

COUNTY, KENTUCKY
WIDENING AND REHABILITATION
CULVERT EXTENSION / LOAD REDUCTION
PROJECT: 5-65.30 & 5-65.31
STATION 2239+36.99

SPECIAL NOTE FOR
LIGHTWEIGHT CELLULAR CONCRETE FILL

REFERENCES:

All references to the Standard Specifications are to the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, Current Edition.

All references to AASHTO are to the current edition.

All references to ASTM are to the ASTM International Cement Standards and Concrete Standards, current edition.

The requirements in the Standard Specifications or AASHTO/ASTM shall be used for information not provided. Where there are conflicts between the Standard Specifications or AASHTO/ASTM, the Standard Specifications shall govern.

PART ONE - GENERAL

1.1 DESCRIPTION

1.1.1 Provide and install Lightweight Cellular Concrete fill material as specified herein at the locations shown on the Drawings.

1.2 MANUFACTURER AND APPLICATOR QUALIFICATIONS

1.2.1 The Manufacturer must be on the Department's List of Approved Materials (LAM) and the lightweight cellular concrete must meet all properties of Section 2 of this note.

1.2.2 The cellular concrete Applicator shall be approved by the Engineer and certified by the Manufacturer of the Lightweight Cellular Concrete prior to ordering materials or beginning work on excavating for placement of cellular concrete. Use skilled workmen who are trained, experienced and familiar with the requirements and the methods for proper performance of this work.

1.2.3 Any specialized batching, mixing, and placing equipment shall be automated with bulk handling equipment approved by the manufacturer. Transit mixes are not acceptable for these applications.

1.2.4 The certified Applicator shall have been regularly engaged in the placement of Lightweight Cellular Concrete for at least five years. The cellular concrete shall have been successfully applied on ten projects, which have performed satisfactorily for at least ten years.

1.3 SUBMITTALS

1.3.1 Details of the Lightweight Cellular Concrete Fill shown in the contract plans on the lightweight fill detail sheet are based on the stated maximum allowable unit weight. If the Contractor proposes to use the unit weight specified in the plans, then a material data sheet must be supplied for verification of the proposed material. (No additional calculations will be required unless requested by the Engineer.) If the Contractor elects to use a unit weight different than what is shown in the contract plans, design calculations and construction plans (5 copies) clearly showing conformance with the Standard Specifications, AASHTO, ASTM and contract plans shall be submitted to the Department for review 30 calendar days prior to ordering material or beginning excavation for placement of Lightweight Cellular Concrete Fill. Lightweight fill designs and construction plans shall be dated, sealed, and signed by a registered professional engineer licensed to practice in Kentucky. The Contractor shall

allow 30 calendar days for the Department to review the first complete submission. Additional time required by the Department to review resubmissions shall not be cause for increasing the number of contract working days. The additional work required by the Contractor to provide resubmissions shall be at no cost to the Department.

Details need to be enclosed in the submittal about the construction methods proposed. These could include, but are not limited to: Procedure for applying waterproofing membrane, A description of any temperature restrictions on placement of the material, etc.

Embankment benching, excavation stabilization, final installation and protection details necessary to construct the lightweight fill and produce a stable final embankment integrated with the remainder of the roadway embankment shall be the responsibility of the Contractor. Design of sheeting, shoring or other earth retention systems necessary to stabilize excavations shall be part of the construction submittal. The Engineer may request that construction plans be supplied prior to any construction.

The format for the construction plans shall be in accordance with the current edition of the Division of Structural Design's Guidance Manual. The first sheet shall be a title sheet. All final tracings, with drawing number, shall be submitted on 3 mil, or thicker, 22" X 36" mylar film.

1.3.2 The bid shall be based on work being performed by an approved Applicator, and the material being provided by an approved Manufacturer from the LAM (See section 2.1.1).

1.3.3 Other documentation including concrete mix designs, material certifications, etc. shall be submitted in accordance with this Special Note.

1.3.4 Refer to the proposal for additional details regarding submittals.

PART TWO - PRODUCTS

2.1 MATERIALS

2.1.1 The Lightweight Cellular Concrete should be provided by a Manufacturer on the Department's List of Approved Materials (LAM), and should meet all requirements of Section 2 of this special note. Materials from Suppliers not on the LAM may be used provided that the materials are submitted for approval at least 30 calendar days prior to beginning work, and the materials are accepted after testing.

2.1.2 Expansion Material / Foaming Agent: The expansion material shall be in accordance with the Lightweight Cellular Concrete Manufacturer recommendations and ASTM C 869, and shall be approved in advance by the Engineer to produce the cellular concrete meeting the properties of Section 2.2.

2.1.3 Cement: Portland cement shall comply with Section 801 and 844 of the Standard Specifications. Pozzolans and other cementitious materials may be used. The Lightweight Cellular Concrete Manufacturer shall design the mix.

2.1.4 Water: Use potable water.

2.1.5 Admixtures: Admixtures may be used when specifically approved by the Manufacturer of the Lightweight Cellular Concrete.

2.1.6 Water-proofing layer: An asphalt primer or other water-proofing membrane is required and shall be in accordance with the Lightweight Fill Manufacturer's recommendations. The coverage rate shall be as recommended by the Manufacturer for protection of the installation from water infiltration.

2.1.7 Drainage Blanket: The drainage blanket shall meet of the requirements for "Coarse Aggregate for Rock Drainage Blanket" in Section 805 of the Standard Specifications, unless otherwise stated in the lightweight fill detail sheet. The cost of the drainage blanket will be incidental to the cost of Lightweight Cellular Concrete.

2.1.8 Geotextile Fabric: Type IV Geotextile Fabric shall be in accordance with Sections 214 and 843 of the Standard Specifications. Contrary to Section 214 of the Standard Specifications, the cost of geotextile fabric will be incidental to the cost of Lightweight Cellular Concrete.

2.2 PROPERTIES

2.2.1 The Lightweight Cellular Concrete shall meet the following:

	Class A	Class B	Class C
Cast Unit Weight	26-30 pcf	30-36 pcf	36-42 pcf
Minimum Compressive * Strength@ 28 days	40 psi	80 psi	120 psi
Long-Term Water Absorption (% Cast Unit Weight) (ASTM C 796)	20%	16%	14%
Coefficient of Permeability Permeability (cm/sec) (@ 2.0 psi) (ASTM D 2434)	10^{-4}	10^{-4}	10^{-4}

* If fly ash is used for cement replacement in percentages of 40% or greater, the compressive strength shall be tested @ 56 days.

2.3 GEOTECHNICAL DESIGN PARAMETERS

2.3.1 Unit Weight:

	Class A	Class B	Class C
Maximum unit weight for design above the water table*	30 pcf	36 pcf	42 pcf
Maximum unit weight for design below the water table	36 psf	42 psf	48 psf

*Maximum unit weight value for use in design above water table is assumed to be cast unit weight.

2.3.2 Uplift Forces

Where the lightweight cellular concrete will be designed for use below the water table, uplift forces shall be calculated. The unit weight of lightweight cellular concrete used for these calculations shall be the minimum value from Section 2.2.1 of this note for the applicable Class of material. The thickness of rip-rap, soil, or other material required as a cap to offset the uplift forces shall be determined.

PART THREE - EXECUTION

3.1 SITE CONDITIONS: Examine the areas for work of this Section so that conditions detrimental to timely and proper completion of the work are corrected.

3.2 PREPARATION: The installation of the cellular concrete shall be in accordance with procedures provided by Lightweight Cellular Concrete Manufacturer. The area to be filled shall be prepared in accordance with the contract documents and plans, and shall not have any standing water in it prior to fill placement. Items encased in the fill shall be set and stable prior to installing the cellular concrete.

3.3 INSTALLATION: Use automated job site batching, mixing, and placing equipment certified by the Lightweight Cellular Concrete Manufacturer. The Contractor is responsible for maintaining a stable slope during construction.

3.3.1 A drainage blanket shall be constructed in accordance with requirements of the lightweight fill detail sheet. The drainage blanket beneath the lightweight cellular concrete shall be wrapped with Type IV Geotextile Fabric, unless the plans state otherwise.

3.3.2 Mix the materials and convey promptly to the point of placement. Cast the lightweight fill in lifts in such a manner to prevent segregation. The maximum lift thickness of the cellular concrete shall be 4 feet.

3.3.3 The final surface finish shall be within 6 inches of plan elevation. The final surface of the lightweight fill shall be primed with an acceptable asphalt primer.

3.4 SAMPLING (to be completed by the Applicator in accordance with this Special Note):

Take four (4) 3" x 6" cylinder test specimens for each 300 cubic yards of lightweight fill placed or for each four (4) hours of placing. Take samples in accordance with ASTM C 495. The samples molds shall be provided by the Lightweight Fill Applicator, and the cost of the sample molds is incidental to the placement of lightweight fill.

3.5 CURING:

Mark the cylinder and place it in a location where it will not be disturbed or subjected to temperature extremes. Avoid excessive or early handling of test cylinders. After 2-3 days, the cylinders may be delivered to the material testing laboratory. Care should be taken during delivery to prevent damage of the specimens. Maintain the curing environment as specified in ASTM C 495, Section 6 except as modified by ASTM C 796, Section 8.9 in which allowable temperatures are as follows:

Day 1: $70 \pm 10^{\circ}\text{F}$, Days 2-7: $73.4 \pm 3^{\circ}\text{F}$ (specimens will be in a moist condition and temperatures of the specimen surface will be lower than the surrounding atmosphere due to evaporation), Days 8-28: $70 \pm 10^{\circ}\text{F}$ and relative humidity of $50 \pm 3\%$.

3.6 TESTING:

3.6.1 The Applicator shall perform the field unit weight measurement in accordance with ASTM C 796, Section 8). Field unit weight shall be measured using a machined-steel container with a volume of 0.5 cubic feet and a flat smooth rim. The scale used for the weight measurement shall be accurate to within 0.1% of the measured weight. Fill the tared weighing container with a representative sample of the lightweight concrete (tap the sides of the container with a rubber hammer during filling). Overfill the container, then strike off excess concrete by holding the strike-off plate in a horizontal position and moving it across the top of the container with a sawing motion. Wipe the outside surface of the container free of spilled concrete with a cloth. Record the weight of the container and concrete. Calculate the unit weight of the lightweight concrete. Adjust the mix as required to obtain the specified cast unit weight at the point of placement.

3.6.2 Compressive Strength: The Department, Division of Materials shall test compressive strength in accordance with ASTM C 495. Specimens shall have been moist cured for a period up to 7 days prior to a 28-day compressive strength test or a 56-day compressive strength test if greater than 40% of the cement has been replaced by fly ash. Specimens may be tested at any age to monitor the compressive strength. Note: The maximum load required to break the sample should not be less than 10% of the maximum load range of the testing equipment being used. A testing machine with a load range of 5,000 pounds is appropriate to use when testing cellular concrete.

3.6.3 Absorption: Water absorption must be certified by the Manufacturer to meet the requirements of Section 2.2 prior to approval for the LAM. The procedure for certification shall be as specified in ASTM C 796, Section 8.

3.6.3 Permeability: Permeability must be certified by the Manufacturer to meet the requirements of Section 2.2 prior to approval for the LAM. The procedure for certification shall be as specified ASTM D 2434.

PART FOUR - METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.1 Method of Measurement:

4.1.1 No separate measurement shall be made for Lightweight Cellular Concrete Fill. Lightweight fill shall be paid for based on the volume of Lightweight Cellular Concrete Fill shown on the plans. Changing the limits or

character of the installation due to the Contractor's construction methods or the Contractor's choice of a lightweight fill material of different unit weight as outlined in Section 1.3.1 of this Special Note shall not be cause for changing the plan pay quantities including plan roadway pay quantities.

4.1.2 The Contractor's selected construction methods may require additional excavation, fill or lightweight fill volume, or incidental items to satisfy the plan requirements. Sheeting, shoring, temporary walls or other earth retention systems necessary to stabilize any excavation required during lightweight fill construction shall be paid for based on the quantities shown on the plans. The Contractor will be responsible for maintaining a stable slope during construction. All designs, labor, materials, etc. required to complete this work shall be included in the unit price bid per linear foot for "Sheet Piling".

4.3 PAYMENT: Work specified in this Section will be paid for at the contract unit prices for the quantities specified herein. The quantities shall be as shown in the Construction documents and specified herein for Lightweight Cellular Concrete Fill.

<u>Code</u>	<u>Item</u>	<u>Pay Unit</u>
	Lightweight Cellular Concrete Fill	Cubic Yard