



SUPERSEDED BY EB 23-024 EFFECTIVE 8/3/23		<i>New York State Department of Transportation</i> ENGINEERING INSTRUCTION	EI 08-014
Title: REVISED SPECIAL SPECIFICATION FOR EXPANDED POLYSTYRENE FILL			
Distribution: <input checked="" type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33) <input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Consultants (34) <input checked="" type="checkbox"/> Regional/Agencies (32) <input checked="" type="checkbox"/> Contractors (39) <input type="checkbox"/> _____ ()		Approved:  Robert L. Sack, P.E., Deputy Chief Engineer (Research) 31 MAR 08 Date 	

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of September 4, 2008.
- This EI does not supersede any previous issuances.
- The information transmitted by this issuance will reside in the Special Specifications directory of the Toolbox Server.

PURPOSE: The purpose of this EI is to issue a revised special specification for furnishing and installing expanded polystyrene fill.

TECHNICAL INFORMATION:

- Geotechnical Test Procedure GTP-7 Expanded Polystyrene Sampling and Specimen Preparation Procedure is being issued concurrently via EB 08-011.
- Geotechnical Engineering Manual GEM-24 Guidelines for Project Selection, Design, and Construction of Expanded Polystyrene Fill as a Lightweight Soil Replacement is being issued concurrently via EB 08-012.
- Expanded Polystyrene fill (commonly known as EPS or “geofoam”) is used as an extremely lightweight soil replacement to reduce stresses on underlying soils when treating a soft or unstable roadway embankment foundation, or to reduce lateral pressures on retaining walls and abutments.
- Revisions to Special Specification: The special specification was revised as follows:
 - Materials
 - 1. General: The dimensions of the EPS blocks are defined as nominal because they may vary depending on the supplier’s mold size.
 - 2. General: A requirement for a fire retardant additive has been added.
 - 3. General: A minimum seasoning period has been added to allow out-gassing.
 - 4. General: Minimum Physical Properties – Density: The nominal density has been changed to the minimum density. (In the past, the minimum allowable density of an EPS block was often incorrectly interpreted as 10% less than the specified nominal density. This stemmed from an ASTM variance intended to apply only to test specimens cut from full sized blocks. The variance is necessarily included in the testing procedures to account for heterogeneity caused by the molding process. However, the overall minimum density should be adhered to for quality assurance purposes.)

5. General: Minimum Physical Properties – Compressive Strength, Flexural Strength, and Flammability: Parameters have been changed or added in accordance with ASTM D6817, Standard Specification for Rigid Cellular Polystyrene Geofoam.
6. General: Minimum Physical Properties – Tensile Strength, Shear Strength, Water Absorption, Coefficient of Thermal Expansion, and Insect Resistance: These requirements were deleted. (Their original inclusion was based on guidance for cellular polystyrene thermal insulation used in the building industry.)
7. Submittals: A submittal section was added to ensure that the minimum specified physical properties can be met. This requires a third party quality assurance test report accompanied by detailed manufacturing records of the tested blocks (which can later be compared to production blocks).
8. Basis of Acceptance: Labeling of the weight will be done after the seasoning period to better agree with field weighing.
9. Basis of Acceptance: The Contractor will be required to provide a scale for field weighing.
10. Basis of Acceptance: Maximum damage allowances have been added.
11. Basis of Acceptance: The State will reserve the right to perform additional testing.

Construction Details

1. Installation: Metal barbed fasteners between blocks have been eliminated. It has been found that these are of little benefit in construction and tend to cause damage as blocks are shoved into position. The blocks remain adequately anchored in place by self weight and friction. Furthermore, current research indicates that EPS fills perform better in seismic events without the barbed plates.
 2. Installation: Changes have been made to the instructions for placement.
 3. Installation: A provision was added to use a portable hot wire device supplied by the manufacturer as a field cutting method.
- PIN Approval: The Expanded Polystyrene Fill special specification is to be approved on a project-by-project basis. Designers must send their request for approval to the Design Quality Assurance Bureau (DQAB) and the Geotechnical Engineering Bureau (GEB) through the Regional Special Specification Coordinator as per Highway Design Manual (HDM) Chapter 21.

IMPLEMENTATION:

- The following special specification is disapproved:
Item 203.03950005: Expanded Polystyrene Fill.

TRANSMITTED MATERIALS:

Attached are the following special specifications:
Item 203.03950017 - Expanded Polystyrene Fill.

BACKGROUND: The generic term “geofoam” is often used to describe expanded polystyrene formed into low-density cellular plastic solids used as lightweight, stable, inert, and environmentally safe blocks. The manufacturing process begins by exposing polystyrene resin beads, containing a hydrocarbon blowing agent, to steam. The polymer softens and the blowing agent expands the beads to form “pre-

El 08-014 Page 3 of 3

puff". These expanded beads are then blown into large rectangular block molds. Steam is injected into the molds, where the beads expand further and fuse together to form the final product.

The specification was revised to update the physical requirements of expanded polystyrene fill, improve quality assurance procedures, and to reflect construction best practices.

CONTACT: Questions or comments regarding this issuance should be directed to Randall J. Romer, P.E., of the Geotechnical Engineering Bureau at (518) 457-4714, romer@dot.state.ny.us. Questions or comments regarding the technical aspects of the Special Specification should be directed to Matt Barendse, P.E., of the Geotechnical Engineering Bureau at (518) 457-4796, mbarendse@dot.state.ny.us.

ITEM 203.03950017- EXPANDED POLYSTYRENE FILL

DESCRIPTION

Furnish and install Expanded Polystyrene fill (EPS) as shown in the contract documents and as directed by the Engineer.

MATERIALS

General

Furnish EPS blocks of the dimensions shown in the contract documents or as approved by the Engineer. EPS is typically supplied as right rectangular prismoid blocks with nominal dimensions of 0.6 m x 1.2 m x 2.4 m. Blocks shall be smooth and flat on all surfaces and have a dimensional tolerance of $\pm 0.5\%$. Blocks shall be manufactured using a modified resin that contains a fire retardant additive. Blocks shall be seasoned by storing them at the manufacturer's facility in normal ambient room temperature for a minimum of 72 hours after being released from the mold. Blocks shall meet the following physical requirements after seasoning:

MINIMUM PHYSICAL PROPERTIES

ASTM D1622	Density	20 kg/m ³
ASTM D1621	Compressive Strength:	at 1% deformation 40 kPa
		at 10% deformation 110 kPa
ASTM C203	Flexural Strength	207 kPa
ASTM D2863	Flammability (Oxygen Index)	24.0 %

The following reference standards shall apply in whole or in part to material supplied under this specification:

APPLICABLE STANDARDS

ASTM D6817	Standard Specification for Rigid Cellular Polystyrene Geofoam
ASTM C390	Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots

The EPS blocks shall be produced by a manufacturer with an in-place quality control program which is monitored and certified by an accredited, independent third-party testing organization.

Submittals

A minimum of 20 business days prior to beginning work, the Contractor shall submit two copies of certified third-party test reports to the Engineer for approval by the Deputy Chief Engineer for Technical Services (DCETS), showing that at least two separately molded EPS blocks, representative of those which will be supplied, conform to the physical properties and standards listed above. The date of manufacture of the tested EPS blocks shall be no more than 6 months prior to the date of the submittal. Test specimen selection and preparation shall be done in accordance with the relevant ASTM standard and Geotechnical Test Procedure GTP-7. The publication is available upon request to the Regional Director or the Director of the Geotechnical Engineering Bureau.

ITEM 203.03950017- EXPANDED POLYSTYRENE FILL

Submit detailed manufacturing records for the tested blocks which clearly state, in part, the percentage, type (in-plant or post-consumer), and original density of any recycled EPS material (regrind) used in the molding process.

Basis of Acceptance

Each EPS block shall be labeled with the manufacturer's name, product type, lot number, date of manufacture and weight (as measured after seasoning and trimming). Unlabeled blocks will be rejected. The Contractor shall supply detailed manufacturing records of individual blocks if requested by the Engineer.

The Engineer will perform on-site density tests by weighing and measuring one block randomly chosen from each truckload or 75± cubic meters of EPS delivered to the project site. The Contractor shall provide a calibrated scale accurate to within 0.05 kg and with sufficient capacity for this purpose. Blocks shall be kept clean and dry prior to weighing. If any block does not meet the minimum density requirement, the sampled truckload or 75± cubic meter batch will be rejected by the Engineer.

EPS blocks that do not meet tolerances, or have side area surface damage of 20% or more or volume damage of 1% or more will be rejected.

The State reserves the right to take random samples from the project site (not to exceed 1 block per 285 cubic meters) for additional quality assurance testing. If testing yields unsatisfactory results the Contractor may be directed to remove and replace potentially defective EPS blocks at no additional cost to the State.

CONSTRUCTION DETAILS

General

Exercise care to prevent damage to the EPS during delivery, storage and construction. Protect the EPS blocks from (1) Organic solvents such as acetone, benzene, and paint thinner; (2) Petroleum based solvents such as gasoline and diesel fuel; (3) Open flames and (4) Prolonged exposure to sunlight (more than 30 days).

Provide a system of temporary weights or tie downs, approved by the Engineer, to anchor the EPS blocks if there is wind gust or flooding potential.

Do not drive or operate heavy machinery or place concentrated loads directly on the EPS blocks. EPS blocks damaged due to the Contractor's operations will be removed and replaced at no additional cost to the State.

Installation

Grade the leveling course within a tolerance of 13 mm in 3 meters. Place the EPS blocks as indicated on the plans. Fit blocks tight and flush against adjacent blocks on all sides. Avoid continuous vertical joints by laying blocks in a running bond pattern and orienting the long axis of the blocks in each successive layer perpendicular to the long axis of the blocks in the previous layer.

ITEM 203.03950017- EXPANDED POLYSTYRENE FILL

Trim the EPS blocks in the field where necessary with a portable hot wire device supplied by the manufacturer, or a handsaw, or an alternative cutting method approved by the Engineer.

METHOD OF MEASUREMENT

The quantity of Expanded Polystyrene fill is the number of cubic meters satisfactorily installed as measured in its final position.

BASIS OF PAYMENT

The unit price per cubic meter shall include the cost of labor, materials, incidentals and equipment necessary to satisfactorily complete the work.