, FOR BNSF RAILWAY COMPANY; LUMP

Delete Proposal Line No. 1114 2595-0000013 LIABILITY INSURANCE, MODIFIED, FOR BNSF RAILWAY COMPANY; LUMP

If the above changes are not made, they will be made as shown here.

Make the following changes to the PROPOSAL SPECIAL PROVISIONS LIST & TEXT:

Delete:
SP-120176 April 15, 2014
SPECIAL PROVISIONS FOR WORK ON RAILROAD RIGHT-OF-WAY (BNSF)

Delete:
SS-12001 October 16, 2012
SUPPLEMENTAL SPECIFICATIONS FOR WORK ON RAILROAD RIGHT-OF-WAY (Burlington Northern and Santa Fe)

Replace:
SP-120048 April 15, 2014
SPECIAL PROVISION FOR EMERGENCY ACTION PLAN

With:
SP-120048a April 15, 2014
SPECIAL PROVISION FOR EMERGENCY ACTION PLAN

Replace:

SP-120049 April 15, 2014
SPECIAL PROVISIONS FOR GROUND IMPROVEMENT WITH RIGID INCLUSIONS

With:

SP-120049a April 15, 2014
SPECIAL PROVISIONS FOR GROUND IMPROVEMENT WITH RIGID INCLUSIONS

Make the following changes to IM-NHS-029-3(97)48--03-78:

Plan Sheet B.8:

Typicals ‘I-29 Detour Widening’ and ‘IA 92/US 275 Detour Widening’, Change Transverse Joint:

From: CD
To: C

Typical ‘I-29 Detour Shoulder Replacement’, Change ‘P’ for Station Range 1244+29.3 to 1252+72.2:

From: 10
To: 6

And Station Range 1252+72.2 to 1267+30.94:

From: 6
To: 10

Plan Sheet Q.27:

Replace Plan sheet Q.27 with attached Plan Sheet Q.27

Plan Sheet Q.56:

Replace Plan sheet Q.56 with attached Plan Sheet Q.56

Plan Sheet R.3:

Replace Plan sheet R.3 with attached Plan Sheet R.3

Iowa Department of Transportation

SPECIAL PROVISION
FOR
EMERGENCY ACTION PLAN

Pottawattamie County
IM-NHS-029-3(97)48--03-78
IM-NHS-029-3(98)48--03-78
IM-NHS-029-3(111)48--03-78
NHS-029-3(100)48--11-78

Effective Date
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120048a.01 DESCRIPTION.

A. **Levee Unit Name**: Ag Levee L-624, Section 3 (Mosquito Creek Levee)
Missouri River - Council Bluffs Flood Protection

Local Sponsor: City of Council Bluffs, Iowa

River Miles: M0.00 to about M1.69

Levee Stations: 1010+00 to 1060+00

Project Name: Council Bluffs Interstate System – Segment 3
Reconstruction of I-29 / I-80 East System Interchange
and Railroad Consolidation
Pottawattamie County, Iowa

B. The Iowa DOT is proceeding with the reconstruction of the I-29 / I-80 East System Interchange (Segment 3) as a part of the Council Bluffs Interstate System. The work for Segment 3 involves the construction of new roadway embankments and bridge structures. The levees affected by this construction is the Agricultural Levee L-624, which was a part of the Council Bluffs Flood Protection System that was originally designed and constructed by the Omaha District of the U.S. Army Corps of Engineers (USACE) in the early 1950s. A large portion of the interstate reconstruction will take place within the "critical area" of the levee, which is defined by the USACE as the area within 300 feet riverward and 500 feet landward of the levee.

The work covered by this Emergency Action Plan (EAP) addresses the removal of bridge foundations and embankments, water main, storm sewer pipe, and sanitary sewer pipe and construction of roadway embankments including ground improvements bridge structures, storm

sewer, and sanitary sewer within the Mosquito Creek levee critical area. The ground improvements consist of below grade concrete columns that will be used to support the new embankments.

120048a.02 CONSTRUCTION.

A. Preparation of Emergency Action Plan.
Prior to construction, prepare and follow an EAP which will address the requirements presented in this document and the procedures for high water conditions during construction. The EAP shall include emergency contact information, including cell phone and pager numbers of the project manager, project superintendant and foreman. The numbers provided shall be monitored 24 hours a day, 7 days a week. Separate EAPs shall be prepared for the Water Main, Sanitary Sewer and Storm Sewer Construction and Removals, each.

B. Submittals.
Any changes proposed by the contractor that might impact the levee, such as changes to staging, excavation depths, shoring, haul routes, or levee access, must be submitted to the Engineer for approval.

Submittals for contractor proposed changes, EAPs, excavation shoring designs, or temporary bridge designs in the levee critical area may be reviewed by both the Engineer and the City of Council Bluffs. Allow 4 weeks for review of these submittals.

~~B~~ C. Staging.

1. All construction related to the piggy-back levee must be substantially complete prior to the commencement of any excavations within the existing levee section. See staging plans for additional details and requirements.

2. The Iowa DOT, City of Council Bluffs representatives, and the Engineer shall be notified 1 week prior to construction of the piggy-back levee and at the completion of the piggy-back levee construction operations at least 1 week prior to beginning any excavations within the existing levee section.

3. Approval for the substantially complete levee work will include review of:
   a. The earthwork grading and
   b. Compaction test results for the embankments.

~~C~~ D. Limitations.
Ensure that the proposed construction will not involve any additional landward or riverward excavations in the critical area that may impact the levee at any time during construction except as shown in the approved plans and specifications.

~~D~~ E. Survey.
Survey the levee a minimum of 50 feet of each side of the levee access and levee restoration areas. The levee shall be surveyed prior to construction activities and after restoration of the disturbed areas. The results of the survey should be provided to the Engineer prior demobilization. Areas determined to be deficient by the Engineer shall be immediately repaired and confirmed by survey. Survey information should be reported in a table format with levee stations and elevations presented along the levee centerline at 25 foot intervals.

120048a.03 EMERGENCY ACTION PLAN.

A. Contents of Emergency Action Plan.

1. The contents of the EAPs will present a detailed staging plan and all provisions in the contract documents so that the integrity of the levee system and its ability to provide flood protection will be maintained throughout the entire duration of construction. The location of stockpiles that will be available for emergency backfill will be provided on a site map. The EAPs shall be submitted at least 21 days prior to construction within the critical area.

2. The proposed construction will be performed during flood and non-flood event periods, including the work on the top, riverside and landside of the existing levee. The potential does exist for the river to rise to flood level during the proposed construction and provisions will be in place to address this potential.

B. Procedures.

The following procedures shall be in place to address an emergency situation:

1. Daily Monitoring.

The water level in the Missouri River shall be monitored on a daily basis by the Contractor and the Iowa DOT. The extended forecast of future river levels shall also be monitored.

2. Monitoring Agencies.

The river level shall be monitored through USGS and National Weather Service websites for River Gage - 06610000 Missouri River at Omaha, NE.

- http://waterdata.usgs.gov/ne/nwis/uv/?site_no=06610000&amp
- http://www.riverwatch.noaa.gov/forecasts/OAXRDOAX.php

3. Ceasing Operation.

Construction operations will cease in the event the river levels are within 5 feet of the published flood stage of 29 feet (Elevation 974.4 feet). The 100-year flood elevation at this location is 981 feet. The 500-year flood elevation is 983.0 feet.

4. Construction Equipment.

Provide a list of all construction equipment that will be present throughout the duration of construction within the critical area. All equipment, construction materials and stockpiled soils will be removed in the event of high water and relocated to the landside of the levee during high water events.

5. Emergency Backfilling.

During excavation construction of the water main, sanitary sewer, storm sewer, drilled shafts or rigid inclusions, if the river level reaches an elevation within 5 feet of the published flood stage of 29 feet (Elevation 974.4 feet), emergency backfilling shall be commenced. The rate of emergency backfilling shall exceed the rate of the rising river. Soils excavated shall be used as emergency backfill. Concrete or soil can be used as emergency backfill for the ground improvements and drilled shafts.

120048a.04 EMERGENCY CONTACT INFORMATION.

A. City of Council Bluffs.

Jeff Krist, P.E.
City of Council Bluffs, Public Works Dept.
290 Pearl Street
Council Bluffs, Iowa 51503
Phone: 712-328-4635 (office)
Email: jkrist@councilbluffs-ia.gov

Pat Miller, Operations Manager
Phone: 402-510-2700 (cell)

Chuck Pendegraf, Levee Superintendent
Phone: 402-510-3675 (cell)

B. IDOT Resident Construction Engineer.
David Dorsett, P.E.
3538 S. Expressway
Council Bluffs, Iowa 51501
Phone: 712-366-0568
Email: David.Dorsett@dot.iowa.gov

C. IDOT District 4 Construction Engineer.
George Feazell, P.E.
2210 East 7th Street
Atlantic, Iowa 50022
Phone: 712-243-3355
Email: George.Feazell@dot.iowa.gov

D. Designer Contact.
Patrick H. Poepsel, P.E.
HDR, Inc.
8404 Indian Hills Drive
Omaha, Nebraska 68114
Phone: 402-399-1368
Email: Patrick.Poepsel@hdrinc.com

E. USACE – Omaha District.
Chris Horihan, P.E.
USACE – Readiness Branch
1616 Capitol Avenue, Suite 9000
Omaha, Nebraska 68102-4926
Phone: 402-995-2700
Email: Christopher.j.horihan@usace.army.mil

120048a.05 METHOD OF MEASUREMENT AND BASIS OF PAYMENT.
All costs for complying with this special provision shall be considered incidental to the project. No separate payment will be made.

Iowa Department of Transportation

SPECIAL PROVISIONS
FOR
GROUND IMPROVEMENT WITH RIGID INCLUSIONS

Pottawattamie County
IM-NHS-029-3(97)48--03-78

Effective Date
April 15, 2014

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120049a.01 DESCRIPTION.

A. Scope.
The work shall consist of detailing, furnishing, installing, monitoring and testing of ground improvements using rigid inclusion to the lines and grades designated on the project drawings and as specified herein. The installation of the rigid inclusion shall also include the removal and disposal of excavation spoils as a result of the installation process of the rigid inclusions. The excavated material is all assumed to be unsuitable and shall either be wasted or used in accordance with the Standard Specifications for unsuitable soils. The cost of installation of the rigid inclusions shall include the cost of hauling, stockpiling and disposal, of the excavated material.

B. List of Approved Rigid Inclusion Types and Vendor Information.

1. Controlled Modulus Column (CMC) by Menard (Phone: 1 800 326 6015) or their affiliate Nicholson Construction (Phone 1-800-388-2340).

2. Auger Pressure Grouted Displacement Piling (APGD) by Berkel & Company Contractors, Inc. (Phone: 1-913-422-3588).

3. Vibro Concrete Columns (VCC) by Hayward Baker (Phone: 1-800-456-6548).

4. Vibro Concrete Columns (VCC) by Subsurface Constructors, Inc. (Phone: 1-866-421-2479).

5. Rigid Inclusions (RI) by Hayward Baker (Phone: 1-800-456-6548).

6. Geo-Concrete Columns (GCC) by Tensar- GEOPIER FOUNDATIONS (Phone 1-800-371-7470).

7. Omega Rotary Torque Displacement Pile (ORTD) by Malcolm Drilling Company (Phone: 1-206-571-9945).

C. References.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to by the basic designation only.

1. American Society of Testing and Materials (ASTM).

- **a.** ASTM D1143 / D1143M - 07e1 Standard Test Methods for Deep Foundations Under Static Axial Compressive Load.
- **b.** ASTM C39/C39M-12a Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- **c.** ASTM D4595-11 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- **d.** ASTM D4751-04 Standard Method for Determining Apparent Opening Size of a Geotextile.
- **e.** ASTM D5261-10 Standard Method for Measuring Mass per Unit Area of Geotextiles

2. Geosynthetic Research Institute (GRI).

GRI GT7-92 Standard Practice for Determination of Long-Term Design Strength of Geotextiles.

D. Definitions.

1. Rigid Inclusions: Rigid inclusions may consist of CMC, APGD, VCC, RI, GCC, or ORTD. The purpose of the rigid inclusions is to provide ground improvement and support for highway embankment fill.

2. Test (Demonstration) Rigid Inclusion: Test (Demonstration) Rigid Inclusion is a rigid inclusion that is installed at non-production rigid inclusion locations. These test rigid inclusion will be installed as demonstration to verify the installation technique, to assist in selecting location of load tests, develop installation criteria, and identify installation sequence. The rigid inclusions that will be selected for static load tests shall either be installed prior to production of rigid inclusion as verification load test, or during production installation to proof load test the rigid inclusions. Rigid inclusions installed prior to production rigid inclusion are to allow for selection, performance and evaluation of static load tests as well as developing of the installation criteria by the Engineer.

3. Load Transfer Pad: A load transfer pad will be constructed at the top of the rigid inclusions. The transfer pad shall consist of compacted granular fill with layers of high strength geotextile reinforcement as shown on the plans. The purpose of the pad is to transfer the majority of the embankment loads to the rigid inclusions, thereby providing adequate support above and between the rigid inclusions.

4. Monitoring for Strain Gauges on Rigid Inclusions during load test: The monitoring shall consist of monitoring the strain gauges during load testing of the rigid inclusions prior to construction of production rigid inclusions.

After monitoring the strain gauges during load tests, the strain gauges cables or wires shall be routed through a buried schedule 80 PVC pipe and shall be connected to the real time monitoring system to be monitored during placement of embankment and delay period as defined in the Special Provisions for Instrumentation. Strain gauges shall be compatible with the real time monitoring system. The readings shall consist of real time monitoring with daily frequency and available online to the engineer.

5. Any strain gauge that malfunctions or becomes inoperable or unreadable during the load test shall be replaced including re-performing the load test by the contractor at no additional cost to the Iowa DOT.

6. Additional special provisions for instrumentation related to the grading works are included in the contract documents.

E. Subsurface Conditions.

1. Borings completed within the limits of the project encountered varying thicknesses of soft to medium stiff alluvial silt and clay. The explorations typically encountered medium dense to very dense alluvial sand and gravel with silt and clay below elevations shown in the plans.

2. Groundwater at the time of boring drilling was recorded between approximately 4 and 10 feet below the natural ground at the time of drilling, which was performed in November and December of 2010. It is anticipated that the groundwater level will rise during prolonged periods of precipitation or flooding, and perched groundwater may be present. For the purpose of installation, assume that the ground water is at the ground surface and make all necessary preparation to complete the installation under this condition at no additional cost to Iowa DOT.

3. Installation of the rigid inclusions to the minimum tip elevation will typically require penetration in the ±12 inch thick compacted granular fill layer that will be constructed at the ground surface to serve as a working pad and load transfer pad. Wide spread obstructions due to nested deposits of construction debris or wood are not anticipated.

F. Submittals.

1. Provide vibration study including estimated peak particle velocity, frequency, and its impact on fresh and curing concrete as it relates to the distance between the columns that can be installed successively without damaging the newly completed rigid inclusion during concrete or grout curing. This is required to establish realistic sequence of construction, ensure the integrity of the completed rigid inclusion(s), and that work can be completed successfully within schedule. The vibration study must be developed by well qualified vibration specialist, who has developed at least three similar studies within the past 7 years. Without such study, any of the techniques listed in Article 120049a.01, B that are using impact or vibratory energy to advance the tool used to install the rigid inclusions cannot be accepted. If the technique is not using vibratory or impact energy, then a certification will need to be provided by the supplier that states that no such techniques are used in the installation and therefore the vibration study is not required.

2. For rigid inclusion installation techniques that utilize vibration, a minimum distance equal to three times the spacing or 8 hour time duration is required prior to installing adjacent rigid inclusions. If the vibration study referenced in Article 120049a.01, F, 1, indicates larger spacing or greater time is needed, then such requirements shall be followed. Mobilize adequate number of rigs and utilize adequate work shifts to meet the schedule and special provision requirements.

3. The rigid inclusion equipment must be equipped with installation monitoring capabilities include the following as a minimum: a) applied torque or applied vibration amplitude, b) applied static down pressure and c) advance rate foot per minute.

4. Shop drawings that include spacing, diameter, installation procedure and sequence of construction with sufficient details including transitions areas, planned cut off and tip elevations, material, proposed equipment, and mix design. The design shall conform to the criteria in Subsection G of this Article.

5. Install 80 test (demonstration) rigid inclusions at non-production locations throughout the site to select the locations of the rigid inclusions that will be load tested and to be used in the development of the production installation criteria. These test (demonstration) rigid inclusions

shall be included before the load tests and before installation of production rigid inclusions. The demonstration rigid inclusion shall be paid at the same unit rate as the production rigid inclusion and no separate mobilization or additional cost shall be borne by Iowa DOT.

6. Submit a load testing program to verify the design in accordance with the requirements of this special provision. The submittal shall include the following:

- **a.** The load test program shall be performed prior and during production of rigid inclusions.
- **b.** The rigid inclusion production shall only start upon completion of four load tests and after the Engineer issues the final tip elevation, installation criteria, and spacing of the rigid inclusions.
- **c.** A total of eight single load tests shall be performed on rigid inclusions in accordance with ASTM D 1143 four of which shall be performed as verification load tests prior to the start of the production rigid inclusion to maximum load test of 300% of the design load. The remaining four load tests shall be proof load tests that will be conducted during the production rigid inclusion installation at locations and times and locations selected by the engineer to maximum load test of 150% of design load. The location of the test rigid inclusions will be selected by the Engineer with input from the Contractor and depending on the work and traffic control sequence. The Contractor shall accommodate in his schedule the performance of the eight load tests, evaluation time, and issuance of installation criteria by the Engineer.
- **d.** The design load shall meet or exceed the values shown for the approved techniques in Article 120049a.01, G, 1, a.
- **e.** Submit design calculations for the load test reaction piles including diameter, type, reinforcement, depth as well as the reaction frame and beams. All details and supporting calculations shall be submitted for review by the Engineer. Design the reaction piles and frame for minimum two times the maximum test load. All shop drawings and supporting shop drawings calculations shall be signed and sealed by a Professional Engineer registered in the State of Iowa.
- **f.** At least 7 days prior to performing the load testing, submit calibration records for load cells, hydraulic jacks, pumps and pressure gauges.
- **g.** Submit a complete load test report within 3 days of completion of each test. The Engineer shall evaluate the results of the load tests and within 14 days from the receipt of the last load test report, shall issue the final tip elevations and planned spacing for the production rigid inclusions.
- **h.** The test rigid inclusions shall be instrumented with five levels of strain gauges; the strain gauges shall be Geokon GK-401 model or approved equivalent. The strain gauges shall be compatible with the real time monitoring system. The test rigid inclusions shall include a rebar to facilitate installation of the strain gauges. Preliminary strain gauges level elevations are provided in the Table 120049a-1. Strain Gauges final elevation shall be adjusted by the Engineer on site based on the confirmation borings and length of the rigid inclusion.

Table 120049a-1: Strain Gauges Preliminary Elevations

Approximate Depth (feet)	Approximate Elevation (feet)*	Sub-surface Layer
6.0	972.0	Medium Stiff to Stiff Fat Clay
14.0	964.0	Very Soft to Soft Fat Clay
24.0	954.0	Very Soft to Soft Fat Clay
30.0	940.0	Loose to Medium Dense Sand/Silty Sand
40.0	938.0	Medium Dense Sand/Silty Sand

* Approximate elevations for strain gauges are based on an approximate ground surface elevation of 978feet.

- **i.** The Engineer shall develop production rigid inclusion installation criteria within 14 calendar days of the receipt of the last load test report of the first three preproduction load tests.

7. Shop Drawings: Furnish shop drawings and any supporting calculations at least 15 days prior to start of the installation of the production rigid inclusions. Each rigid inclusion shall receive a reference number, which will be indicated on the shop drawings. The shop drawing submittal shall also show cutoff elevations, typical sections and detail drawings as required.

8. Submit as-built plans for the installed rigid inclusions with the transfer pad based on actual locations and tip elevations. The surveyed locations shall be sealed and signed by a licensed surveyor and tip elevations shall be certified by the Contractor's Professional Engineer registered in the State of Iowa.

9. Submit rigid inclusion installation records as specified in Article 120049a.03, G, 2, b. Installation records shall include all recordable information including applied torque or applied vibration amplitude, applied static down pressure and advance rate foot per minute.

10. Work Plan: Submit to the Engineer for review, details of the equipment, sequence, and method of installation. The submittal should include a detailed narrative of the Quality Control Plan and how the work plan will comply with all requirements of the Project Safety Plan.

11. Materials: Provide documentation for all imported materials including pertinent laboratory test results prior to delivery on site.
- **a.** Granular Material for use in the load transfer pad: Provide the material source and results of recent gradation testing. Deliver a representative 5 gallon bucket sample of the product to the Engineer a minimum 10 days prior to delivery on site. This is not required if the Contractor intends to use granular material from the Optional Iowa DOT Borrow 32 as specified in Article 120049a.02, A, 1.
- **b.** Geotextile for use in the load transfer pad: Provide the manufacturer's specifications and material source. Deliver samples of the product to the Engineer a minimum of 10 days prior to delivery on site.

12. Qualifications: Documentation of the Contractor's qualifications shall show that he/she has been engaged in successful design and installation of deep ground improvements for at least five years, and designed and constructed a minimum of five similar projects in similar scope utilizing the deep ground improvement method proposed for the subject project. A list of previous projects including name, description, relative size and contact person with phone number shall be provided. Resumes of the Contractor's site superintendent and/or foreman shall also be provided. Qualifications of the firm that will be performing the pile integrity tests shall also be provided.

G. Design and Performance Criteria.

1. Installation Criteria: The Contractor shall be responsible for the shop drawings of the deep ground improvement system, with the following constraints:
- **a.** The rigid inclusions may consist of CMC, APGD, VCC, RI, GCC, or ORTD. No other substitute shall be accepted. The design shall conform to the requirements summarized in the contract documents.
- **b.** The load transfer pad shall be as shown on the plan documents and as specified herein.

2. Design Criteria: The Contractor shall be responsible for the design of the single load tests reaction frames and reaction piles.

120049a.02 MATERIALS.

A. Load Transfer Pad.

1. The granular material used to construct the load transfer pad shall generally conform to the requirements of Section 4133 of the Standard Specifications with less than 5% fines.

2. The granular material for the load transfer pad shall be compacted with moisture control in accordance with the Standard Specifications.

3. High Strength Geotextile Reinforcement: Shall conform to the following requirements:

Table 120049a-2: High Strength Geotextile for use in Load Transfer Pad

Property	Value	Test Method
Mass/Unit Area	22 oz/sq.yd	ASTM D5261
Tensile Strength (both directions)	1142 lb/in	ASTM D4595
Tensile Strength at 5%	514 lb/in	ASTM D4595
Elongation at Break	10%	ASTM D4595
Apparent Opening Size	No. 40 US Sieve	ASTM D4751
Long-Term Design Strength (Sand)	490 lb/in	GRI-GT7

B. Grout.
For CMC, RI, APGD, or ORTD, meet the following grout requirements.

1. Portland Cement.
Shall conform to requirements of Article 4101.01, A of the Standard Specifications
- **a.** Type I or Type II.
- **b.** Cement shall be from an approved source per Materials I.M. 401. If the brand or type of cement is changed during the course of the project, additional grout mix tests shall be conducted to ensure consistency of quality and performance.

2. Fly Ash shall meet requirements of Section 4108 of the Standard Specifications.

3. Sand shall meet the requirements of Section 4110 of the Standard Specifications.

4. Water Reducer shall meet the requirements Materials I.M. 403

5. Fluidifier.
- **a.** Water Reducing Agent.
  - Specrete-IP Incorporated; Intrusion-Aid SCX.
  - Specrete-IP Incorporated; Intrusion-Aid FG.
  - Grace Concrete Products; WRDA 35.
  - Grace Concrete Products; ZYLA 640.
- **b.** Retardant.
  - Specrete-IP Incorporated; Flo-Aid XR.
  - Grace Concrete Products; Recover.

6. Water.
Shall conform to requirements of Section 4102 of the Standard Specifications

7. Grout Mix.
- **a.** Proportion by weight to produce a grout capable of being satisfactorily pumped and of penetrating and filling all voids.
- **b.** Minimum Compressive Strength:
  - 4,000 psi at 28 days.
  - 2,000 psi at 7 days as required prior to pile integrity testing.
- **c.** Minimum Flow Cone Rate: 10 to 25 seconds with modified 3/4 inch opening flow cone, ASTM C939.
- **d.** Slump: 6 to 8 inches.

e. The grout mix shall be designed utilizing fluidifiers as needed to maintain the range of acceptable fluid consistency (flow cone rate) for a period of at least 2 hours.

8. A ready mix truck shall be supplied from an approved ready mix plant with certified plant inspection according to Articles 2001.20 and 2001.21 of the Standard Specifications and Materials I.M. 528. An Iowa DOT ticket per Materials I.M. 528 shall be prepared and provided to the Engineer.

C. Concrete for VCC or GCC Construction.

1. All materials, proportioning, air entraining, mixing, slump, and transporting of PCC shall be according to Section 2403 of the Standard Specifications, except as modified herein.

2. Water/cement ratio: not to exceed 0.45.

3. Use Class D PCC mixture with a slump of 6 inches ±1.5 inches.

4. Portland cement: meet the requirements of ASTM C 150 Type I / II and Section 4101 of the Standard Specifications.

5. Fly Ash shall meet requirements of Section 4108 of the Standard Specifications.

6. Sand shall meet the requirements of Section 4110 of the Standard Specifications.

7. Water Reducer shall meet the requirements of Materials I.M. 403.

8. Air entrainment: apply Section 2403 of the Standard Specifications.

9. Retarder is required according to Materials I.M. 403 to maintain workable concrete.

10. Do not use GGBFS.

11. Minimum Compressive Strength:
- 4,000 psi at 28 days.
- 2,000 psi at 7 days as required prior to pile integrity testing.

12. A ready mix truck shall be supplied from an approved ready mix plant with certified plant inspection according to Articles 2001.20 and 2001.21 of the Standard Specifications and Materials I.M. 528. An Iowa DOT ticket per Materials I.M. 528 shall be prepared and provided to the Engineer.

120049a.03 CONSTRUCTION.

A. Safety Requirements.
Complete all work in accordance with the Project Safety Plan. The Contractor shall be responsible for ensuring that all conditions of these requirements are met to the satisfaction of the Engineer.

B. Equipment.

1. Utilize machines or combinations of machines and equipment that are in good working condition, are safe to operate and will produce the results specified herein.

2. Utilize equipment that is capable of advancing the rigid inclusion through the subsurface materials efficiently and timely to meet the project schedule.

3. The equipment shall be of sufficient size and capacity, and be capable of installing rigid inclusions to the minimum depths shown in the plans or the depth required by the design, whichever is deeper.

4. The equipment shall be capable of installing rigid inclusions in the presence of very dense granular soils and/or obstructions, where encountered.

C. Site Preparation.

Inspect the site prior to the start of operations to verify the deep ground improvements can be constructed using the proposed equipment.

D. Rigid Inclusion Construction.

1. Provide adequate number of drilling rigs to meet the project schedule considering all facets of the project including but not limited to preproduction load testing, waiting periods, integrity testing, reporting, and preparing as-built plans.

2. Evaluate the site and subsurface conditions and assess any need for working platforms that facilitate his installation. Such platforms or preparatory work, or stone needed is considered part of the means and methods and no additional payment or time will be granted toward such work.

3. Performance of Load Tests: Perform four test elements prior to the start of rigid inclusion production. The load test results will be signed and sealed by the Contractor's Professional Engineer and submitted to the Engineer. No payment shall be made for load tests which were unsatisfactorily performed as determined by the Contractor and/or the Engineer.

4. Layout and Tolerances.

a. Surveying: Prior to installation of the rigid inclusions, each rigid inclusion location shall be surveyed by an licensed surveyor. Provide all survey layouts, maintain utility clearances and provide any required coordination with the Engineer and any other local, state, and federal agencies having jurisdiction, prior to the start of construction. The location of each rigid inclusion shall be marked using a numbered utility flag.

b. Plan position: The center of the completed rigid inclusion shall be within 3 inches of the plan location.

c. Verticality: The axis of the completed rigid inclusion shall not deviate more than 2% from vertical. The verticality of the mast of the rig shall be checked by the operator before start of the installation for each rigid inclusion. The operator shall indicate on the daily drilling log for each rigid inclusion that verticality was within tolerance by checking the appropriate box on the installation log.

d. Diameter: The completed rigid inclusion diameter shall not deviate more than 10% from the plan diameter.

5. Rejection: Rigid inclusions improperly located or installed beyond the maximum allowable tolerances or reported to be defective as a result of pile integrity testing, shall be abandoned and replaced with new rigid inclusions unless the Contractor and the Contractor's designer propose a remedial measure which is acceptable to the Engineer, either of which will be done at no additional cost to the Iowa DOT.

6. Schedule: Mobilize and maintain sufficient equipment, materials, and personnel to complete the work in accordance with project milestones and shall coordinate operations with all other aspects of the project.

7. Installation Sequence: Install the rigid inclusions in accordance with the sequence detailed in the approved work plan. If adjacent rigid inclusions are observed to be influenced by the installation of a neighboring rigid inclusion, the installation sequence shall be modified to

prevent disturbance of rigid inclusions. Any required modifications to the sequence, or mitigation of rigid inclusions deemed unusable due to disturbance, shall be completed at no additional cost to the Iowa DOT or extension in the project schedule.

8. Depth: Install the rigid inclusions through the first layer of the load transfer pad to the minimum tip elevation, or deeper as required to found the rigid inclusions in a suitable bearing stratum, as determined by the Engineer.

9. Obstructions: Subsurface obstructions may include but are not limited to boulders, timbers, concrete, bricks, utility lines, foundations, slabs, etc. that prevent rigid inclusions to be installed to the required depth. In the event that obstructions are encountered during installation of a rigid inclusion that cannot be penetrated with reasonable effort, one or more of the following procedures will be used:

- Position the element a short distance not more 1.5 feet away from the original position.
- Pre-drill the obstruction.
- Install additional elements to bridge over the obstruction.

Any change made to the design or rigid inclusion layout because of obstructions shall be approved by the Engineer. Provide to the Engineer an as-built submittal no later than 7 calendar days after the modification has been performed on site. This submittal shall be signed and sealed by the Registered Professional Engineer responsible to the Contractor and having stamped the design submittals. All elements that are abandoned due to obstructions or equipment malfunction shall be completely backfilled with grout. Excavation or removal of defective element will not be permitted within the levee critical zone as defined on the plans. The cost for obstruction shall be compensated for per the unit cost per linear foot of rigid inclusion, no additional compensation or time shall be awarded to the contractor for delay, waiting, or moving between the obstruction location and the relocated position of the rigid inclusion.

10. Cut-off Elevation: Cutoff the rigid inclusions to the top elevation of the first layer of the load transfer pad, or slightly higher to allow any required trimming or removal of low strength material at the butt of the rigid inclusion. The cut-off elevation of each rigid inclusion shall be established with an accuracy of +/- 0.1 feet.

11. Protection of Rigid Inclusions: Perform excavation for the load transfer pad, rigid inclusion installation, and embankment construction in such a way to prevent the damage to the rigid inclusions or disturbance of the soil matrix between the rigid inclusions.

12. Load Testing: Following a cure time (if applicable) to achieve the design strength, perform axial load tests on selected rigid inclusions. At the test location, excavate to the bottom of the load transfer pad elevation. Perform the excavation, load test setup, load testing, and backfill the excavation, in a single shift.

E. Excavation.

1. Cure time: Embankment construction shall not begin in any area until the rigid inclusion design strength has been reached. If any rigid inclusion is broken or otherwise damaged during embankment construction, propose a remediation solution within 2 days and resume construction only if all parties are in agreement with the remediation solution and the remediation has taken place.

2. Load Test Evaluation: Excavation for the load transfer pad shall not begin until the results of the load testing program on rigid inclusions has been submitted and approved by the Engineer.

3. Excavation: The final excavation for the load transfer pad shall be made using an excavator equipped with a smooth-edged bucket to minimize disturbance to the in-situ soils. The prepared subgrade shall consist of in-situ soils compacted to moisture content within +/- 2%

of optimum moisture content. If compaction is not practical due to natural moisture water contents far above optimum and/or wet weather conditions, the in-situ soils shall be over excavated to a depth of 12 inches and replaced with compacted granular fill as defined in Article 120049a.02, A, 1. Any organic-rich or otherwise unsuitable soils shall be removed and replaced with compacted granular fill.

4. Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory conditions in the field. Drag, blade, or slope the embankment to provide proper surface drainage. In wet weather conditions, dewater as required to prevent the accumulation of ponded water in excavations for embankment construction, and the earthwork should be done in sections to minimize the need for such dewatering.

5. Disposal of Excavation Spoils: Stockpile all spoil material, including any topsoil and spoils generated by rigid inclusion installation, at the locations designated on the soil erosion plan. Handling and disposal of spoils shall be performed at no additional cost to the Iowa DOT.

F. Load Transfer Pad Construction.

1. Prior to construction of the load transfer pad, the existing ground shall be excavated and stripped of topsoil and other unsuitable material as specified in Article 120049a.03, E, 3.

2. Place and compact with moisture control the first layer of the granular fill for the load transfer pad until the layer is 1 foot in thickness. Install the rigid inclusions after the installation of the first 1 foot of the pad. Place the first layer of the geotextile on top of the granular fill layer and elements with appropriate overlap and then place the next lift of granular fill. Place the second layer of geotextile after the installation of an additional 3 feet of the pad. Continue this sequence until the required numbers of layers as shown in the plans are placed. The top of the completed load transfer pad shall be a minimum of 2 feet above the last layer of geotextile placed.

3. Any rutting or pumping of the load transfer pad that occurs during installation of the rigid inclusions should be measured and the Engineer notified. If practical, reroute construction traffic to avoid further damage to the underlying in-situ soils, or remove and replace the pumping material with compacted granular fill.

4. Following installation and curing of the rigid inclusions, proof-roll the first 1 foot of the load transfer pad using a fully loaded dump truck. Where deflections more than 1/4 inch are observed under the wheel loads of the dump truck, remove the fill, over excavate 12 inches per Article 120049a.03, E, 3, and reconstruct the load transfer pad. The excavation shall be performed so as to avoid impacting the rigid inclusions.

5. Place geotextile layers at appropriate intervals to the dimensions shown on the plans, specified in Article 120049a.03, F, 2; and overlapping in accordance with the manufacturer's specifications and the Contractor's Design Submittal.

G. Contractor Quality Control.

1. Field Quality Control.
The following describes the minimum inspection and testing required in the Contractor's Quality Control (CQC) Plan and Program for the work of this section and is for CQC only. The implementation of the Contractor Quality Control Program does not relieve the Contractor from the responsibility to provide the work in accordance with the contract documents, applicable codes, regulations, and governing authorities.

2. Quality Control: Supervision, Inspection, and Records.

a. The Contractor shall have an onsite field engineer to manage all of the QC activities on the project including pile integrity testing, grout sampling (if applicable) and other testing at frequencies defined in the Design Submittal and approved by the Engineer. Monitoring, recording of the data and evaluation of load tests, and inspection and recording of data for production rigid inclusion construction, subgrade preparation and the construction of the load transfer pad shall be done under the direct supervision of a Professional geotechnical Engineer registered in the State of Iowa on the staff of the Contractor or a sub-consultant to the Contractor. The geotechnical engineer shall have supervised a minimum of five similar deep ground improvement projects.

b. Records:

1) An accurate record shall be kept for all rigid inclusions as installed. The record shall indicate the rigid inclusion location, length, cut-off elevation, date and time of construction, applied torque or applied vibration amplitude, applied static down pressure, advance rate foot per minute and any other pertinent installation details as indicated in the Design Submittal and approved by the Engineer. Immediately report any unusual conditions encountered during installation. Any corrective measures shall also be recorded. Daily records shall be signed by the Contractor' superintendent and by the inspector. A complete tabulation of all records pertaining to approved rigid inclusion installation shall be certified by the Contractor's engineer and shall be delivered to the Engineer no later than 14 days after the completion of the rigid inclusion work. All testing and inspection documents shall be reviewed and approved by the Contractor's engineer certifying the rigid inclusions and load transfer were installed based on the construction and installation criteria.

Provide on a daily basis pertinent installation data as defined in the Design Submittal and approved by the Engineer. These documents shall be prepared continuously as the production progresses and shall be submitted to the Engineer no later than 1 working day after the installation of a rigid column. Ensure the Engineer has complete access at all times to data for the rigid inclusion installation, as required.

2) Granular Fill: Perform a gradation sieve analysis at the beginning of the job and for every change in source and/or type of material. Perform proof-rolling of the top of the load transfer pad prior to and following completion of the rigid inclusion installation. The proof-rolling shall cover the entire work area, and the wheel pass spacing shall be equal to the axle length of the dump truck. All required testing will be completed to the satisfaction of the Engineer at no additional cost to the Iowa DOT.

3) Concrete and Grout: Conduct strength testing of the concrete in accordance with ASTM C 39 and Articles 2001.20 & 2001.21 of the Standard Specifications and Materials I.M. 528. **F**urnish a sufficient quantity of molded and cured cylinders measuring 3 inches in diameter by 6 inches high for required strength tests on concrete. For testing grout, furnish a sufficient quantity of cubes with 2 inch sides. Provide molds, and a curing environment conforming to the requirements of ASTM C 39. At a minimum, prepare a set of four test cylinders or cubes for each 50 cubic yards of concrete or grout placed or a minimum of two sets of four cylinders or cubes each per day (whichever is greater). One cylinder or cube from each set shall be tested for strength at 1, 2, 7, and 28 days. Provide certified strength test results to the Engineer for acceptance. **S**ubmit the grout mix design intended for use on the project to the Engineer for review. Only the mix design approved by the Engineer shall be used. Any subsequent mix design changes will have to get additional approval from The Engineer prior to use on the project.

4) Pile Integrity Testing: Pile Integrity Testing (PIT) shall be performed on all test elements and approximately up to 300 of the rigid inclusions. The PIT shall be performed in accordance with ASTM D5882 - 07 Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations. The production elements selected for the PIT shall be at the discretion of the Engineer based on daily records indicate likelihood of anomalies in the inclusions. The PIT shall be performed by a

firm qualified to do such testing. Documentation of the firm's qualifications shall show that he/she has successfully performed PIT testing for at least 5 years, and for a minimum of five similar projects. A list of previous projects including name, description, relative size and contact person with phone number shall be provided. A report of the test results shall be provided to the Engineer within 48 hours of test completion.

5) Strain Gauges Readings: Take initial readings 24 hours after completing installation and testing of each strain gauge. For the Strain Gauges, readings shall consist of a minimum of two readings surveys per 24 hours using real time remote and automated monitoring operations for each strain gauge.

After monitoring the strain gauges during load tests, the strain gauges will continue to be monitored as defined in the Special Provision for Instrumentation.

120049a.04 METHOD OF MEASUREMENT.

A. Installation of Rigid Inclusion will be measured from cut off elevation to tip elevation to the nearest vertical foot for payment in place at the locations shown on the plans, including test (demonstration) rigid inclusions. The measurement shall include performance of PIT testing at 300 production rigid test inclusions. PIT shall be performed for each location, including performance of the test, developing a report either for single location or multiple locations but no more than ten PIT testing shall be included in one report unless approved by the Engineer.

B. Load Test on Single Inclusions will be paid on a per test basis. Test rigid inclusions will include four verification load tests prior to production installation and four proof load tests after production installation. PIT testing will be performed for all load test rigid inclusions.

C. Construction of the load transfer pad will be measured for payment in place to the nearest cubic yard at the locations shown on the plans.

D. High Strength Geotextile shall be measured for payment in place to the nearest square yard at the locations shown on the plans.

E. For the purpose of subcontracting, Rigid Inclusions, Load Test on Single Inclusions, and High Strength Geotextile will be considered specialty items.

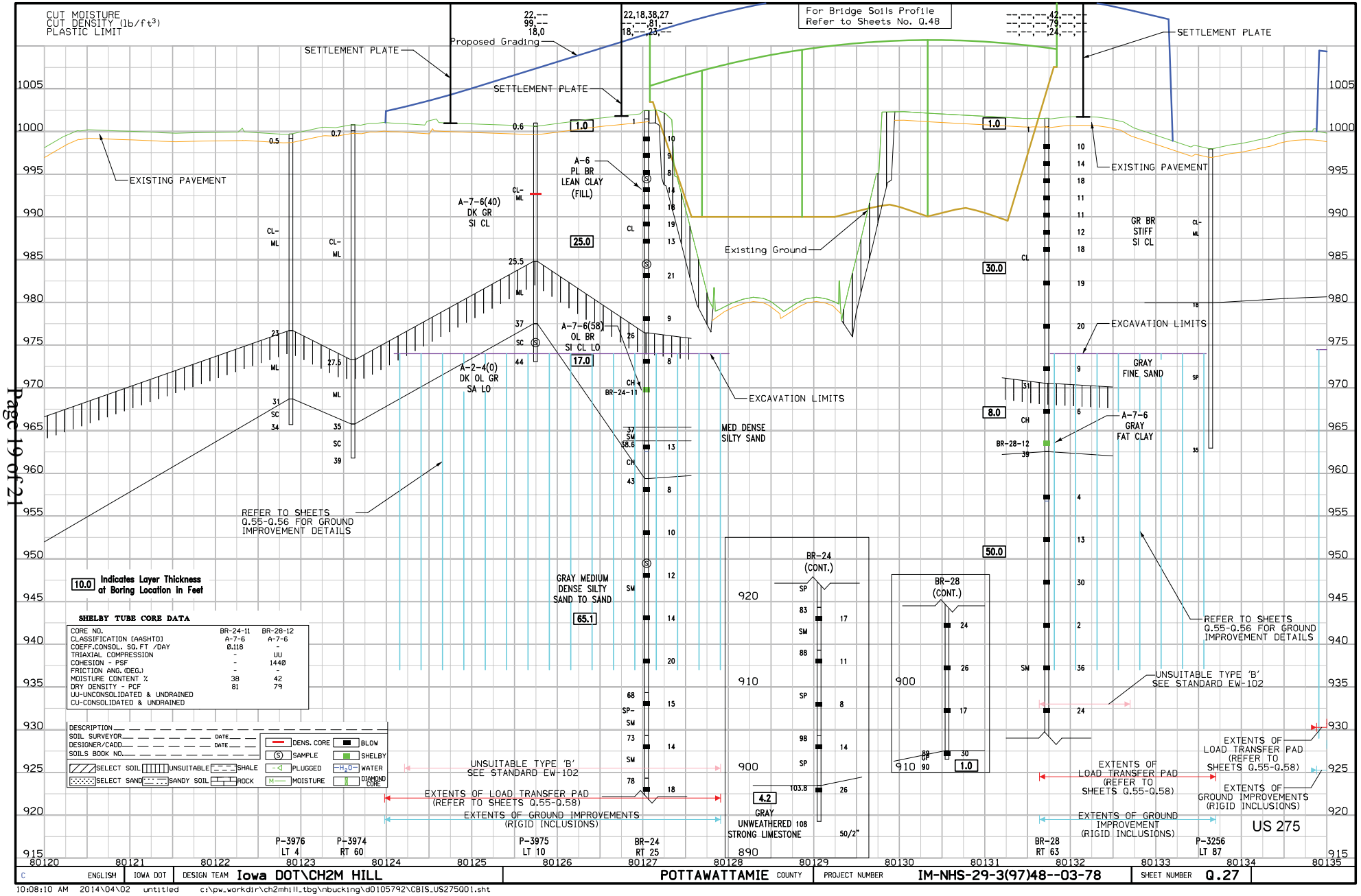
120049a.05 BASIS OF PAYMENT.

A. Payment for Rigid Inclusion will be made at the Unit Price Bid per linear vertical foot and will constitute full compensation for providing all labor, material, and equipment, including design, site preparation, test pile installation, production installation, handling and disposal of cuttings, and any associated inspection, PIT, or laboratory testing services.

B. Payment for Load Test on Single Inclusions will be made on a per test basis and will constitute full compensation for providing all labor, material and equipment and any associated installation, inspection, testing, and monitoring, including PIT and strain gauges.

C. Payment for construction of the load transfer pad, including granular fill, subgrade preparation and any associated inspection or laboratory testing, will be measured for payment in place to the nearest cubic yard at the locations shown on the plans and will be included in the payment for the Class 10 Excavation and Compaction with Moisture Control.

D. Payment for the High Strength Geotextile will be made at the Unit Price Bid per square yard and will constitute full compensation for providing all material, labor, equipment and any associated installation, inspection and testing, including any quantity needed for overlap.



C ENGLISH	IOWA DOT	DESIGN TEAM Iowa DOT\CH2M HILL	POTTAWATTAMIE COUNTY	PROJECT NUMBER IM-NHS-29-3(97)48--03-78	SHEET NUMBER Q.27

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GROUND IMPROVEMENT USING RIGID INCLUSIONS

1. Ground improvement comprising of rigid inclusions shall be installed as shown on the plans and in Table 1. The work shall be performed in accordance with the Special Provision for "Ground Improvement using Rigid Inclusions."
2. Before starting the ground improvement work, the grading contractor shall strip the existing ground of topsoil, organic matter, roots, etc. The topsoil shall be stockpiled for use in slope dressing for the embankment fill.
3. The ground improvement installation shall commence only after the load testing and other requirements of the Special Provisions are met and after obtaining approval from the Iowa DOT Engineer.
4. The rigid inclusions shall be installed in accordance with the spacing and depth criteria shown in the typical drawings and details shown on Table 1. These rigid inclusions will typically require penetration in the 12-inch thick compacted granular fill layer that will be constructed at the ground surface to serve as a working pad and load transfer pad.
5. It is to be noted that this depth is based on the subsurface information currently available. The minimum depth of the rigid inclusion will be decided by the Engineer based on the results of the load test program. A copy of the geotechnical report can be made available if requested by the Contractor.
6. After the ground improvement elements are installed, construction of the load transfer pad shall commence as shown on this sheet and Sheets Q.55 and Q.58 and described in the Special Provisions. Suitable granular material for the load transfer pad is available from the Optional Borrow #32. If the granular material is provided by the contractor from another site, it shall meet the requirements of Standard Specifications 4133 for Granular Backfill Material. The top of the granular fill, compacted with moisture control shall extend a minimum height of 2 feet over the last geotextile layer.
7. Approximately 228,950 cu.yds. (183,150 cu.yds. + 25% shrinkage) of granular material is required for the load transfer pad for areas shown in Table 2 (entire project).
8. The number of geotextile layers shown in the Table 2 are from base of the fill. The number of layers shall transition to a minimum of one geotextile layer placed at 1 ft from the base of the fill in the areas from the start of the grading to maximum height.
9. Approximately 196,250 sq.yds. (178,400 sq. yds. + 10%) of high strength reinforcement geotextile needed for the load transfer pad (entire project). This quantity includes 10% for overlap. Specifications of the high strength reinforcement geotextiles are presented in the Special Provision for "Ground Improvement using Rigid Inclusions".
10. Wherever the new embankment construction abuts the existing embankment, the grading Contractor shall strip the topsoil from the foreslope of the existing embankment and stockpile it for slope dressing for the new fill.
11. For Rigid Inclusion that will be installed on top of existing slope, benching and/or filling to provide level surface to facilitate the installation will be required and assumed to be part of the work at no additional cost to Iowa DOT.

SETTLEMENT PLATES

1. Settlement plates shall be installed by the grading contractor at the locations shown in the plans as per detail shown in Standard Roadway plan EW-212 and in accordance with Section 2106 of the Standard Specifications.
2. Care shall be taken to protect the settlement plates from damage during placement of the embankment fill from equipment traffic or construction activities.
3. Settlement plate readings shall be taken at the start and end of placing of each embankment lift and at weekly intervals after the fill is placed to its final height for a period of 10 weeks, and at the end of fill placement and once every two weeks for 42 weeks thereafter. Additional readings over additional duration may be needed based on the settlement plates readings. The total estimated delay period between the end of grading and start of paving operations is 150 days.

Table 1: Ground Improvement Using Rigid Inclusions

Alignment	Station Range		Rigid Inclusion Option	Minimum Diameter (in)	Design Load (kips)	Maximum Spacing in Zone A		Maximum Spacing in Zone B		Estimated Embedment into Bearing Stratum (ft)	Estimated Tip Elevation (ft)	Estimated Number of Elements	Estimated Total Quantity (LF)
	From	To				"x" (ft)	"y" (ft)	"x" (ft)	"y" (ft)				
I-29	6638+95	6643+87	See Special Provisions	18	150	6	6	N/a	N/a	20	940	1,579	65,000
I-29	6651+14	6660+00	See Special Provisions	18	140	6	6	N/a	N/a	11	933	4,010	194,000
I-29	6660+00	6668+00	See Special Provisions	18	120	8	8	12	12	10	926	2,153	120,000
Ramp A	81533+03	81535+50	See Special Provisions	18	140	8	8	N/a	N/a	15	945	649	23,000
Ramp A	81535+50	81541+00	See Special Provisions	18	120	6	6	N/a	N/a	15	945	2,077	74,000
Ramp C	87524+50	87528+16	See Special Provisions	18	110	8	8	N/a	N/a	8	945	751	25,000
US-275	80123+98	80127+96	See Special Provisions	18	135	8	8	N/a	N/a	15	937	925	39,000
US-275	80131+61	80132+70	See Special Provisions	18	135	8	8	N/a	N/a	15	937	242	10,500
US-275	80134+87	80139+12	See Special Provisions	18	120	8	8	N/a	N/a	11	929	1,014	53,500
US-275	80147+84	80156+00	See Special Provisions	18	110	8	8	N/a	N/a	13	943	1,776	67,000

Note:
CMC = Controlled Modulus Columns
VCC = Vibro Concrete Columns
APGD = Auger Pressure Grouted Displacement Pile
"x" = spacing in direction of travel
"y" = spacing transverse to direction of travel
See typical section and drawings

VIBRATING WIRE PIEZOMETERS:

1. Vibrating Wire Piezometers shall be installed by a qualified instrumentation specialist as subcontractor to the prime contractor at the locations shown in the plans.
2. The Contractor shall notify the Engineer at least 10 workdays in advance of the start of the installation and shall be responsible for maintenance of the data logging equipment during and after construction. The Engineer shall be on site during installation of the Vibrating Wire Piezometers.
3. A two level Vibrating Wire Piezometers (GEOKON MODEL 4500S or equivalent) shall be installed in one borehole immediately following the foundation soil preparation at the location shown in the plans. The two piezometer transducers shall be located 15 and 25 feet below ground surface. The wiring shall be protected during construction.
3. The Contractor shall take initial readings 24 hours after completing installation and testing of each piezometer. Readings shall consist of minimum of two reading surveys per 24 hours using real time remote and automated monitoring operations.
4. For the duration of the project, piezometers shall continue to be monitored after completion of the fill placement and beyond through a duration of 25 weeks. The readings shall consist of real time monitoring with daily monitoring frequency and available online to the Engineer.

INCLINOMETERS

1. Inclinometer casings and inclinometers shall be installed by a qualified Contractor at the locations shown in the plans and after the embankment fill is completed.
2. The Contractor shall drill, sample, and log borings of soil drilled for the purpose of installing inclinometer casing. Borings for inclinometers shall be drilled using 6" minimum inside diameter casing and water or, where ground conditions permit, using drilling mud in a 6" diameter borehole.
3. The inclinometers shall have a minimum length of 60' below existing ground surface plus the height of the fill at the locations of the inclinometer plus 3'.
4. The casing shall protrude 3' above finished grade. The Contractor shall flag and protect inclinometer locations. Provide the top of each inclinometer casing with a cap, and with a locked protective metal housing extending below grade. All cables shall be protected and routed through a PVC pipe to ensure that these are not damaged during construction activities.
5. The Contractor shall notify the Engineer at least 10 workdays in advance of the start of installation and shall be responsible for maintenance of the data logging equipment during and after construction. The Engineer shall be on site during installation of the inclinometers.
6. The Contractor shall take initial inclinometer readings 24 hours after completing installation and testing of each inclinometer casing. Readings shall consist of a minimum of two reading surveys per 24 hours using real time remote and automated monitoring operations, at 2' intervals throughout the depth of the inclinometer casing.
7. For the duration of construction, multi-point settlement extensometers shall continue to be monitored by the contractor. After completion of construction and through a duration of 52 weeks the readings shall be completed by the engineer. The readings shall consist of real time monitoring with daily monitoring frequency and available online to the Engineer.

MULTI-POINT SETTLEMENT EXTENSOMETERS

1. Multi-point settlement extensometers shall be installed by a qualified Contractor at the locations shown in the plans.
2. The Contractor shall drill, sample, and log borings of soil drilled for the purpose of installing extensometer casing. Borings for extensometers shall be drilled using 6" minimum inside diameter casing and water or, where ground conditions permit, using drilling mud in a 6" diameter borehole.
3. The Contractor shall flag and protect all cables. The cables shall be routed through a PVC pipe to ensure that these are not damaged during construction activities.
4. The multi-point extensometers shall have a minimum length of 50' below existing ground surface. Preliminary elevations of settlement points are provided in the Special Provisions. Final settlement point elevations shall be adjusted by the Engineer on site based on the confirmation borings.
5. The Contractor shall notify the Engineer at least 10 workdays in advance of the start of installation and shall be responsible for maintenance of the data logging equipment during and after construction. The Engineer shall be on site during installation of the multi-point settlement extensometers.
6. The Contractor shall take initial readings 24 hours after completing installation and testing of each multi-point settlement extensometer.
7. For the duration of the project, multi-point settlement extensometers shall continue to be monitored after completion of the fill placement and beyond through a duration of 52 weeks. The readings shall consist of real time monitoring with daily monitoring frequency and available online to the Engineer.

Table 2:

I-29 Geotextile Layers	
Station	Number of layers
6638+95 to 6642+75	4
6651+14 to 66557+00	4
6657+00 to 6660+00	3
6660+00 to 6668+00	2

US-275 Geotextile Layers	
Station	Number of layers
Entire Improvement Area	4

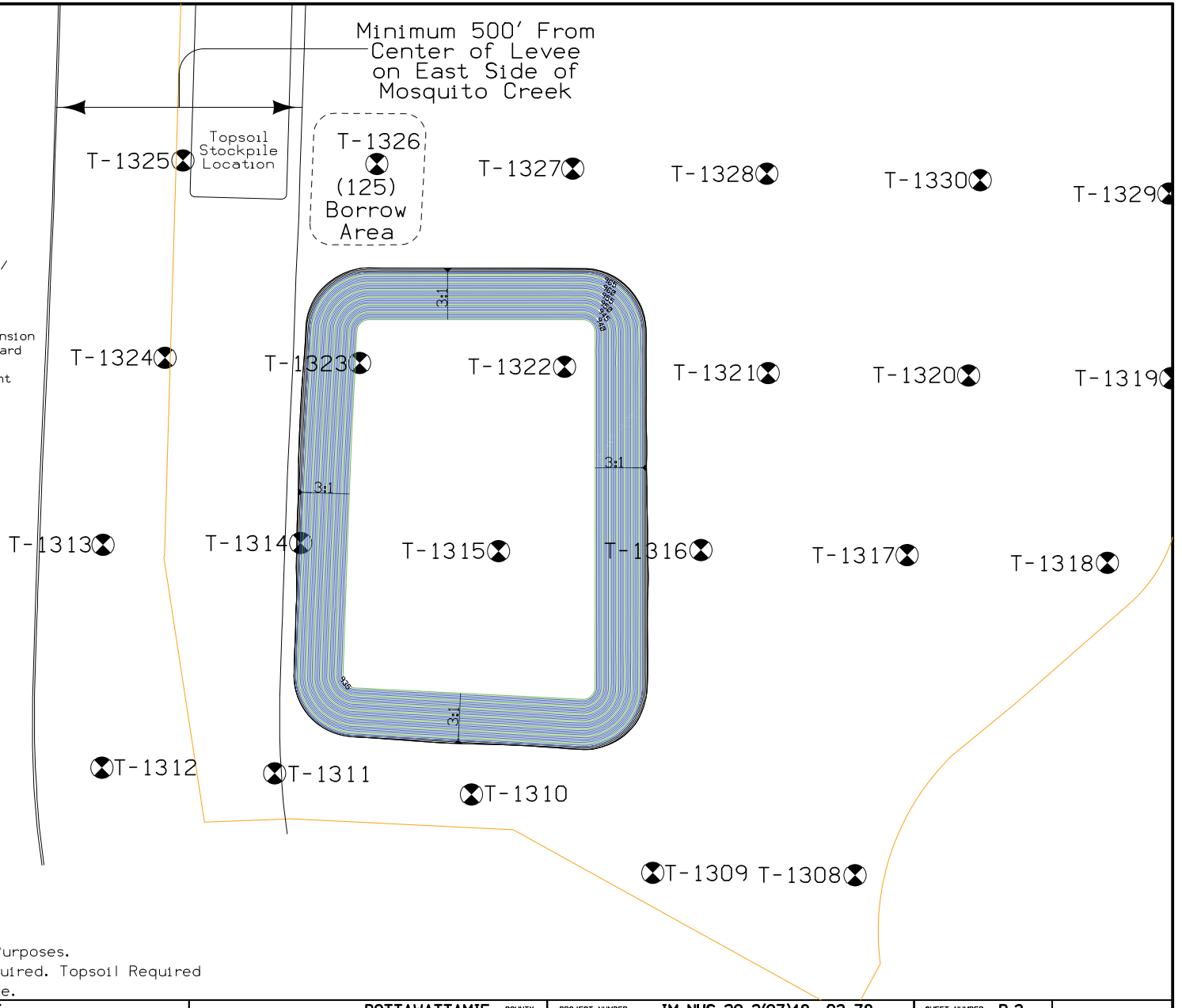
Ramp A Geotextile Layers	
Station	Number of layers
Entire Improvement Area	4

Ramp C Geotextile Layers	
Station	Number of layers
87524+50 to 87526+00	2
87526+00 to 87527+60	3

DETAILS FOR RIGID INCLUSIONS

(97) BORROW

* Total Area of Borrow is 74,047 yds2.
* Estimated water elevation is 957.4. However, variations may be expected based on time of year and other factors.
* Topsoil stockpile area provided in northwest portion of south half of overall borrow site. See Sheet R.1.
* This borrow is designed for 60% cushion above the known project need of 363,305 yds3. The intention of the borrow is to supplement Class 10 and select material from the mainline/ sideroad excavations.
* Unless approved otherwise by Engineer, borrow excavation shall commence on the south end of the borrow and extend full-depth and full-dimension in an east-west direction, and progress northward as far as necessary, leaving the site in a condition acceptable to Engineer for subsequent borrow excavation by others.



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(97) Borrow		
MATERIAL	AVAILABLE CU. YDS.	REQUIRED CU. YDS.
TOPSOIL B	53,800	0**
CLASS 10	391,438	363,305
SELECT SAND*	208,337	0
TOTAL	653,575	363,305

* Select Sand May Be Used For Class 10 Purposes.
** Topsoil replacement on borrow not required. Topsoil Required represents topsoil need for project use.

ENGLISH	IOWA DOT	DESIGN TEAM STANLEY\MOYLE	POTTAWATTAMIE COUNTY	PROJECT NUMBER IM-NHS-29-3(97)48--03-78	SHEET NUMBER R.3