



Iowa Department of Transportation

SPECIAL PROVISIONS FOR EXPANDED POLYSTYRENE FILL

Woodbury County
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Effective Date
March 19, 2013

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

120024.01 DESCRIPTION.

A. General.

The work shall consist of designing the size and layout of the expanded polystyrene (EPS) blocks and related aspects of the EPS fill, and furnishing all labor, material, and equipment for placement of expanded polystyrene (EPS) block fill and its protective and load distribution materials to the lines and grades shown on the Plans for the purpose of reducing settlement of the fill embankment. The EPS fill blocks shall be placed on a sand bedding / leveling layer, and shall be covered completely by an impervious geomembrane for protection from petroleum products. A layer of sand fill shall be placed over the geomembrane and a concrete load distribution slab shall be placed over the sand layer. Special Backfill shall be placed over the load distribution slab. Subdrains shall be placed at the toes of the EPS fill. The work shall include designing the size and layout of the EPS blocks, interblock connectors, and related aspects of the EPS fill.

B. Definitions.

For the purposes of this Special Provision, the following definitions are used for the parties indicated below:

1. Molder: The company actually manufacturing the EPS blocks used for fill.
2. Supplier: The company having the contractual relationship with the Contractor for the supply of the EPS blocks. This may be the Molder directly or an intermediary company (typically a distributor of construction and / or geosynthetic products manufactured by others). Where appropriate, the Supplier may delegate certain tasks of this Special Provisions to the Molder.

C. Design Requirements.

1. Design of the EPS fill block composition and block layout shall be performed in accordance with the latest version of NCHRP Web Document 65 (Project 24-11) "Geofoam Applications in the Design and Construction of Highway Embankments." The design documents shall include the proposed location, layout, and details of all EPS blocks, inter-block mechanical connectors, and all necessary items to be used as part of the fills or to construct them. The submitted drawings shall include, but not limited to, plans, elevations, cross-sections showing profiles and cross-slopes, location of connectors between EPS blocks, connections and accessory items as necessary.
2. The block layout shall be designed in accordance with the following general design requirements:
 - a. The plane on which a given layer of blocks is placed is to be flat and level.
 - b. There must be a minimum of two layers of blocks at all locations.
 - c. Within a given layer of blocks, the longitudinal axes of all blocks must be parallel to each other.
 - d. Within a given layer of blocks, the vertical joints between adjacent ends of blocks within a given row of blocks must be offset to the greatest extent practicable relative to blocks in adjacent rows.
 - e. The longitudinal axes of blocks for layers above and/or below a given layer must be perpendicular to the longitudinal axes of blocks within that given layer.
 - f. The longitudinal axes of the uppermost layer of blocks must be perpendicular to the longitudinal axis of the road alignment.
 - g. Blocks shall be laid out such that blocks of adjacent layers are overlapped, and there are no seams or coincident joints more than one block in height. The minimum overlap of blocks in adjacent layers shall be at least 3 feet, or the thickness of the blocks, whichever is greater.
 - h. Blocks shall be placed with their smallest dimension oriented vertically.
 - i. All blocks shall butt tightly against adjacent blocks on all sides.
3. There shall be a minimum of two inter-block connectors on every EPS block. Inter-block connectors shall be placed at approximately equal distances from opposite ends of the block, and shall be approximately centered transversely on the block. The Contractor's design shall determine if additional inter-block connectors are required.
4. The Contractor shall include on the submitted drawings a step-by-step description of the installation and construction procedure proposed for each EPS fill stage on this project. Descriptions of the installation and construction sequence, supplemented by drawings and calculation as necessary, of the EPS blocks that may be within or affected by the EPS fill shall be included in the design. EPS block sizes and laying pattern as well as methods of temporarily ballasting and stabilizing EPS blocks to prevent movement during construction, including between construction stages, shall be provided. Placement of the geomembrane shall all be described.
5. All additional details to those depicted on the Plans required in support of the construction procedures shall be designed by the Contractor. All Contractor-designed items shall be stamped by a Professional Engineer licensed in the State of Iowa. All such details will be reviewed and approved prior to construction.
6. The layout of all EPS blocks and attachments shall be in conformance with the lines and grades shown on the Plans. Placement of the EPS blocks shall be subject to the following tolerances:

Table 120024.01-1: EPS Block Tolerances

Top Elevation	No higher	Up to 6 inches lower
Bottom Elevation	No higher	No lower
Sides	No wider	Up to 2 feet maximum between envelope and inside corner of the EPS blocks. Outer corners of the blocks shall reach the envelope.

120024.02 MATERIALS.

A. General.

1. All EPS block fill shall consist entirely of expanded polystyrene. EPS shall be fabricated using virgin feedstock manufactured into blocks having no more than five percent regrind content. Previously used EPS blocks are not allowed in part or in full on this project. Blocks shall have a height of at least 32 inches or 16 inches for a half block, a width of at least 48 inches, and a length of at least 96 inches.
2. EPS blocks for this project shall be grade EPS100 as defined in Table 120024.02-1 below. Only EPS 100 block material type designations shall be used on all correspondence and communication relate to this project.

Table 120024.02-1: Material Type Designation for EPS-Block Geofoam

Material Designation	Minimum Allowable Density (Unit Weight), lb/ft ³	
	Each Block as a Whole	Any Test Specimen
EPS100	2.0	2.0

3. Inter-Block Connectors: Inter-block mechanical connector (“gripper”) plates shall be made of 20 gage (minimum) galvanized steel with two-sided multi-barbed design, or approved equal, capable of piercing the EPS up to 3/4 inch.
4. Sand: Sand fill and sand blanket shall be natural sand meeting the requirements of Section 4110 or 4134 of the Standard Specifications.
5. Geomembrane: Geomembrane shall meet the requirements of Special Provisions for Geomembrane over Expanded Polystyrene Fill.
6. Subdrains: Drain lines for the toes of the EPS fill shall be 4 inch nominal diameter perforated plastic pipe meeting the requirements of Section 4143 of the Standard Specifications.

B. Physical Properties.

1. For a given material type, the dry density (seasoned unit weight) shall equal or exceed that shown in Table 120024.02-1. The dry density shall be determined by measuring the mass of the entire block by weighing on a scale and dividing the mass by the volume of the block.
2. Table 120024.02-2 gives the minimum allowable values for the physical properties for EPS 100. It is imperative to note that there is no guarantee, expressed, implied or suggested, that the minimum required block density for a given grade of EPS will result in EPS that will meet

the required minimum values of material properties as stated in Table 120024.02-2. For the purposes of this specification, the minimum material-property values specified in Table 120024.02-2 are to be assumed to be independent of each other. A Molder or Supplier must make their own independent assessment of block density required to meet or exceed all material property values specified in Table 120024.02-2 for a given grade of EPS.

Table 120024.02-2: Minimum Allowable Values of Material Properties for Individual Test Specimens

Material Designation	Dry Density (lb/ft ³)	Compressive Strength (psi)	Flexural Strength (psi)	Elastic Limit Stress (psi)	Initial Secant Young's Modulus (psi)
EPS100	2.0	33.5	55	14.5	1450

3. These material parameters are to be obtained by testing specimens prepared from samples taken from actual blocks produced for this project. Testing or material properties shall comply with the following:
 - a. All test specimens shall be seasoned as specified in ASTM C 578.
 - b. Dry density, compressive strength, and flexural strength shall be measured as specified in ASTM C 578.
 - c. The specimens used for compressive testing shall be cubic in shape with a 2 inch side length.
 - d. A strain rate of 10% per minute shall be used for the compressive strength tests.
 - e. Both the elastic-limit stress and initial secant Young's modulus shall be determined in the same test used to measure compressive strength. The elastic-limit stress is defined as the measured compressive normal stress at a compressive normal strain of 1%, after correcting as necessary for curve shape in accordance with the directions given in ASTM C 165. The initial tangent Young's modulus is defined as the average slope of the compressive stress versus compressive strain curve between 0% and 1% strain.

4. Each EPS block shall meet dimensional tolerances as determined in three distinct areas as described below:
 - a. Variations in linear dimension: The thickness, width and length dimensions of an EPS block as defined herein as the minimum, intermediate and maximum overall dimensions of the block, respectively, as measured along a block face. These dimensions of each block shall not deviate from the theoretical dimensions shown on the approved Contractor's drawings, by more than 0.5% but not to exceed 0.25 inches.
 - b. Deviation from perpendicularity of block faces: The corner or edge formed by any two faces of an EPS block shall be perpendicular, i.e. form an angle of 90 degrees unless indicated to be otherwise on the Contractor's approved drawings. The deviation of any face of the block from a theoretical perpendicular plane or the indicated angle, if different, shall not exceed 0.5%.
 - c. Overall warp of block faces: Any one face of a block shall not deviate from theoretical planarity by more than 0.5%.

5. All EPS blocks shall satisfy the product flammability requirements specified in ASTM C 578. The EPS shall contain a flame retardant additive and shall have UL Certification of Classification as to External fire Exposure and Surface burning characteristics so as to comply with the Oxygen Index requirements of ASTM C 578.

6. All EPS blocks shall be treated by the manufacturer with a tested and proven termite treatment for below-grade applications, 3 year minimum exposure. The termite treatment agent shall be an EPA registered material.

C. Quality Assurance.

1. Complete material documentation of all EPS to be used on the Project must be disclosed as part of the pre-construction certification process described in this Special Provision. This documentation must state the source (nation of origin) and specifications (including, but not limited to, bead size, flame retardancy, and relative content of pentane blowing agent) of all EPS. This documentation must also indicate complete quality and safety compliance of the EPS as would normally be required for its use in producing EPS for construction in the U.S.A. Should any changes in the source and/or specifications of EPS occur during the course of the Project, updated information must be supplied to an approved prior to the implementations of any change. In addition, if a Molder plans to use any optional chemical additive in the finished EPS-block product that is not required or generic EPS-block manufacture, e.g. a chemical additive for insect control, the nature and safety issues associated with the use of such additive(s) must be stated clearly by the Molder or Supplier prior to molding any blocks for the Project as part of the pre-construction certification process. In addition, the Molder or Supplier must demonstrate that the proposed additive(s) will not compromise the ability of the finished EPS blocks to meet the minimum flammability requirements specified in this Special Provisions and pose no environmental hazard in either the short- or long-term. Finally, the molder or Supplier shall provide written documentation that will indemnify and hold harmless the Iowa DOT against all environmental risks associated with the additive(s) that may exist at present or might develop in the future. Should any changes relative to optional chemical additive usage occur during the course of the Project, updated information must be supplied and approved prior to implementing any change.
2. All EPS blocks shall be manufactured using a vacuum-assisted mold. Written documentation and technical information concerning the mold to be used shall be submitted as part of the pre-construction certification process. Should any changes in mold use occur during the course of the Project, updated information must be approved prior to any change. Note that any change in mold may require a completely new pre-certification process as described in this Special Provision.
3. Any anticipated use of oil or any other type of additive intended to assist the molding process shall be disclosed in writing as part of the pre-construction certification process. The type and percentage of oil and/or additive must also be noted in this written disclosure. In addition, the Molder or Supplier shall demonstrate by using appropriate ASTM standards referenced in this Special Provision and tests performed by a certified, independent testing laboratory that the minimum flammability requirements specified in this Special Provision are not comprised by the presence of the oil and/or other additives. Should the Molder or Supplier desire to make any changes regarding the use of oil or other additive during the course of the Project, updated information concerning flammability shall be supplied and approved prior to making any changes in the molding process. Note that any change in oil/additive usage may require a completely new pre-certification process described in the Special Provisions.
4. All EPS blocks shall be adequately seasoned (aged) prior to shipment to the project site. For the purposes of the Special Provisions, seasoning is defined as storage in an area suitable for the intended purpose as subsequently defined herein for a minimum of 72 hours after an EPS block is released from the mold. Seasoning shall be done within a building or other structure that protects the EPS blocks from moisture as well as UV radiation. The area in which EPS blocks are stored for seasoning shall also be such that adequate space is allowed between blocks, and positive air circulation and venting of the structure provided so as to foster the out-gassing of blowing agent and trapped condensate from within the blocks. The Engineer shall be allowed to inspect the structure to be used for seasoning upon request and during normal business days and hours. The supplier may request a shortened seasoning period if the EPS blocks are seasoned within an appropriate heated storage space and the Molder demonstrates that the alternative seasoning treatment produces blocks that equal or

exceed the quality of blocks subjected to the normal 72 hour seasoning period, and that outgassing is complete so that it is safe to transport the seasoned blocks.

120024.03 CONSTRUCTION.

A. Submittals.

1. **EPS Fill Designer and Contractor Experience Requirements:** The EPS fill layout shall be designed by a Professional Engineer licensed in the State of Iowa with experience performing the design of EPS fills. The superintendent employed by Contractor (and subcontractors if used) shall have experience in the construction and installation of EPS fills. Referenced projects relative to qualifications shall be of similar size as this project. For the qualifications of each of the individuals or the contractor mentioned in this section, a list of EPS fill projects performed shall be provided, along with names and contact information or client and/or owner representatives who can verify the experience referenced.
2. **EPS Fill Contractor/Installer/Designer Qualifications:** At least 30 calendar days before the planned start of installation, the Contractor shall submit the experience qualifications for the proposed EPS fill designer, and contractor/installer, along with details for referenced construction projects, including a brief project description of each with the owner's name, contact person and current phone number. This should include projects and references for the proposed superintendent who will direct the construction and installation and for the Professional Engineer to oversee installation of the block fill. Upon receipt of the experience qualifications submittal, the Engineer shall have 15 calendar days to approve or reject the proposed EPS fill Contractor/Installer.
3. **Manufacturing Quality Control (MQC) Submittals:** The Contractor shall submit a copy of the Molder's Manufacturing Quality Control program, along with all related documents or documents referenced in this document.
 - a. **Test Compliance:** The Contractor shall supply summaries of test compliance with specified performance characteristics and physical properties for the EPS blocks and galvanized steel connector plates for review and approval.
 - b. **Certificates:**
 - 1) The Contractor shall supply for review and approval hard copy product certificates showing compliance to the Material Properties stated in Table 120024.02-2 of this Special Provisions. Product certificates shall be signed by the Supplier to certify material compliance with the specified performance characteristics, criteria, and physical requirements outlined in this Special Provisions.
 - 2) The Contractor shall provide in writing for review whether or not the Supplier has an independent Third-Party Certification. If Third-Party Certification is offered, this notification shall be accompanied by documentation that indicates the business entity providing the Third-Party Certification and describes in detail the steps to be taken by this agency to verify the Molder's compliance with the specific requirements of this Special Provisions. Approval of the Molder's Third-Party Certification will waive the need for pre-construction product submittal and testing as specified in the MQA section of this Special Provisions.
 - 3) The Contractor shall submit for approval, Supplier's standard warranty document or certificate executed by an authorized company official. Supplier's warranty is in addition to, and not a limitation of, other rights the Iowa DOT may have under Contract Documents.
4. **EPS Fill Design Submittal:** At least 30 calendar days before the planned start of construction or installation of the EPS fills, the Contractor shall submit complete design drawings, descriptions and any calculations for review and approval. The drawings shall include all plan and elevation views, and all details, descriptions, dimensions, quantities, ground profiles, and

cross-sections necessary to construct and inspect the EPS fill, and as described in this Special Provision. The Contractor shall verify the limits of the EPS fill and ground survey data before preparing drawings. Any calculations used to complete the EPS fill block layout shall be included. If the Contractor's design drawings as originally submitted are not approved and are revised and resubmitted, a minimum of 15 additional working days will be required to review and approve the drawings per each revision cycle. Construction of the EPS fill shall not begin until the design drawings have been approved. The Contractor shall submit four sets of design drawings for approval. The drawings shall include all details, dimensions, quantities, and cross sections necessary to construct and inspect the fill. The drawings shall be prepared to Iowa DOT standards. The drawings shall be signed and sealed by the Contractor's Professional Engineer licensed in the State of Iowa.

5. Design Descriptions: Design descriptions, and calculations as needed, shall include, but not be limited to, the following items:
 - a. A written report summarizing the EPS fill design and block layout. This report shall be supplemented by drawings and calculations as necessary to show the specific layout, positions, orientation and interaction of the blocks.
 - b. Applicable code requirements and design references.
 - c. Drainage design, including temporary drainage to prevent run off water from flowing onto or collecting or ponding on partially completed EPS fills or onto temporarily exposed surfaces.
 - d. Descriptions of means and methods of placing the geomembrane over the surface of the EPS fill.
 - e. Descriptions of the means and methods of placing the sand over the geomembrane and EPS fill, with particular attention given to avoiding displacement or damage to the geomembrane and the EPS Blocks.
 - f. Design notes including an explanation of symbols and computer programs used in the design.
 - g. If sacrificial EPS blocks are used as a construction expedient to temporarily support equipment or traffic, calculations shall be provided to show that the sacrificial lay is sufficient thickness and strength to support the loads without damaging underlying permanent EPS blocks.
6. Drawings: Drawings prepared by the Contractor shall include, but not be limited to, the following items:
 - a. Drawings to show the specific layout, position, orientation and interaction of the EPS blocks.
 - b. A plan view of the fill(s) showing:
 - 1) Use of project centerline and elevations for reference baseline and elevation datum.
 - 2) The offset from the construction centerline or baseline to the face of the fill at its base at all changes in horizontal alignment.
 - 3) Stations for beginning and end of EPS fill.
 - 4) Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences, and centerline of any drainage structure or drainage pipe behind, passing through, or passing under the EPS fill.
 - c. Elevation view of the fill(s) identifying:
 - 1) The elevation at the top of the EPS fill at all horizontal and vertical break points, and at least every 25 feet along the EPS fill.
 - 2) Elevations at the EPS fill base.
 - 3) The distance along the face of the EPS fill to all steps in the PS-Block Fill base.
 - 4) Existing and finish grade profiles both behind and in front of the EPS fill.
 - 5) Details showing how the EPS fill will be stepped to transition from the EPS fill to the earth embankment at either end of the EPS fill.

- d. Cross Sections showing:
 - 1) Means, methods, and dimensions showing interlocking or keying of the EPS fill into the existing embankments.
 - 2) Interface and interaction of the EPS fill with proposed abutments of the adjacent bridge.
 - 3) These cross sections shall be provided at a maximum spacing of 50 feet for the length of the EPS fills from beginning to end.
 - 4) A listing of the summary of quantities on each cross section showing estimated square feet and the cubic yards of EPS fill between adjacent cross sections.
 - e. EPS fill material properties, block dimensions, applicable codes, and any other parameters used in the block composition and layout design.
 - f. Notes and drawings shall define the subgrade preparation, materials upon which the EPS blocks are to be placed, and number and placement of inter-block connectors.
 - g. General notes for constructing the fill including construction sequence or other special construction requirements such as temporary protection measures from impact, wind, including natural gusts or gusts produced by traffic in adjacent lanes, elements or chemical exposure (fuels, solvents, etc.). The Contractor shall be responsible for safety at the site relative to all aspects of the EPS fill construction.
 - h. Provide detailed construction staging and sequencing description, including, but not limited to block placement and interaction with other staging requirements of the project.
 - i. Notes and drawings shall describe temporary protection measures for exposed portions of the EPS fill between layers of block and stages of fill construction, and for possible interruption or delay of construction during the fill placement.
7. Shipping, Handling, and Storage Plan for EPS fill: The Contractor shall submit their proposed shipping procedure for the EPS block for review at least 30 days before shipment begins. The procedure shall include protective measures during shipping to avoid any damage to the blocks including crushing to the edges, sides and corners of blocks. If the Contractor desires to make changes to the shipping, handling and storage plan after it has been approved, a revised plan must be submitted and approved before changes in procedure are implemented.
8. Plan for placement of EPS fill and load distribution layer: At least 30 days before the start of construction, the Contractor shall submit a work plan describing how EPS blocks will be moved from the storage or delivery sites onto the fill, and how they will be placed in accordance with the Contractor's approved layout design. This plan shall include how the blocks will be handled, including in windy or otherwise inclement weather. This plan shall describe how the EPS blocks will be incorporated into the existing embankment fill. Descriptions of temporary support systems or measures, if required, shall be included. The plan shall describe how the work of this Special Provisions will be coordinated with other work activities of the project, including the staging of the construction. The plan shall include descriptions of methods for placing the geomembrane and the load distribution layer over the EPS fill. Descriptions shall include what equipment will be used, how materials, including excavated soil, will be removed from the excavation site and where it will be disposed. The plan shall describe how the geomembrane will be placed to make a continuous layer.
9. Inter-Block Connectors: The Contractor shall supply samples and test data for the proposed inter-block mechanical connectors showing that they comply with the requirements in the Materials section of this Special Provisions for review and approval prior to construction.

B. Sampling and Testing.

- 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designations only.
 - a. American Society for Testing and Materials (ASTM).

- b. NCHRP Web Document 65 (Project 24-11) "Geofoam Applications in the Design and Construction of Highway Embankments."
2. Manufacturing Quality Assurance: Manufacturing Quality Assurance (MQA) of the EPS-Block product will be conducted to verify the Manufacturing Quality Control (MQC) procedures. The Contractor shall have primary responsibility for all MQA, and shall submit all documents, test results, data, certifications, and other documents for review and approval. On-site MQA activities shall be performed in the presence of the Engineer. MQA of the EPS-block will consist of two phases:
- Phase I MQA – Molder/Supplier Pre-certification, which consists of pre-certification of the Molder and Supplier and shall be conducted prior to shipment of any EPS blocks to the Project construction site.
 - Phase II MQA – Block Verification, which is conducted as the EPS blocks are delivered to the Project construction site.
3. **Phase I MQA – Supplier Pre-Certification.**
No EPS blocks shall be shipped to the project site until such time as all parts of Supplier Pre-construction certification, as specified in this section, have been completed in the order listed below:
- a. The Contractor shall first indicate in writing whether the Molder has an independent third-party certification program in force. If third-party certification is offered, this notification shall be accompanied by documentation that identifies the business entity providing the third-party certification and describes in detail the steps to be taken by this agency to verify the Molder's compliance with the specific requirements of this Special Provisions. Acceptance of the Molder's certification will waive the need for pre-construction product submittal and testing as described below. When there are multiple Molders, third-party certification must be acceptable for each and every Molder.
 - b. If the Molder does not have third-party certification or the certification is deemed unacceptable, the Contractor shall deliver a minimum of three full-size EPS blocks for each EPS grade to be used on this project to a location specified. These blocks shall in all respects be the same as the blocks to be supplied to this project, including required seasoning as described in the specification. If there are multiple Molders, there shall be three blocks from each Molder. Acceptable blocks remaining from the certification/testing may be used in construction of the project, subject to approval.
 - c. The Contractor shall supply a scale with sufficient capacity and precision for weighing of the EPS blocks. This scale shall be delivered to the project site or to an alternate location specified. This scale shall have been calibrated within the last 6 months and certification of such calibration shall be provided.
 - d. The Contractor shall weigh and measure each of three blocks of each grade of EPS supplied. The Contractor will sample and test at least one of the three blocks of each grade, selected randomly, to evaluate the ability of the supplier to deliver EPS blocks of quality as specified herein. The sampling and testing protocol will be the same as for construction site quality assurance as discussed below. Any EPS blocks not used for testing may be utilized for construction provided they satisfy all the requirements outlined in the Special Provisions.
 - e. The Contractor's design drawings, calculations and other design related documents as required herein have been reviewed and approved for construction in conformance with project requirements and this Special Provisions.
 - f. Prior to delivery of any EPS blocks to the project site, a meeting shall be held between, at a minimum, the Engineer, Contractor, the Contractor's superintendent for installation of the EPS fill, and the Supplier and/or Molder of the EPS blocks. The purpose of this meeting shall be to review the pre-certification results and discuss all aspects of construction to ensure that all parties are familiar with the requirements of this Special Provisions. At the satisfactory conclusion of this meeting, the Contractor shall be allowed to begin on-site receipt, storage (if desired) and placement of the EPS blocks in accordance with this Special Provisions.

4. Phase II MQA – Construction Site Block Verification.

- a. Construction site quality assurance – Block Verification, which is conducted as the EPS blocks are delivered to the Project construction site.
- b. The Contractor shall assume the primary responsibility for conducting this phase of the work. Contractor shall perform the construction site quality assurance activities in the presence of the Engineer, and shall provide reports of all activities, including but not limited to, results of measurements, data recorded and lists of any blocks rejected within 2 working days of the activity.
- c. No EPS blocks shall be placed on any fill of this project until such time as all activities of construction site quality assurance – Block Verification, as specified in this section, have been completed successfully in the order listed below:
 - 1) Each block of every grade of EPS delivered on any truck to the construction site shall be inspected on-site visually to check for damage as well as for verification of the labeled information included on each block. Any blocks with damage not meeting the requirements of this Special Provisions will be rejected on the spot, marked “unacceptable”, be placed in an area separate from those blocks that are accepted, and eventually returned to the Molder or Supplier at no cost the State.
 - 2) At least one block of every grade of EPS delivered on every truck to the construction site shall be checked to verify its compliance with the requirements of this Special Provisions for the minimum block dry unit weight, as well as the physical tolerances, specified in the Materials section of this Special Provisions. Weighing of blocks shall be conducted onsite using a scale with sufficient capacity and precision for weighing of EPS blocks to be supplied by the Contractor in conformance with the requirements of the Pre-certification.
 - 3) Should verification of the parameters of item ii above indicate lack of compliance, at least three additional blocks of every grade EPS delivered from the same truck-load will be individually checked. The entire shipment of the grade of EPS in question shall be rejected should any one of the three additional blocks fail to meet the requirements of this Special Provisions for minimum block dry unit weight and physical tolerances outlined above.
 - 4) At least one block of every grade of EPS delivered on the first truck to the construction site for use on any one EPS fill structure, shall be selected for sampling and testing. Sampling will be at locations A, B, and C shown in Figure 120024.03-1. The samples shall be approximately square in cross-section and of sufficient width to enable preparing the test specimen required by this Special Provisions. Testing shall be performed in the presence of the Engineer.

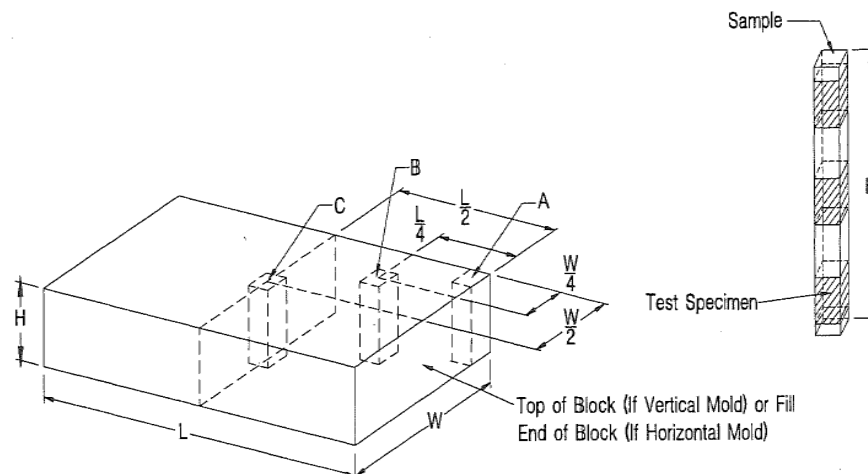


Figure 120024.03-1: Locations of require EPS block sampling for an individual block.

- d. Laboratory tests shall be performed to check for compliance with the Material Properties shown on Table 120024.02-2 in the Materials section of this Special Provisions. Additional blocks of each grade of EPS shall be selected for sampling and testing during the course of construction at a rate of approximately one block for every 325 cubic yards of EPS delivered, or when in the opinion of the Engineer, additional sampling and testing is needed.
- 1) If unsatisfactory results are obtained, the Contractor shall remove potentially defective EPS blocks and replace them with blocks of acceptable quality at no additional expense to the State.
 - 2) Portions of sampled blocks that are damaged by sampling or used for testing are not acceptable for construction. Portions of sampled blocks that are not damaged or otherwise compromised by the sampling and are otherwise acceptable can be used as desired by the Contractor provide that they comply with all other requirements of this Special Provisions and the Contractor's design requirements.
 - 3) The Contractor shall allow for early delivery of the EPS blocks to the construction site to allow for conducting laboratory testing of the blocks. For those truckloads where EPS blocks will be selected for sampling an testing, as described above, a minimum of 3 business days, or longer time if required to complete laboratory testing, are required prior to their scheduled installation to allow for samples to be taken and laboratory testing conducted. Any shipment of EPS blocks, for which the representative samples fail to meet the parameters outlined in this Special Provisions are considered defective and shall be replaced by the Contractor with non-defective EPS block at no additional cost or time to the State.
 - 4) The Construction site quality assurance shall include preparation of as-built drawings as well as additional record keeping to document the location of all EPS blocks placed for the project.

C. Delivery, Storage, Handling.

1. Prior to delivery of the EPS fill to the project site, the Contractor shall review, plan and implement, with the assistance of the Supplier, a material handling procedure that shall include the following as a minimum:
 - a. Type of vehicle to be used to transport the EPS blocks from the Molder to the project site, i.e. flatbed, closed body, etc.
 - b. Measures to be exercised during shipping, handling, and storage on-site to prevent any damage to the EPS blocks. Particular attention should be paid to avoid punctures or crushing the edges, sides and corners of the blocks during shipping from the Molder to the project site. All shipment shall conform to the approved shipping plan, as prepared and submitted by the Contractor.
2. At all stages of construction, the EPS blocks shall be handled in a manner to prevent physical damage to the blocks. The Contractor shall prevent any damage to the EPS blocks during delivery, handling, storage, and construction. Blocks damaged during handling or storage on-site, even though they may have been previously accepted and verified during construction site quality assurance, shall be rejected and must be replaced by the Contractor with undamaged equal EPS blocks at no additional cost. EPS blocks with cracks of any size are not acceptable and shall be rejected. Holes shall not be created in the blocks at any stage of manufacturing, storage or construction to facilitate shipping or handling of the blocks.
3. Each EPS block shall be labeled to indicate the name of the Molder (if there is more than one for a given EPS fill structure), the date the block was molded, the mass of the entire block in pounds as measured after a satisfactory period of seasoning as specified in the materials section of this Special Provisions, the dimensions of the block in inches and the actual dry unit weight in pounds per cubic foot.

4. Additional identification markings using alphanumeric characters and/or symbols, applied as necessary by the Supplier, to indicate the location of placement of each block relative to the Contractor's approved design drawings shall also be provided. Stripes of different color paint shall be utilized to identify blocks of their grade of EPS. The use of no marking shall be considered an acceptable marking for the lower (lowest) grade EPS blocks supplied. Any paint, etc., used to mark EPS blocks shall be chemically compatible with EPS and not cause any dissolution of the EPS during, or subsequent to, application of the paint.
5. If the EPS blocks are to be stockpiled at the construction site until placement, a secure storage area shall be identified and designated by the Contractor for this purpose, subject to approval. The storage area shall be away from any heat source or construction activity that produces heat or flame or would expose the blocks to hydrocarbon fuels such as diesel, kerosene, or gasoline. In addition, smoking shall not be allowed in the storage area. EPS blocks in temporary on-site storage shall be secured with sandbags and similar "soft" weights to prevent their being dislodged by wind. The blocks shall not be covered in any manner that might allow the buildup of heat beneath the cover. The blocks shall not be trafficked on by any vehicle or equipment. In addition, foot traffic by person shall be kept to a minimum.
6. The amount of time during which EPS blocks can be stored at the Project construction site shall be limited to a maximum of 30 calendar days.
7. Cover any EPS fill to be exposed to sun light for more than 90 days with opaque material which will prevent ultraviolet light degradation.
8. Any damage to the EPS resulting from the contractor's vehicles, equipment, or operations, shall be corrected.
9. Correct damage to EPS as follows:
 - a. Slight damage (<0.12 cubic feet with no linear dimension >1 foot) may be left in place as is.
 - b. Replace EPS blocks with damage (i.e., exceeding the "slight" category) with EPS blocks which meet the specifications. EPS blocks exceeding the slight damage criteria may be cut to eliminate the damage and the remaining undamaged portion of the block may be used within the fill, provided the undamaged portion of the block meets all other requirements.

D. Site Preparation.

1. Construction Quality Control: Contractor shall be directly responsible for all construction quality control, earthwork and related activities relative to site preparation other than manufacturing and shipment of the EPS blocks.
2. The site for the EPS fill shall be prepared as follows:
 - a. The surface to receive EPS fill shall be overexcavated to the grades indicated on the contract drawings and a minimum 8-inch-thick sand blanket placed at the base of the excavation.
 - b. The subgrade surface upon which the EPS blocks will be placed shall be flat, level, and smooth prior to the placement of the first block layer. The required smoothness is defined as a vertical deviation of no more than 0.4 inches over a 10 foot horizontal distance. A sand bedding course shall be used to achieve the levelness and smoothness requirements. The sand bedding course shall be compacted by tamping by hand or with light equipment such as plate vibrators.
 - c. There shall be no debris of any kind on the sand bedding or other exposed surface at the time EPS blocks are placed.

- d. Unless directed otherwise, there shall be no standing water or accumulated snow or ice on the sand bedding within the area where EPS blocks are placed at the time of block placement. EPS blocks shall not be placed on a frozen subgrade.

E. Execution.

1. Staking.

Set, maintain, and reset all alignment stakes, slope stakes, and grade stakes necessary for the construction of the EPS fill. This includes, but is not limited to subgrade preparation, and all appurtenances within the limits of the EPS fill and load distribution layer.

2. EPS Block Placement.

- a. The Contractor shall be responsible for safety during placement of the EPS fill. Plans for safety during placement shall consider the height and vertical face of the fill, under what weather conditions EPS block may not be placed, whether traffic will be maintained through the construction site, and any other conditions that could affect the safety of any persons on the site. Special attention shall be given to handling and placement of blocks in windy, wet or sub-freezing weather.
- b. EPS blocks shall be placed at the locations and in configurations shown on the Contractor's approved design drawings.
- c. Equipment may drive on sacrificial blocks of EPS if necessary to access or construct portions of the fill. Sacrificial blocks of EPS fill which shall include any EPS block upon which traffic as driven, shall be removed after access is no longer required, and shall be completely replaced with new EPS blocks meeting all the requirements of this Special Provisions. Sacrificial EPS shall be thick enough to adequately protect underlying permanent EPS blocks. Any EPS beneath the sacrificial layer that is damaged by transmission of stresses through the sacrificial layer shall be removed and replaced at no expense to the State.
- d. There shall be no debris of any kind between adjacent surfaces of EPS blocks at the time adjacent EPS blocks are placed.
- e. There shall be no standing water or accumulated snow, ice or frost on the previously placed EPS block layer within the area where subsequent EPS blocks are to be placed at the time of block placement.
- f. EPS blocks shall be placed so that all vertical and horizontal joints between blocks are tight. Where EPS block is placed against a cut in soil for benching or keying into the existing ground or new embankment, if there are gaps between EPS blocks and adjacent soil cut, the space shall be filled with sand and hand tamped.
- g. While placing successive layers of EPS blocks, the Contractor should exercise care to ensure all placed blocks are supported over their entire bearing area. In the event the top constructed surface of an assembly of blocks becomes uneven or where rocking of the blocks is observed, Contractor shall notify the Engineer and propose a remedial procedure for corrective action. Such procedure shall be submitted for review and approval prior to resuming construction.
- h. Blocks placed next to exterior vertical surfaces shall be placed such that the resulting exterior surfaces on the sides of the EPS fill structures are vertical and planar within a tolerance of plus or minus one-eighth (1/8) inch between blocks. Block faces not satisfying this criterion shall be field trimmed using a hot wire cutting apparatus to achieve the desired evenness within the above tolerance.
- i. Inter-block connectors shall be used to restrain EPS blocks from moving laterally in layer over layer applications. The inter-block connectors shall be placed at the locations shown on the Contractor's approved design drawings and shall be set into the EPS block such that the inter-block connectors do not cause a gap to exist between adjacent layers of EPS blocks.
- j. The final surface of the EPS blocks shall be covered as shown on the Contractor's approved design drawings. Care shall be exercised during placement of the cover material so as not to cause any damage to the EPS blocks or displacement or damage to

the geomembrane that is not to be placed over the EPS fill. The surfaces of the EPS blocks and the overlying geomembrane shall not be directly traversed by any vehicle or construction equipment during or after placement of blocks. If construction traffic is required before the load distribution slab is complete, a minimum thickness of one (1) foot of temporary sand protection shall be required before traffic or construction equipment will be allowed over the blocks.

- k. With the exception of sand bags or similar "soft" weights used to temporarily restrain EPS blocks against wind, no construction material other than shown on the Contractor's approved drawings shall be placed or stockpiled on the EPS blocks. At no time shall heat or open flame be used near the EPS blocks so as to cause melting or combustion of the EPS.
 - l. Partial installations or temporary exposures and finished surfaces of EPS shall be protected from damage during construction. Surfaces or blocks of EPS damaged during construction and prior to completion and acceptance of the EPS block fill shall be removed and replaced at no cost to the State.
 - m. The Contractor shall be responsible for disposal of EPS block material or portions of unused blocks resulting from testing or construction by returning it to the Supplier/Molder for recycling. Such process shall be conducted on a regular basis or as directed.
- 3. Geomembrane Placement.**
- a. Geomembrane shall be placed continuously across the full width and length of the EPS fill as shown in the plans and in accordance with the Special Provisions for Geomembrane over Expanded Polystyrene Fill. The geomembrane shall be placed directly on the top layer of EPS fill, and shall be pulled taut and free of wrinkles before placement of fill over it. Joints between adjacent sheets or ends of sheets of geomembrane shall be spliced or otherwise connected in accordance with the Special Provisions for Geomembrane over Expanded Polystyrene Fill. The result of the splices or methods of connecting adjacent sheets of geomembrane shall be that a continuous sheet of the material having the specified minimum strength at all locations and in all directions within the plane of the geomembrane shall be provided over the entire area of the EPS fill.
 - b. The Contractor shall include in his submittal or placement of EPS blocks how the geomembrane will be placed to make a continuous layer, including overlaps and splices.
- 4. Load Distribution Layer Construction.**
- a. The load distribution layer is defined for the purposes of this Special Provision as all material placed above the geomembrane and EPS fill within the limits of the roadway and extending to the bottom of the pavement, including any shoulders. The load distribution layer shall be constructed above the geomembrane and EPS fill as shown on the contract drawings.
 - b. The sand fill, load distribution slab, and special backfill shall be installed over the geomembrane using appropriate labor and equipment that will not damage the EPS fill or the geomembrane. No vehicles or construction equipment shall traverse directly on the EPS blocks or on the geomembrane. Materials for the load distribution layer shall not be pushed onto the geomembrane and EPS fill. Materials shall be placed using a method that does not displace or drag the geomembrane or the EPS blocks.
- 5. Subdrain Construction.**
- Subdrains shall be placed at the toe of the EPS fill as shown on the contract drawings. Connect the subdrains to outlets as shown on the M sheets in the contract drawings.

120024.04 METHOD OF MEASUREMENT.

The item for EPS fill will be the cubic yards in place within the limits indicated in the plans. The Engineer will measure the quantity of EPS fill in cubic yards.

120024.05 BASIS OF PAYMENT.

- A.** The contractor shall be paid the contract unit price per cubic yard for Expanded Polystyrene Fill. This payment shall be full compensation for furnishing, trimming, and placing the EPS fill, providing construction survey for EPS fill, pre-construction certification and construction site testing of the EPS material, and all labor, equipment and incidentals needed to complete the work. Incidentals include inter-block connectors; items used for storage and protection of the EPS fill; sand fill and sand blanket; sand for filling gaps between EPS blocks or between the EPS fill and sides of overexcavation or overlying Class 10 fill; subdrains and outlet pipes; and removal of all leftover materials, blocks, cuttings from blocks, equipment and supplies at the completion of the project.
- B.** Segments of the load distribution layer, including the load distribution slab and special backfill, will be paid under their respective items. Geomembrane will be paid for in accordance with the Special Provisions for Geomembrane over Expanded Polystyrene Fill.