A d d e n d u m

Iowa Department of Transportation
Office of Contracts

Date of Letting: June 20, 2017
Date of Addendum: June 16, 2017

B.O.	Proposal ID	Proposal Work Type	County	Project Number	Addendum
001	07-0636-075	BRIDGE NEW - PPCB	Black Hawk	NHSX-063-6(75)--3H-07 NHSX-063-6(87)--3H-07 NHSX-063-6(90)--3H-07 NHSX-063-6(92)--3H-07 NHSN-063-6(94)--2R-07 NHSX-063-6(96)--3H-07 NHSN-063-6(97)--2R-07	20JUN001A09

Replace SP-150271 with the attached SP-150271a

SP-150271a
(Replaces SP-150271)

SPECIAL PROVISION
FOR
LIGHTWEIGHT FOAMED CONCRETE FILL

Black Hawk County
NHSX-063-6(75)--3H-07

Effective Date
June 20, 2017

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150271a.01 DESCRIPTION.

A. This work shall consist of providing and placing lightweight foamed concrete fill, hereafter referred to as LFCF, as backfill for mechanically stabilized earth (MSE) walls and Cast-in-Place (CIP) walls at locations designated on the plans, and, as specified in this special provision.

B. This Special Provision does not cover the MSE wall with Granular Backfill. MSE wall with Granular Fill shall comply with the plans and Section 2432 of the Standard Specifications.

C. The LFCF supplier shall be accepted in writing by the MSE wall vendor. The LFCF supplier and installer shall coordinate its work with the MSE wall vendor and the MSE wall/ CIP wall constructors.

D. For MSE walls with LFCF, Section 2432 of the Standard Specifications shall be used with the exception of what is specified herein.

150271a.02 MATERIALS.

A. Materials.

1. The materials used for the LFCF Backfill shall meet the following requirements:
- **a.** Portland cement and Portland pozzolan cement type 1 meeting the requirements of Section 4101 of the Standard Specifications.
- **b.** Air Entraining, water reducing, set retarding admixtures meeting the requirement of Section 4103 of the Standard Specifications.
- **c.** Engineering fabrics meeting the requirements of Materials I.M. 496.01
- **d.** Pozzolans and admixtures (for accelerating, water reducing, retaining, improving the bond, etc.) may only be used if specifically designated and approved by the LFCF

supplier.

e. During placement of the initial batches, the density shall be checked and the mix adjusted as required to obtain the specified cast density at the point of placement. Take four test specimens for each 300 cubic yards of LFCF placed or every 4 hours of placing.

f. Testing shall be performed by the LFCF supplier in accordance with ASTM C796 (except do not oven dry load test specimens). The specimens shall be 3 inch diameter by 6 inch high cylinders covered after casting to prevent damage and loss of moisture. Moist cure the specimens for at least 7 days prior to a 28 day compressive strength test. Specimens may be tested at any age to monitor the compressive strength. The supplier shall report test results to its certified applicator for distribution.

g. The LFCF shall complies with the requirements in table below.

Table 150271a-1: LFCF Material Requirements

PROPERTY	REQUIREMENTS	TEST METHOD
Class B: Maximum/ Minimum Dry Density Minimum Unconfined Compressive Strength @ 28 days curing	 48.0 / 40.0 pounds per cubic foot 120 pounds per square inch	 Unit Weight (ASTM C 796) (No oven drying) ASTM C 796 (No oven drying)
Internal Friction Angle	45 degrees (min.)	AASHTO T236 (ASTM D3080-72)
Frost Heave Sample @ 250 hour exposure, 4.5 inch high x 4	< 0.5 in	British Road Research Laboratory, Lab Report LR 90, 1967, by Croney, Jacobs.
Freeze-Thaw Resistance - minimum cycles @ relative E = N/N ≥ 70% per ASTM C666 modified per Bidwell Report dated April, 1975	Relative Young's Modulus, E ≥ 80% at 300 cycles.	ASTM C 666 Procedure B (Rapid freezing in air and Thawing in water) As modified below
Coefficient of permeability @ 2.0 pounds per square inch	1 x 10-5 centimeter per second	

2. Geomembrane.

A puncture-free and flexible, roughened sheet of HDPE, LLDPE or PVC. The geomembrane shall have both sides textured with a rough finish.

Table 150271a-2: Geomembrane Fabric Requirements

Property	Value	Test Method
Minimum Thickness	30 mil	ASTM D 5994
Minimum Tear	10 pounds	ASTM D1004
Minimum Puncture Resistance	32 pounds	ASTM D4833

150271a.03 CONSTRUCTION.

A. Submittals

In addition to the submittal items required per Section 2432 of the Standard Specifications, given below are submittals required per the special provision

1. Submit a LFCF quality control (QC) and placement plan. Placement of the retaining wall backfill shall be in accordance with the information provided in the QC plan. Submit the plan to the Engineer for review and comment no later than 2 weeks prior to LFCF placement. LFCF production shall not begin before the plan has been reviewed and accepted by the Engineer. The submitted plan shall provide, as a minimum, the following elements:

a. An organizational chart including names, telephone numbers, current certifications /

titles, roles, and responsibilities of those involved with the quality control program.

b. The process of communication by which the quality control information will be disseminated to the appropriate persons, including materials suppliers. This shall include a list of recipients, the communication means that will be used, action time frames, and report formats.

c. Materials list of items proposed to be provided under this section.

d. Manufacturer's specifications, catalog cuts, and other engineering data needed to demonstrate compliance with the specified requirements.

e. Mix designs for the LFCF, prepared by the supplier, showing compliance with the specified properties.

f. LFCF's design strength at 1, 7 and 28 days.

g. Certification of batch, mixing and placing equipment by the LFCF supplier meeting the requirements specified herein.

h. Written evidence of acceptance of the certified producer/supplier by the foam agent manufacturer.

i. Written evidence that LFCF installer is certified by and approved by the foam agent manufacturer.

j. LFCF curing procedures.

2. At least 6 weeks prior to placement, a trial batch will be prepared and trial batch testing results submitted showing that the proposed LFCF material properties comply with the requirements of this specification and design requirements of the MSE wall. The trail batch testing results shall include 1, 7, and 28 day unconfined compressive strength. This shall include certified test results of the LFCF reinforcing pullout resistance and pullout friction factor, f*, meeting the minimum requirements of the MSE wall design and written certification that the reinforcing material is not susceptible to corrosion when in contact with the proposed LFCF material. The accepted trial batch mix design and tested properties will become the standard of the material furnished under this contract.

3. At least 2 weeks prior to placing, the contractor shall submit ten 3 inch diameter by 6 inch high cylinder samples of the designed and tested LFCF to the Engineer. Specimens shall be covered after casting to prevent loss of moisture and shall not be oven dried. At the department's option, the samples may be tested for strength and density in accordance with the requirements of ASTM C495 and ASTM C796, respectively, to verify the submitted test results and validate the contractor's testing procedures and quality of the furnished product.

4. Geomembrane Fabric.

a. At least 3 weeks prior to the start of construction the Contractor shall furnish the Engineer a Certificate of Compliance certifying that the geomembrane complies with the applicable contract specifications listed below. Provide the manufacturer's specifications and material source.

b. The geomembrane manufacturer's certification shall include quality assurance test results.

c. Deliver samples of the product to the Engineer a minimum of 10 days prior to delivery on site.

d. Locations and placement details including adhesion method.

B. Construction Supervision.

LFCF suppliers shall provide a qualified and experienced representative on site at the beginning of the wall construction for up to 3 days at no additional cost to the Contracting Authority.

C. Personnel Requirements.

1. The LFCF installer shall be certified by the foam agent manufacturer and regularly engaged in the production and placement of the LFCF. This shall include the completion of lightweight

foamed concrete fills having a minimum of 1000 total cubic yards in the past 4 years. Furthermore, the material shall have been successfully applied on at least three LFCF projects, which have performed satisfactorily for at least 3 years.

2. The LFCF installer shall be certified and approved in writing by the foam agent manufacturer of the LFCF material. The Installer's foreman shall have a minimum of 2 years of experience in this type of work and shall have worked on at least one of the three successful LFCF projects presented.

3. The Installer shall use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed to assure proper performance of the work noted in this Section.

~~4. The manufacturer's representative shall be experienced in the placement of LFCF and shall be on site full time during placement.~~

D. General LFCF Placement Requirement.

1. LFCF shall be a homogeneous mixture and all materials shall be approved prior to use.

2. The areas to be filled shall not have any standing water prior to placement of the LFCF. The contractor shall ensure the LFCF remains above the water table at all times during construction.

3. Subgrade for LFCF fill will be prepared in accordance with Section 2109 of the Standard Specifications.

4. Material shall be protected before, during, and after installation and the LFCF installer shall protect the work and materials of other trades. In the event of damage, immediately make replacements and repairs to the acceptance of the Engineer at no additional cost to the Contracting Authority.

5. Drainage pipes, or any other items that will be encased in the LFCF shall be set and stable prior to installation of the LFCF.

6. LFCF shall not be placed at a temperature below 32°F, nor when freezing conditions are expected in less than 24 hours unless precautions are taken to maintain temperatures above freezing. Do not place LFCF on frozen ground.

7. Cure LFCF in accordance with the accepted placement plan.

8. LFCF shall only be proportioned, mixed, and placed using equipment approved by the supplier as indicated in the accepted LFCF placement plan. Once mixed, the LFCF concrete shall be conveyed promptly to the location of placement without excessive handling.

9. LFCF shall be placed in lifts not exceeding 24 inches in depth. The first lift shall be at least 2 inches below the top of the lowest MSE wall precast panel.

10. Prior to placing LFCF, vertical and horizontal joints between MSE wall panels shall be covered with geotextile fabric on the back face of the panels.

11. Scarify each lift before placing the next lift. Each lift shall be scarified to a minimum depth of 1/2 inch using a hand rake or other suitable means. Scarifying shall be done in a manner to not disturb the alignment of the reinforcing strips/mesh. Scarifying shall be done after sufficient curing time such that foot traffic will not excessively damage the lift surface (no greater than 1/4 inch indentation).

12. Allow ~~a minimum of~~ 24 hours between subsequent lifts. This 24 hour requirement may be shortened by the Engineer if the Contractor can demonstrate that the LFCF has adequate walkability as defined by ACI 523.1R, Guide for Cast-in-Place Low-Density Cellular Concrete. A minimum of 12 hours shall be allowed between subsequent lifts under all circumstances.

13. Move the discharge hose(s) sufficiently to ensure leveled filling through the specified fill area. Uneven filling is not permitted.

14. Limit the area of placement to the volume that can be placed within 1 hour, up to the maximum lift height of 2 feet. Stagger placements such that the vertical joints are at least 10 feet apart.

15. The discharge hose length shall not exceed 500 feet in length.

16. The final surface finish of LFCF shall be within + 0.1 foot of the elevations shown on the plans, and shall be sloped to promote drainage as indicated on the plans.

17. Paving machines, heavy construction equipment or other unusual loading of the LFCF shall not be permitted until it has attained the specified 28-day compressive strength.

18. Saw cutting of the LFCF for utilities, drains, or other conflicts will be by methods approved by the Engineer.

19. Any material that does not comply with the minimum specified criteria shall be removed and replaced at no additional cost.

20. The LFCF will be applied at locations designated on the plans and in accordance with the supplier's recommendation.

21. Granular backfill that is immediately adjacent to LFCF shall not be placed within 24 hours after LFCF placement, or before that LFCF is cured, whichever takes longer.

E. MSE Wall Reinforcement Placement within the LFCF.

1. The reinforcement shall be installed in accordance with the manufacturer's recommendations, unless otherwise modified by this special provision. The reinforcement shall be placed within the layers of the LFCF as shown on the plans.

2. The reinforcement shall be placed in continuous longitudinal strips in the direction of the main reinforcement.

3. The contractor shall provide adequate means such as rebar stakes and horizontal rebars to keep the straps horizontal within the LFCF.

4. Place only the reinforcement required for immediately pending work to prevent undue damage. Suitable arrangement shall be made to hold the reinforcement in place before placing the LFCF. Care should be taken that the reinforcement is not damaged or displaced during the placement of the LFCF.

5. Precast panels and MSE steel reinforcing strips shall be fully or partially encased in the LFCF and properly set and stable prior to the installation of the subsequent LFCF lift.

6. After the specified LFCF layer has been placed, the next reinforcement layer shall be installed.

The process shall be repeated for each subsequent layer of reinforcement and LFCF.

7. During construction, the surface of the fill should be kept relatively horizontal.

8. Reinforcements are to be placed within 3 inches of the elevation per the approved submittals unless otherwise directed by the Engineer. Correct orientation of the reinforcement shall be verified by the Contractor.

F. Geomembrane Placement.

1. The limits of the geomembrane are shown in the plans.

2. The installation of the geomembrane shall be in accordance with manufacturer's recommendations and as approved by the Engineer.

3. Before the geomembrane installation, the area below shall be smooth and free of sharp objects or debris of any kind.

4. Atmospheric exposure of the geomembrane to the elements following lay down shall be a maximum of 14 days or per manufacturer's recommendations, whichever is shorter.

5. The Contractor shall install a geomembrane liner free of defects, holes, and tears.

6. Geomembrane shall not be installed during periods of precipitation or in conditions of excessive moisture such as fog or dew in accordance with the geomembrane manufacturer's recommendations and as approved by the Engineer.

7. All seams of the geomembrane liner system shall be welded or bonded, as per the manufacturer's specification. A water tight seal shall be formed to prevent any leakage. Seams shall have a minimum finished overlap of 4 inch unless a greater overlap is specified by the geomembrane manufacturer.

8. When backfilling, care shall be taken to prevent damage to the geomembrane. Any tears, punctures or holes incurred during the installation process shall be assessed by the Engineer and the membrane shall either be repaired in accordance with recommendations of the membrane manufacturer or replaced at the Engineer's discretion at no additional cost to the Contracting Authority.

9. Perforations through the liner shall be limited. Where penetrations are necessary, the Contractor shall provide details demonstrating the method(s) of sealing the penetration for approval by the Engineer.

10. The perforated drain pipes shall be placed on top of the geomembrane as shown in the plans.

150271a.04 METHOD OF MEASUREMENT.

A. Lightweight Foamed Concrete Fill.
Measurement for Lightweight Foamed Concrete Fill, in cubic yards, will be the quantity shown in the plans.

B. Geomembrane.
Measurement for Geomembrane, in square yards, will be the quantity shown in the plans.

150271a.05 BASIS OF PAYMENT.

A. Lightweight Foamed Concrete Fill.

1. Payment for Lightweight Foamed Concrete Fill will be at the contract unit price per cubic yard.
2. Payment is full compensation for:
   - Furnishing and placing LFCF for the reinforced earth zone, the zone behind the reinforced earth zone, and the zone behind the CIP wall as shown in the plans.
   - Material testing.
   - Coordination of and scheduling of LFCF placement with MSE retaining wall erection on site manufacturer representative.

3. Payment for MSE retaining wall, including the design, foundation preparation, leveling pad, panels, coping, earth reinforcement placement and subdrains shall be per Section 2432 of the Standard Specifications.

B. Geomembrane.

1. Payment for Geomembrane will be at the contract unit price per square yard.

2. Payment is full compensation for furnishing and placing geomembrane for the areas shown in the plans.