Introduction

The Expanded Shale, Clay and Slate Institute is an international trade association for manufacturers of rotary kiln-produced expanded shale, expanded clay and expanded slate lightweight aggregates. The Institute promotes the use of these products for structural lightweight concrete, lightweight concrete masonry, asphalt, geotechnical, horticulture and other markets. Their product research and development findings are disseminated to the building industry and the association works closely with other technical organizations (ACI, ASTM, etc.) to maintain product quality, life-safety and professional integrity throughout the construction industry. Manufacturers are located throughout the United States and Canada. Contact www.escsi.org for locations.

ESCS is a manufactured porous ceramic material produced by expanding and vitrifying select shales, clays and slates in a rotary kiln. The process produces a high quality ceramic aggregate with predictable qualities of being lightweight, inert, structurally strong, dimensionally stable, durable and highly insulative. Best of all, it is an absorptive aggregate that will not degrade over time.

Lightweight aggregates are produced by mining raw shale, clay or slate, crushing them into manageable sizes before being heated in a rotary kiln at temperatures exceeding 2000° Fahrenheit. Once cooled, the material is crushed and screened until the desired application size is achieved.
Material Properties

**Inert and Sterile**- ESCS is a ceramic material, 100% inert and completely inorganic. It can be blended with other soil supplements and is free of insects, weed seeds and soil-borne pests.

**Non Toxic**- ESCS is clean, odorless and contains no toxic minerals that could be damaging to plant or animal life.

**Light in Weight**- At less than half the weight of sand or gravel, ESCS engineered fill will reduce dead loads and lateral forces by more than half. ESCS can also be used to insulate thermally sensitive elements.

**Strong and Durable**- Will not degrade during shipping or handling, nor will it float or break down in the soil over time.

**Network of Pores**- ESCS retains as much as 12%-35% of its weight in absorbed water and water-borne nutrients. Water and nutrients are steadily released as the soil dries.

**Filtration**- ESCS helps cleanse the environment by capturing suspended solids, hydrocarbons, metals, nitrogen and phosphorus. It is an integral component for green roof, bio-retention and porous turf parking media.

**Custom Sizing**- ESCS comes in a variety of gradations that can be blended for custom conditions.

**Material pH**- ESCS can be either slightly acidic or alkaline. It can be easily changed or “charged” with chemical supplements or organic materials to meet the pH requirements of the growing medium.

**Regional**- ESCS is regionally produced with shipping by truck, rail and barge. Less weight equals increased savings on transportation.
Engineered Fill & Drainage Media

ESCS lightweight aggregates are favored in projects where weight is an issue. ESCS materials can help reduce dead loads and lateral forces by more than half in installations over structures and those with soft soils. ESCS fill is also used to reduce pressure behind retaining walls, to insulate underground structures and utilities, as a sub-base material for concrete and landscape pavers and as a stable drainage medium beneath soils. The lighter weight results in greater productivity in the field.
Amending Clay Soils

Clay soils pose challenges to landscape professionals and homeowners alike. The tight structure is easily compacted thereby creating more surface runoff, with less water and oxygen available at the root zone. A 1” irrigation cycle only infiltrates to a depth of approximately three inches in clay soil, prompting shallow rooting and increased water loss to evaporation. When used at a rate of 25-30%, ESCS materials improve the infiltration of clay soils and promote deeper water and oxygen storage for healthier roots and plant materials. The environmental benefits are improved stormwater filtering, less runoff and less wasted irrigation. When ESCS materials are combined with a well aged organic and subsurface irrigation or low spray heads, homeowners and municipalities can benefit from increased water savings. The beauty of ESCS materials is that they only require one application for permanent results.

Improved Infiltration And Soil Structure = Healthier Plants, Less Irrigation Usage, Greater Stormwater Control
Green roofs and large container plantings benefit from ESCS materials that are durable, lightweight, sterile and porous. They have the ability to facilitate drainage while providing beneficial moisture to plant roots. Used in both intensive and extensive systems, ESCS materials provide a wide range of particle sizes to meet growing media specifications and drainage aggregate at significantly reduced weight.
Low impact development techniques for managing stormwater rely heavily on bioretention areas and rain gardens. ESCS materials are a critical component in these soils because they allow for more efficient infiltration, less clogging of the media and greater water holding capacity. The rewards for this approach are less urban runoff, improved environmental filtering, less pressure on combined stormwater and sanitary systems and reduced treatment cost.
Permeable Turf Parking

Most green solutions for pervious turf parking begin with an aggregate base over which a plastic or concrete cell lattice containing a shallow soil media is placed.

Using a blended combination of ESCS materials and select soils eliminates the need for these cell structures thereby saving on material, labor and replacement costs. The ESCS/soil profile is also deeper, which encourages greater root development, healthier turf and improved stormwater filtration.

Permeable turf parking using ESCS materials can be used for temporary overflow parking, emergency access routes and fire lanes. It can be utilized in compaction prone zones and high use areas in parks, golf courses, cemeteries and airports. LEED credits can be obtained by lowering the heat island effect, improved stormwater quality and quantity and the use of local materials. It is an environmentally responsible solution.
Trees are great for the urban environment and mature trees serve us more completely. Their broadened canopies and root systems are better equipped to intercept rain and filter stormwater runoff. Large trees help to reduce the heat island effect and cool parking lots and storefronts, increasing the life of asphalt pavement. Mature trees also produce more leaf area for the sequestration of carbon dioxide which helps purify the air we breathe. They serve to reduce noise and wind forces and provide habitat corridors in an otherwise bleak environment. Studies have shown that their beauty and majesty also help increase real estate values and improve retail sales.

ESCS materials and a select soil are blended to produce a structural soil for urban trees. The structural soil mix can be placed beneath pavements in parking areas or under sidewalks to promote the establishment of expanding root systems and substantially larger trees. The benefits of a structural soil mix include: more available air and pore space, better drainage, high structural strength and less pavement heaving.
Sports Fields, High Traffic Areas

Improperly developed soils for sports fields and high-use areas will struggle with issues from compacted turf. ESCS materials can be incorporated into the soils to improve agronomic conditions with added air/pore space at the root zone and less compaction. The range of gradations and applications are widespread, from turf topdressing, to USGA soil amendments for sports fields, golf courses and parks, to more structural applications where large crowds, vehicles and heavy foot traffic are anticipated.
Alternate Uses

- Hydroponics
- Aquaculture
- Petting Zoos
- Horse Arenas
- Mud Stopper
- Paver Bedding
- Wetland Soil Media
- Bonsai Growers Media
- Orchid Growers Media
- Model Railroad Aggregate

Photographic Index

1. Kimbell Art Museum, Fort Worth, Texas - Engineered fill and planting soil over subsurface parking garage.
2. Nasher Sculpture Center, Dallas, Texas - Engineered fill and drainage media.
3. Klyde Warren Park, Dallas, Texas - Engineered fill and drainage media over highway deck structure.
5. Tradition Senior Living, Dallas, Texas - Clay soil amendment for turf and landscape beds.
7. Dallas Arboretum, Dallas, Texas - Clay soil amendment for planting beds.
8. Klyde Warren Park, Dallas, Texas - Lightweight soil for turf, landscape plantings and trees over deck structure.
11. Healing Garden, Richmond, Virginia - Soil amendment and lightweight container soil.
15. Lone Star College, Humble, Texas - Stormwater control, soil media for rain garden.
16. Wylie Civic Center, Wylie, Texas - Permeable turf, fire lane and maintenance access.
17. Wylie Civic Center, Wylie, Texas - Permeable turf, fire lane and maintenance access.
18. Cowboys Stadium, Arlington, Texas - Permeable turf parking at stadium and remote parking lots.
19. Chancellors Residence, NC State University - Permeable turf parking.
20. Klyde Warren Park, Dallas, Texas - Structural soil media for urban trees over highway deck structure.
22. Streetscape, Riverside, California - Structural soil media for urban trees.
23. World Trade Center Memorial, Manhattan, New York - Structural soil media for urban trees.
24. Tuhaye Golf Club, Park City, Utah - Amended soil on practice range tees for drainage and high use.
25. Veterans Memorial Plaza, Sun City, Texas - Turf soil amended for drainage and high use.
26. Dallas Baptist University, Dallas, Texas - Turf soil amended for drainage and high use.
27. Soccer Complex, Kaysville, Utah - Seasonal turf topdressing.
28. West Jordan, Utah - Stormwater control, soil media for the construction of a wetland.
ESCS materials can be used to earn valuable LEED points:

<table>
<thead>
<tr>
<th>LEED Credit Requirement</th>
<th>Points</th>
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<tbody>
<tr>
<td>SSc6.1  Stormwater Control- Quantity Control</td>
<td>1.0+</td>
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<tr>
<td>SSc6.2  Stormwater Design- Quality Control</td>
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<td>SSc7.1  Heat Island Effect- Non-Roof</td>
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<td>SSc7.2  Heat Island Effect- Roof</td>
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<tr>
<td>MRc5   Regional Materials</td>
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Additional Resources:


Expanded Shale, Clay and Slate is readily available throughout the United States and Canada, and is sold under various trade names. The physical properties of lightweight ESCS may vary slightly according to manufacturer. Contact the Expanded Shale, Clay and Slate Institute for a rotary kiln ESCS producer in your area to obtain precise information on mix design, unit weight and other physical properties.