



LEAN SAND ASPHALT (LSA)

Material Description:

Lean Sand Asphalt (LSA) is essentially sand mixed with bitumen with properties similar to dry sand when hot. It will form a hard bound material that is very resistant to wave and tidal action within minutes making it incredibly versatile as a formation layer or emergency fill material in wet environments including underwater.

Primary Uses:

- 3D filter layer below OSA
- Regulating layer and void filler

Common Alternative to:

- Geotextile
- Granular filter layers
- Clay or lean mix concrete void filler

Constituents:

- 96% Sand
- 4% Bitumen

Properties:

- Porous, flexible, robust.
- Resistant against wave, tides and water flow within minutes for short durations typically 1-7 days.
- Placed density of 1.6 t/m³
- Permeability of 1 x 10⁻⁴

Production & Installation:

- Produced in standard asphalt plants
- Delivered in standard 8-wheel delivery lorries
- Can be stored on site for 48 hours
- Placed with standard or long reach excavators
- Delivered at 160°C
- Can be placed in all weathers and underwater
- Does not require compaction

Durability:

LSA is not designed as to be left exposed to tides, waves and water flows for extended periods but as a test, was recently left exposed for six months over the winter 2023/2024 with no sign of any material loss or degradation.

LSA is flexible, so will follow settlement of underlying formation without breaking up.

Maintenance:

LSA requires zero maintenance. However, if the overlying armour layer is removed and the LSA is damaged through foreign object strikes or wave attack, the existing material needs only cleaned and fresh LSA/OSA placed on top.



LSA being placed as void filler and filter layer



LSA shaped to form channels and embankments for pump outfalls

Environmental Compatibility:

- The life carbon content has been calculated independently as being approximately 6 times less than the equivalent concrete products.
- Asphalt has been used by all main water companies in the UK. Water exposed to LSA has been found to contain no harmful chemicals above the UK limits for potable water. Individual water companies carry out their own monitoring and we have repeat business from them all.
- Asphalt is compatible with the environment and has been used within many SSSIs.
- At the end of its life, or if the material is removed, it is easily recycled. The material can be processed and added to RAP (Reclaimed Asphalt Pavement) for use in new asphalt materials.

Key Performance Information:

- LSA will function as a three-dimensional filter layer with the sand and bitumen creating a tight matrix with which to retain formation particles.
- No special joint treatment is required between LSA placed at different times. A cleaned joint will allow fresh LSA to bond & key into the existing material
- LSA can be placed underwater though requires to be below 100°C when used in this way so as not to affect the bitumen bond between the particles.
- Voids filled with hot air within the LSA mean it is able to retain its heat during transport and be stored on site for up to 48 hours with no detriment to its performance and still be workable.

Resistance to Wave Impacts and Water Flow:

- LSA is not designed or installed as protection against wave attack in and of itself, it has been shown however to be very resilient to tidal conditions for many weeks when left exposed over winter periods.
- LSA is not designed to specifically withstand waterflow but is not washed away within minutes of being paced by running water and can be placed underwater.



LSA used as void filler where concrete blocks have failed



LSA used overlaid on existing revetment tying into groyne prior to OSA layer

Limitations:

- LSA is not an armour layer and should be considered as one.
- LSA is not a reliable formation for pinning/bolting for concrete formwork but is excellent as a bulk fill for concrete to be cast on

Sources:

Communications – The Use of Asphalt in Hydraulic Engineering by Technical Advisory Committee on Water Defences (Rijkswaterstaat – Netherlands Government).