



Designation: E2788/E2788M – 24

Standard Specification for Use of Expanded Shale, Clay, and Slate (ESCS) as a Mineral Component in the Growing Media and the Drainage Layer for Vegetative (Green) Roof Systems¹

This standard is issued under the fixed designation E2788/E2788M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the quality and grading of the following materials for use as a mineral component of growing media and drainage layer for extensive and intensive vegetative (green) roof systems. The requirements are intended to cover only materials having normal or average gradation characteristics. Procedures covered in this specification are not intended for evaluating the performance nutrients associated with vegetative (green) roof growing media. Where other materials are to be used, appropriate limits suitable to their use must be specified.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 This standard offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

¹ This specification is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.24 on Sustainability.

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1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

- C29/C29M Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
- C88/C88M Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C127 Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate (Withdrawn 2024)³
- C136/C136M Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C330/C330M Specification for Lightweight Aggregates for Structural Concrete
- C331/C331M Specification for Lightweight Aggregates for Concrete Masonry Units
- D75/D75M Practice for Sampling Aggregates
- D3080/D3080M Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
- D5883 Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes
- E2114 Terminology for Sustainability
- E2397/E2397M Practice for Determination of Dead Loads and Live Loads Associated with Vegetative (Green) Roof Systems
- E2399/E2399M Test Method for Maximum Media Density for Dead Load Analysis of Vegetative (Green) Roof Systems
- E2777 Guide for Vegetative (Green) Roof Systems

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

G51 Test Method for Measuring pH of Soil for Use in Corrosion Evaluations

3. Terminology

3.1 Definitions:

3.1.1 For terms related to expanded shale, clay, and slate (ESCS), refer to Guide **D5883**.

3.1.2 For terms related to sustainability relative to the performance of buildings, refer to Terminology **E2114**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *expanded shale, clay, and slate (ESCS)*, *n*—a lightweight, ceramic material produced by expanding and vitrifying select shale, clay, or slate in a rotary kiln.

3.2.2 *extensive vegetative (green) roof system*, *n*—a vegetative (green) roof system that utilizes a narrow range of species limited to herbs, grasses, mosses, and drought-tolerant succulents such as *Sedum*. These types of plants can potentially be sustained in a shallow growing media layer, usually six inches and under, with generally less maintenance than *intensive vegetative (green) roof systems*.

3.2.3 *vegetative (green) roof system*, *n*—assembly designed to support vegetation growth above a waterproofed membrane.

3.2.4 *growing media (media)*, *n*—the substrate in which plants take hold and develop.

3.2.5 *intensive vegetative (green) roof system*, *n*—a vegetative (green) roof system that utilizes a wide variety of plant species that require a growing media greater than six inches that may include lawns, trees, and shrubs.

3.2.6 *Sedums*, *n*—a succulent plant known for its tolerance for extreme conditions.

4. Materials and Manufacture

4.1 ESCS is a lightweight, ceramic material produced by expanding and vitrifying select shale, clay, or slate in a rotary

kiln. It is a highly porous and low-density material. The raw shale, clay, or slate used to produce ESCS is fired in the kiln at temperatures exceeding 1000 °C. As it exits the kiln, the material is sterile, inert, and ceramic. Some crushing may be performed to facilitate final screening in a screening system. ESCS is generally neutral in pH, although the pH can vary somewhat depending on the raw material and the fuel used for processing. Test Method **C29/C29M** determines density (loose unit weight). Test Method **C127** is used to determine the absorption after soaking the material. The particle distribution is determined with the appropriate sieves as stated in Test Method **C136/C136M**. The ESCS is to be sampled in accordance with Practice **D75/D75M**.

5. Requirements

5.1 The aggregates shall conform to the gradation requirements specified in **Tables 1 and 2**. For the drainage layer, no more than 2 % by volume of aggregate particles shall have a diameter of <0.075 mm (No. 200 screen). As a component in the total growing media, the aggregate shall not contribute to the final gradation of the media having more than 5 % of particles with a diameter <0.075 mm for the media for extensive vegetative (green) roof plantings. No more than 20 % by volume of particles with a diameter <0.075 mm should be present in the total gradation of the media for intensive vegetative (green) roof plantings.

5.2 *Physical Properties*—The aggregate shall conform to the physical properties specified in **Table 3**.

5.3 *Chemical Properties*—The aggregate shall conform to the chemical properties specified in **Table 4**.

6. Keywords

6.1 drainage; ESCS; green (vegetative) roofs

TABLE 1 Gradation Requirements for ESCS Granular Drainage Media and Coarse Aggregate for Growing Media (Specification C330/C330M)

Sieve Specification	¾ in. – #4 Gradation % Passing by Mass	½ in. – #4 Gradation % Passing by Mass	¾ in. – #8 Gradation % Passing by Mass
25 mm [1 in.]	100	100	100
19 mm [¾ in.]	90–100	100	100
12.5 mm [½ in.]	–	90–100	100
9.5 mm [⅜ in.]	10–50	40–80	80–100
4.75 mm (No. 4)	0–15	0–20	5–40
2.36 mm (No. 8)		0–10	0–20
1.8 mm (No. 16)			0–10