

**The Road To Success
Is Paved With
Lightweight Aggregate.**



Lightweight Aggregate Paves the Way for Safe and Economical Roads.

When Choosing the Right Pavement Material, the Road Leads to Lightweight Aggregate.

Expanded Shale, Clay and Slate Lightweight Aggregate (LWA) has been used on all types of roads (rural, city and freeways) with proven superior performance. First introduced to the asphalt market over thirty years ago, the use of LWA currently exceeds 3,000 miles annually in the United States alone. LWA has been used in over twenty states with total installed costs competitive to normal weight aggregates yet with far more advantages.



From a fiery rotary kiln comes lightweight aggregate processed in varying gradations and textures.

What is Lightweight Aggregate?

Expanded Shale, Clay and Slate Lightweight Aggregate has a long track record of quality and performance. Since its development in the early 1900s, LWA produced by the rotary kiln process has been used extensively in asphalt road surfaces, concrete bridge decks, high-rise buildings, concrete masonry and geotechnical applications. The quality of LWA results from a carefully controlled manufacturing process.

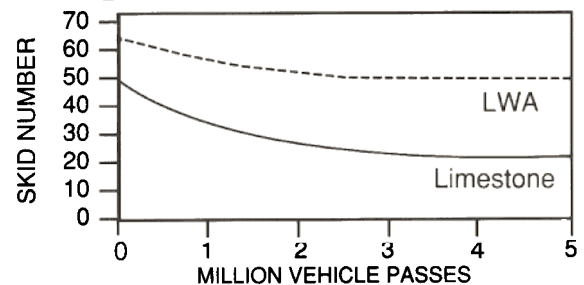
In a rotary kiln selectively mined shale, clay or slate is fired in excess of 2000° F. The LWA material is then processed to precise gradations. The result is a high quality, lightweight aggregate that is inert, durable, tough, stable, highly insulative and free draining, ready to meet stringent structural specifications. When bonded to asphalt it creates an advanced road surface that is safer, more economical and longer lasting than its normal weight aggregate counterpart.

Lightweight Aggregate Can Save Lives.

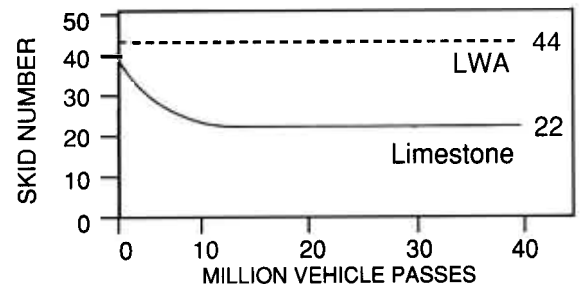
Safety is increased due to the superior skid resistance (wet or dry) of road surfaces made with LWA. This high skid resistance (Fig.1 & Fig.2) is maintained throughout the road's service life because of the aggregate's rough micro surface texture. Pavements made with normal weight aggregates (especially those using limestones, dolomites and gravel) may polish or become slick under the action of traffic and lose a large percentage of their skid resistance. Lightweight aggregates do not polish as they wear. LWA pavement maintains its high skid resistance because under wear, fresh interior cells with rough ceramic-like edges are continually exposed.

All tires sold in the United States are certified for friction compliance on a hot-mix LWA pavement built for the Federal Highway Safety Administration in San Angelo, Texas. Lightweight hot mix was chosen for its constant high friction and durability.

Chip Seal Skid Resistance (Figure 1)



Hot Mix Skid Resistance (Figure 2)



Notes:

Information provided by the Texas Department of Transportation, District II, and the Texas Transportation Institute. **Figure 1:** --- 100% Lightweight Chip Seals. This plot represents over 100 skid tests with each test representing up to 6 data points. — 100% Limestone Chip Seals. This plot represents over 75 skid tests with each test representing up to 6 data points. **Figure 2:** --- Hot mixed asphalt concrete uses 100% lightweight expanded shale, clay or slate as the coarse aggregate. This plot represents approximately 200 skid tests with each test representing up to 6 data points. — Hot mixed asphalt concrete uses 100% limestone as the coarse aggregate. This plot represents approximately 100 skid tests with each test representing up to 6 data points.



LWA pavement helps save automobile fatalities and injuries due to superior skid resistance, wet or dry.

Lightweight Aggregate Makes Tax Dollars Go Farther.

The roadway service life is extended because of LWA's unique and superior bonding capabilities with asphalt. When bonded to the asphalt, lightweight aggregate presents a tough, durable pavement that holds up well under traffic and outlasts most pavements made with normal weight aggregate. LWA has minimal dust unlike normal weight aggregate that is often coated with dust that prevents uniform bonding and creates public complaints during application. Lightweight aggregates consistently pass Los Angeles Abrasion Requirements as well as other quality tests. LWA also shows superior "freeze-thaw" resistance and durability to de-icing salt corrosion. If snow plow damage occurs, LWA is far more resistant to being stripped out than normal weight aggregate.

Lightweight aggregate is the proven solution for cost-sensitive highway and road departments. LWA offers lower direct and indirect costs over the service life of the road and is the reason more state and local transportation departments are specifying LWA.



Lightweight aggregate bonds uniformly to asphalt to create a safe and durable road surface.



LWA offers more than twice the volume for the same weight of conventional aggregates.

Many Cost Advantages in Transport and Construction.

Δ Material haul costs are reduced because LWA weighs about half that of normal weight aggregate thus allowing for a much larger volume of material per truck load and less overall tonnage to be hauled.

Δ Contractors consistently report fewer breakdowns because of less equipment wear and tear.

Δ LWA is much easier to hand-broadcast.

Δ Chip seal projects are safer because there are fewer and less dangerous flying particles caused by passing vehicles. Windshield damage claims are practically eliminated.

Δ Brooming or vacuuming excess chips from chip seal projects is much easier with LWA.

Δ Lightweight aggregate is easily pre-wetted and will hold moisture for days in a stockpile providing an almost dust-free placement – a plus when emulsions are used with chip seals.

Δ Lightweight aggregate is readily available throughout the U.S., Canada and much of the world.

Δ The contractor can use the same machinery and equipment as with normal weight aggregate with one exception: only use pneumatic rubber-tire rollers with chip seal projects (no steel-wheel rollers).

Lightweight Aggregate is the Preferred Pavement Choice, Regardless of Application.

Chip Seal

This surface treatment is referred to by several names depending on the local area. The most common name is chip seal, however, other names like seal coat, surface treatment, inverted penetration, oil and chip, chip and seal, and armor coat are also used.

Chip seals are made by spraying a layer of asphalt emulsion or hot liquid asphalt, covering it with aggregate and then rolling it. Only pneumatic rubber tire rollers are used with LWA.

Any chip seal application has some non-embedded loose stones that can be picked up by a tire and sent "flying". Damage to windshields, headlights and paint caused by "flying" stones is practically eliminated with LWA thus avoiding those costly insurance claims and motorist complaints. The lightness of the LWA plus the higher wind resistance of the rough surface texture lowers the speed at impact. The resulting striking force is too small to do damage. The rough surface texture also bonds to the asphalt better so there are fewer "flying" particles in the first place.

Chip seal paving is a low cost durable surface treatment since it uses less materials and is not premixed at the asphalt plant or job site. This type of surface treatment is normally used on low-volume rural roads or city streets. However, because of its high skid resistance, superior bonding capability and lack of vehicle damage, LWA chip seals have been used on high-speed/high-volume city streets and highways such as the Autobahn in Germany and Interstate highways in the United States.

Lightweight chip seals offer the engineer an economical, long lasting road surface that is safer to drive on and free of motorist complaints.

Plant Mix Seal Overlay or Open-Graded Friction Coarse

This application uses uniformly-sized aggregate. The material is first pre-blended in a drum mix plant using excess oil. The mixture is sent to the job site hot and is put down with a standard laydown machine. The finished road surface has a coarse open-graded texture that is very durable with excellent drainage and skid resistance.



LWA plant mix seals are often used to overlay existing pavement after extensive repairs have been made.

Plant mix seals are very effective on high-volume/high-speed roadways and, because of the open texture, they offer a quieter ride and much less water spray from moving vehicles especially trucks. This type of surface design is quieter because percussion cups are eliminated by the open surface.



Hazardous truck spray and splash from regular dense-graded surface.



Open-graded plant mix surface without spray and splash.

Hot Mix Surface Coarse

Hot mix, the premier asphalt surface alternative, is much denser and a tighter graded mixture that is usually a blend of LWA and normal weight aggregates. This material is shipped hot and laid down using conventional methods.

LWA hot mixes have performed successfully on freeways with high truck traffic. Increased skid resistance and extended performance life makes LWA hot mixes a preferred choice.

Micro-Surfacing (Slurry Seal)

Micro-surfacings are useful in stopping the deterioration of an oxidized asphalt surface and the various types of problems that occur with weathering. Fine-graded LWA works well in slurry seals and micro-surfacing, and improves skid resistance.

Cold Mix – Pothole Patch

LWA is versatile in cold mix form because it has a tenacious bond with asphalt. Since it has a lower heat capacity than normal weight stone, LWA can be used in deep pothole patching applications.



**Lightweight Aggregate.
From Stone Age to a Modern Age
of High Tech Performance.**

In a rotary kiln, selective shale, clay or slate is fired in excess of 2000° F; then processed to exacting gradations and specifications for today's modern roads and highways.

Bidding, Mix Design and Aggregate Considerations.

Bidding

Bid forms and bid evaluations must be converted to include an equivalent volume measurement rather than just a weight measurement. This keeps all materials on an equal and competitive basis by correctly adjusting for the large difference in the aggregate weight/volume ratios.

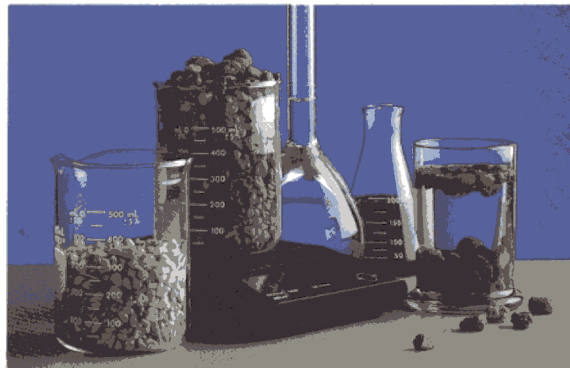
Mix Designs

Mix designs must also be adjusted volumetrically with appropriate weights being used for lightweight aggregate.

Lightweight Aggregate

The physical properties for specific types of rotary kiln expanded lightweight aggregate may vary

according to manufacturer. For precise information on mix design, unit weight and other physical properties of a particular LWA material, consult the rotary kiln expanded shale, clay or slate producers listed below.



Expanded Shale, Clay and Slate Aggregate is chemically inert, durable, economical and environmentally "friendly".