Rotary Kiln Produced
Lightweight Aggregate
For Geotechnical Applications

1 lb. Soil | 1 lb. Gravel | **1 lb. ESCS Lightweight Aggregate** | 1 lb. Limestone | 1 lb. Sand

Compare The Difference

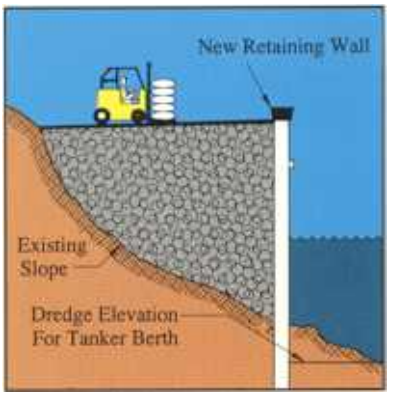
Geotechnical Projects & Applications

Port of Albany Marine Terminal Expansion ❖ *Albany, New York*
Engineer: Childs Engineering, Inc., Medfield, Mass.

Modifications to the Port Albany Marine Terminal reclaimed an area of approximately 1500' x 80' in an unstable slope area and provided increased dockside draft to permit service by large oil tankers. LWA backfill minimized lateral earth pressures, while also reducing overburden pressures on the sensitive silts. Transportation, placement and compaction of the LWA soil fill was readily accomplished in a minimum time frame and without logistic difficulties. Peak delivery rates were 1300 tons, approximately 55 truck-loads per day.

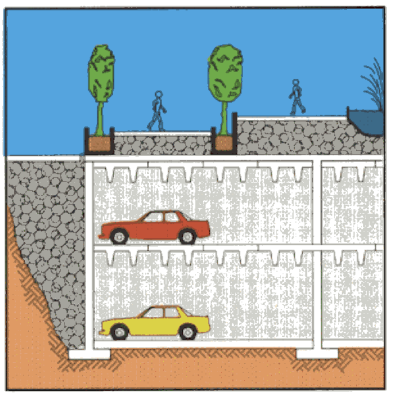
Retaining Wall Backfill ❖ *Providence Rhode Island*
Engineer: C.E. Maguire Engineers, Mansfield, Mass.

This project involved the construction of a retaining wall behind the Rhode Island State House at the Providence River. The weight of the entire project, including the wall, the backfill, and a future roadway at the top of the wall, was quite significant. With the area's soft clay strata, there were engineering concerns that too much weight might force the existing bulkhead toward the river. The use of approximately 3,500 cubic yards of LWA fill reduced the total project weight so dramatically that the probability of deep seated bulkhead failure was virtually eliminated.



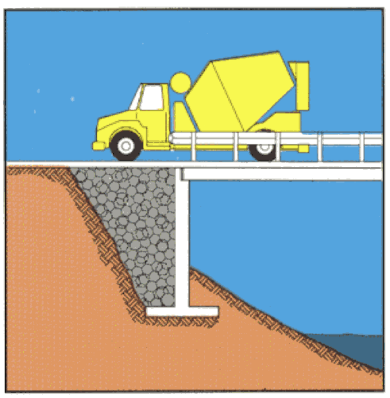
Waterfront Structures

- ❖ Allows economical modification to marine terminals
- ❖ Allows increased dockside draft
- ❖ Reduces lateral thrust/bending moments
- ❖ Allows free drainage and control of in-place density



Landscape & Plaza Fills

- ❖ Minimizes dead loads
- ❖ Free draining helps minimize hydrostatic potential
- ❖ More planters and levels can be added
- ❖ Easy to transport and install



Bulkheads & Retaining Walls

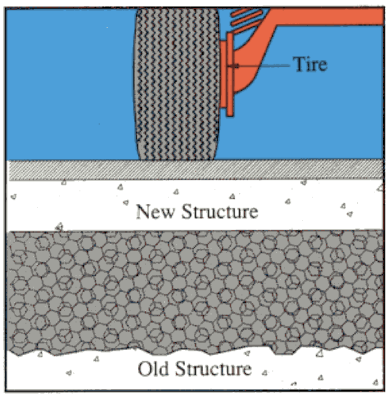
- ❖ Reduces soil thrust as well as bending moments
- ❖ Reduces forces against abutment and end slope
- ❖ Allows free drainage
- ❖ Improves embankment stability

Barney Allis Plaza ❖ *Kansas City, Missouri*
Architect/Engineer: Marshall & Brown Incorporated

6000 cubic yards of LWA (expanded shale) was used as loose granular fill on top of an existing underground parking garage. The material provided subsurface drainage, weight reduction and long term stability. In addition, the LWA material established the grade and contour for a plaza area which was built on top of the parking structure. The LWA material was graded ASTM C330 3/4" x No. 4.

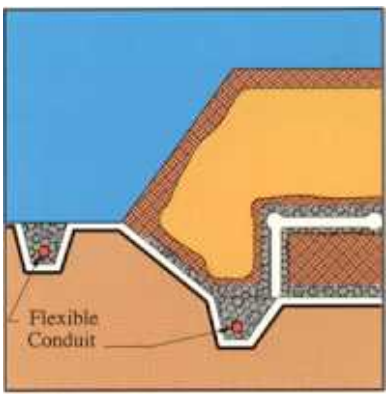
Calgary Pipeline ❖ *Calgary, Canada*
Engineers: City of Calgary / Pildysh & Associates Consultants, Ltd.

Watermains must be installed below the level of frost penetration. In Calgary this requires deep, wide trenches. Such trenches are expensive and often dangerous to workers. The insulating properties of LWA fill allowed engineers to reduce trench depth from 3.3 meters to 2.1 meters. This provided safer working conditions and reliable freeze protection with an environmentally "friendly" material. LWA backfill will also afford easier winter excavation for pipe repair, reduce disruption of water supply and street traffic by decreasing construction time, and eliminate the need for synthetic insulating board and wide trenches. With LWA backfill, present and future savings in capital costs alone are expected to be in the millions.



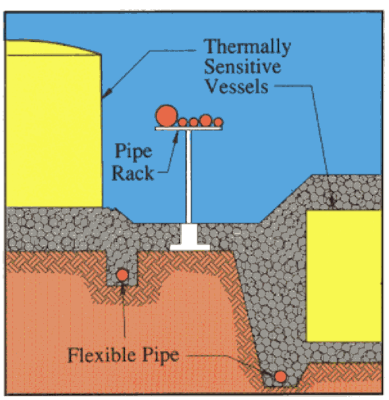
Structure Repair & Rehabilitation

- ❖ Reduces dead load on existing structures
- ❖ Easy transportation and installation increase productivity
- ❖ Precise gradations allow for a uniform and controlled in-place density



Landfill Drainage

- ❖ Inert; high chemical stability
- ❖ Reduces deadloads on pipes
- ❖ Allows free drainage of leachate/water
- ❖ Acid insoluable



Insulating Backfill

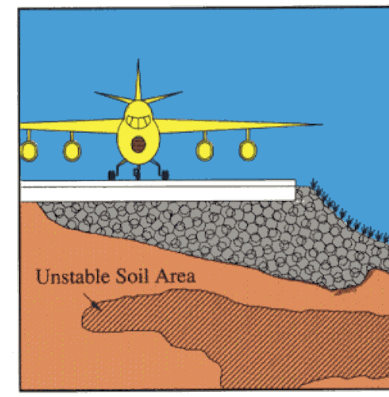
- ❖ Substantially reduces ground movement-induced stresses on buried pipes and structures
- ❖ Counteracts frost heaving, resists freeze/thaw cycles and highly insulative
- ❖ Inert, non-corrosive and stable

Runway Repair ❖ *Norfolk Naval Air Station* ❖ *Norfolk, Virginia*
Engineer: Patton, Harris, Rust & Associates

Much of this facility was built on marsh land. Poor soil conditions and intense traffic loads produced differential settlements and "alligator" cracking of the taxi-way after only 3 years. High soil stability and relief from overburden pressures were provided by substituting compacted LWA for heavy, unstable soil to a depth of 4 feet. LWA material was placed at 6 inch lifts and hand compacted with a vibratory plate. Field compaction and projected yields were monitored using a nuclear densometer. The compacted base was then paved and air traffic restored in a timely manner. Differential settlement was economically solved.

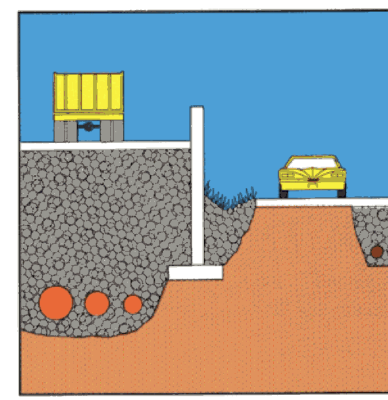
Embankment Fill ❖ *Louisiana DOT D Test Project* ❖ *Morgan City, Louisiana*

Highway embankment fills over unstable soils present particularly difficult problems. Uneven settlement can produce a "Roller Coaster" ride, as well as significant maintenance problems. The Louisiana Department of Transportation and Development constructed a series of roadway test sections with sand fill 9.5 ft. in depth. In one section, 2.5 ft. of sand was replaced with 2.5 ft. of LWA fill. The reduction in weight, coupled with the increase in long term stability provided by the LWA's high angle of internal friction, reduced settlement 40% to 60% as compared to the all-sand fill. Considerable savings in highway maintenance, repairs and replacement can be realized if differential settlement is reduced.



Fills Over Poor Soils & Marsh Lands

- Allows otherwise unuseable land to be reclaimed and developed
- Design elevations are achieved with low fill weight
- Low fill weight increases slope stability
- Controlled gradations assure uniform and consistent in-place density
- Long-term settlement is controlled and reduced
- Controlled fill allows uniform load distribution



Underground Conduits & Pipelines

- Reduces dead loads on buried structures
- Allows construction of higher fills
- Minimizes hydrostatic potential
- Provides thermal insulation to underground facilities
- Economic alternative to flowable fills

Contact a Rotary Kiln Expanded Lightweight Aggregate producer listed on the back of this brochure for complete information and specifications.

THE PROVEN SOLUTION

For almost 50 years Rotary Kiln produced Expanded Lightweight Aggregate (LWA) has been effectively used to solve geotechnical engineering problems and to convert unstable soil into usable land. Lightweight aggregate can reduce the weight of compacted geotechnical fills by up to one-half. Where thermal stability is required, LWA provides significantly greater thermal resistance when compared to soil, sand or gravel fill. It affords permanent economical insulation around water lines, steam lines and any other thermally sensitive vessel. This inert, durable, stable, free-draining and environmentally "friendly" lightweight aggregate is extremely easy to handle and provides economical long term solutions for geotechnical challenges.

THE MATERIAL

Expanded shale, clay and slate lightweight aggregate (LWA) has a long track record of quality and performance. Since its development in the early nineteen hundreds, LWA produced by the rotary kiln process has been used extensively in asphalt road surfaces, concrete bridge decks, high-rise buildings, concrete precast/prestressed elements, concrete masonry and geotechnical applications. The quality of LWA results from a carefully controlled manufacturing process. In a rotary kiln, selectively mined shale, clay or slate is fired in excess of 2000° F. The LWA material is then processed to precise gradations. The result is a high quality, lightweight aggregate that is inert, durable, tough, stable, highly insulative, and free draining, ready to meet stringent structural specifications.

DESIGN ADVANTAGES

- Reduces Dead Loads
- Reduces Lateral Forces
- Reduces Over Turning Forces
- Provides High-Friction Angle
- Controlled Gradations
- Free Draining
- Water Insoluable
- Acid Insoluable
- High InsulationValue
- Chemically Inert
- High Strength & Durability
- Easy to Handle and Install
- Readily Available
- Environmentally "Friendly"

PHYSICAL PROPERTIES

The physical properties for specific types of rotary kiln expanded light-weight aggregate may vary according to manufacturer. For precise information on unit weight, specific gravity, compacted density, friction angle, thermal conductivity and the other physical properties of a particular LWA material, consult the rotary kiln expanded shale, clay or slate producers listed on the back of this brochure.

Wherever you live, work or play, ESCS improves your world!

For nearly one hundred years ESCS (Expanded Shale, Clay and Slate) has been used successfully around the world in more than 50 different types of applications. The most notable among these are concrete masonry, high-rise buildings, concrete bridge decks, precast and prestressed concrete elements, asphalt road surfaces, soil conditioner and geotechnical fills.

What is ESCS? It is a unique, ceramic lightweight aggregate prepared by expanding select minerals in a rotary kiln at temperatures over 1000°C. The production and the raw materials selection processes are strictly controlled to insure a uniform, high quality product that is structurally strong, stable, durable and inert, yet also lightweight and insulative. ESCS gives designers greater flexibility in creating solutions to meet the challenges of dead load, terrain, seismic conditions, construction schedules and budgets in today's marketplace.

Expanded shale, clay and slate aggregate, as manufactured by the rotary kiln process (*originally developed in 1908 and patented in 1918 as Haydite*), is available throughout the world.

Expanded Shale, Clay and Slate Institute

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