

SB - BITUMINOUS ASPHALT CONCRETE BASE FOR BASE-BINDER LAYERS

PRESENTATION:

The base layers are used in thicknesses that rarely drop below 10 centimetres, with a maximum size also above 30. The advantages provided by this type of deep concrete which justify its wide usage can be summarised in the following three points:

- Considerably reduce stress from traffic on the foundation or on the substrate.
- The foundation is immediately protected from rain from the laying of the first layer.
- The paving machine, with normal asphalt pavers, ensures greater respect for the work surfaces and the thickness of the superstructure.

INTENDED USE:

Conglomerates with these properties in the base layers allow the maximum use of local materials and therefore are intended for direct contact with stabilised open-graded material and cement-bound granular material.

COMPOSITION:

The most common thicknesses of a deep layer vary between 10 and 20 cm.

It is also possible to prepare a base for a surface that requires two or more layers of bituminous asphalt concrete by interposing an anchoring layer in cationic emulsion between them. The bitumen required varies between 3.5% and 4.5% of the weight of the aggregates.



::: **SB - SCONNECTING LAYERS**

• • • BITUMINOUS ASPHALT CONCRETES FOR CONNECTING OR BINDER LAYERS

PRESENTATION:

The connecting layer is the part of an intermediate bituminous surface paving between the surface and the base. The loads applied on a road surface are distributed more and more from the top to the bottom. It follows the technical economic opportunity that this layer should be a semi-closed structure and with thicknesses depending on the traffic to which it is subjected.

INTENDED USE:

The properties of a connection layer are to be related with the characteristics of the aggregates of size 0+20 mm and with the rheological particularity of the traffic stresses and with the cohesion of the natural bitumen used.

The spreading of a bitumen emulsion in the ratio of 0.7+1.0 kg/sqm. should be carried out to ensure the anchoring between the connecting layer and the base.

COMPOSITION:

The most common thicknesses of a connection layer vary between 6 and 8 cm.

It is also possible to provide a binder for surfaces requiring two or more layers that rest on the stabilised open-graded material of the superstructure.

The bituminous binders (from 4.0 to 5.5%) are consistent with reference to local temperatures and the established thicknesses of road surfaces.



BITUMINOUS ASPHALT CONCRETE



• • • **SB - WEARING COURSE**

• • • BITUMINOUS ASPHALT CONCRETE FOR WEARING COURSE

PRESENTATION:

The wearing course is the part of a bituminous surface in direct contact with weathering actions and those of traffic. The mixtures used in these surfaces must have a high resistance over time to vertical and tangential stresses and strain. Fagnano Spa has concrete mixes perfectly suitable for any surface, all with the same application, and the scrupulous care of components and production processes. There is wide range of aggregate-bitumen mixture categories present on site and are marked with the letters "A", "B", "C" and "D".

INTENDED USE:

These concrete mixes are used as needed:

- Categories "A" and "B" for roads with medium to extensive urban and suburban traffic, the maximum size contribution of the dry mixture ranges from 12.5 to 16.0 mm.
- Category "C" for roads with low-medium traffic: maximum stone aggregate size 10 mm.
- Category "D", maximum size of the stone materials 8 mm: for closure of excavations in restricted sections, holes, road curbs, for deep maintenance operations, etc.

COMPOSITION:

The stone elements for the four categories are constituted by Fagnano S.p.A. premium category crushed aggregates, but also depend on the request of the supply type.

The bituminous binders (from 5.0 to 6.5%) are of consistency with reference to local temperatures and the established thicknesses of road surfaces.

A cationic emulsion, usually 60% of distilled bitumen, must be sprayed between the laying carpet layers and those below to ensure anchoring.



BITUMINOUS ASPHALT CONCRETE



::: **SB - DRENBIT** • • • PERMEABLE BITUMINOUS ASPHALT CONCRETE

PRESENTATION:

The permeability wearing course is a special bituminous carpet that, thanks to the particularly high quality choice of aggregates and bitumen and the granulation dimensions, allows to achieve high performances in terms of safety. The wearing course layer consists of a mixture of crushed stone chippings, a small quantity of sand and filler; these are open-graded-concrete mixes that provide high surface roughness, stability, resistance to deformation, reduction of rolling noise, elimination of water stagnation and excellent drainage.

INTENDED USE:

Used on roads and motorways with intensive traffic with a thickness of 50 mm; sometimes even on municipal roads provided that optimal conditions of water systems management and the disposal of rain water that make it possible to evacuate the water level inside the layer are always ensured.

COMPOSITION:

The mixture of stone aggregate and mineral additive to be adopted for drainage must have an overall grain size with a strong uneven trend with the maximum size of 18/20 mm, compulsory hot mixed with hard modified bitumen and with a content between 4.5 - 5.5% of the weight of the aggregates.

The drainage is ensured not just by the total amount of voids (16/20%) but also by their well-planned intercommunication. It is crucial to ensure drainage in addition to appropriate planning of voids, even creating the optimal conditions of the laying surface with a side slope of at least 2% in order for the water to flow into the collection deposit.



BITUMINOUS ASPHALT CONCRETE



::: SB - TWO DRENBIT

• • • DOUBLE LAYER PERMEABLE BITUMINOUS ASPHALT CONCRETE

PRESENTATION:

The double layer drainage wearing course is based on the concept of combining a top layer, easy to clean and able to work as a filter to a lower layer with high drainage capacity. This coordinated funnel action derives from the interconnection of voids of different sizes in the two layers.

This coordinated funnel action derives from the interconnection of voids of different sizes in the two layers. This action not only facilitates the cleaning of the bituminous layer but increases its adherence due to the presence of micro texture of stone materials of the surface layer and ultimately extends the duration of the surface.

INTENDED USE:

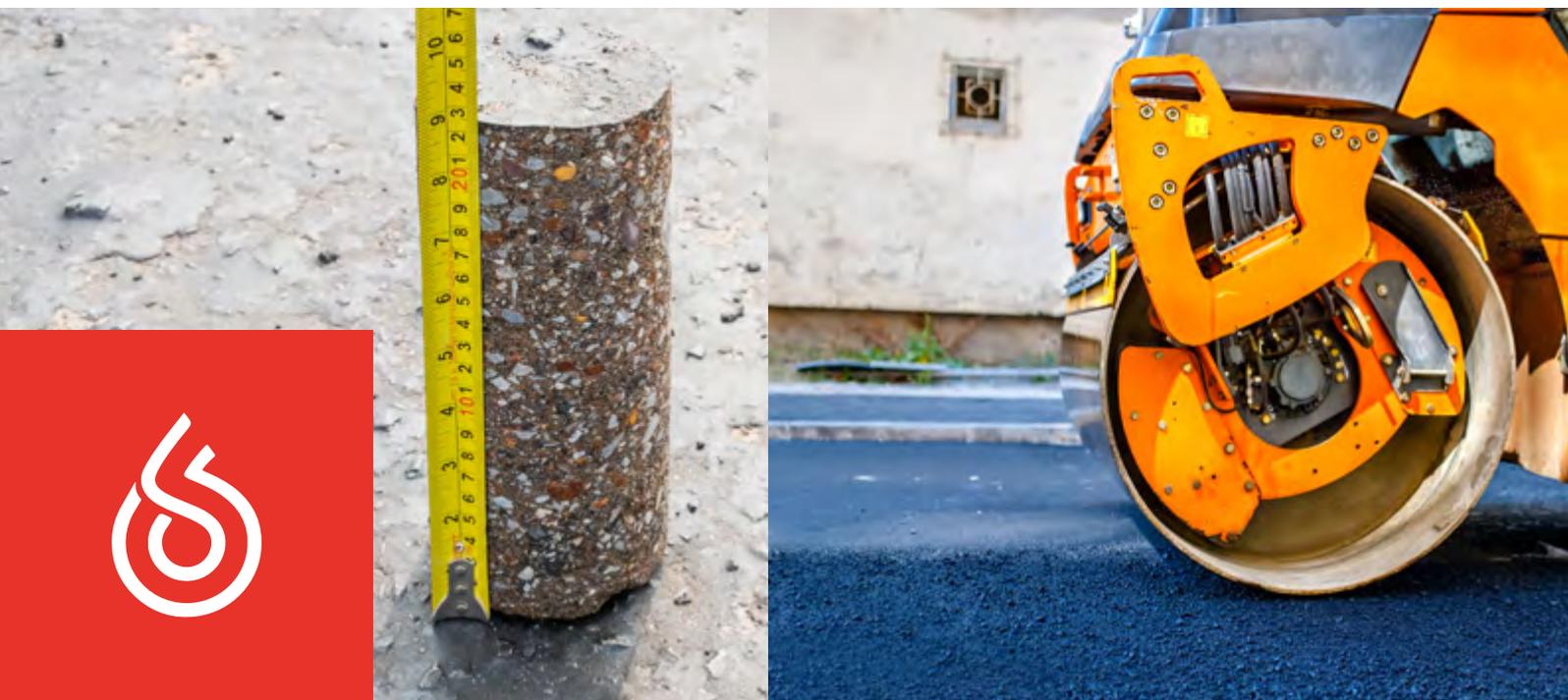
Such a bituminous mass presents a high residual void content ($\leq 25\%$) and is applied on a laying surface with a modified bitumen or modified emulsion anchoring layer, which has the function of waterproofing the underlying layers.

It is used on roads and motorways with high traffic with thicknesses of 20 mm for the lower layer and 10mm for the overlying layer.

COMPOSITION:

The lithoid elements consist of basaltic aggregates for the upper layer and by premium class crushed material in the lower layer with an inert-bitumen mixture having an overall particle size with a discontinuous trend of smaller size of 20mm. Particular attention is given to the laying surface which must be impermeable and have a diagonal slope of about 2.5% enough to ensure drainage of rainwater into the side collecting deposits.

As a result of its two comprehensive features and its high drainage capacity, the product proves to be an advantageous concrete mix in terms of cost-benefit and above all for the duration when compared to the traditional drainage surfaces.



BITUMINOUS ASPHALT CONCRETE



::: **AL TOMOD** • • • HIGH COMPLEX MODULUS BITUMINOUS ASPHALT CONCRETE

PRESENTATION:

The use of high modulus concretes is for the sole purpose of prolonging the useful life and durability in the presence of structural defects of the bituminous layers.

It has high load-bearing capacity, therefore able to support not only the repetition of traffic-borne stresses, but above all, by the volume of traffic expected in the future.

INTENDED USE:

The properties of a high modulus layer are designed to be used in urgent interventions of road surface restoration by reshaping and consolidation of deteriorated areas, in particular in the presence of cracks originating from the lower layers.

COMPOSITION:

The most frequent thicknesses for a layer with high complex modulus vary from 6 to 10 cm.

Use of binders modified by the complex modification of direct distillation bitumen. Percentages of binder greater than 5.5% and percentages of voids less than 4%.



BITUMINOUS ASPHALT CONCRETE



::: **SB - S.M.A.** • • • SPLITTMASTIX ASPHALT BITUMINOUS CONCRETE

PRESENTATION:

The SPLITTMASTIX ASPHALT concrete mix is a concrete mix characterised by a closed stone frame (2+ 4%) and a discontinuous grain size bound by a high viscosity bituminous mastic which consists of modified bitumen and stabilising material. It is also called "non-slip" because the conglomerate is composed of premium class stone elements and by a bituminous mastic which confers high mechanical properties, low void content and substantial surface roughness.

INTENDED USE:

This closed layer is completely impermeable to the underlying layers and is intended for use on roads with heavy traffic and areas with harsh climates and use of studded tires. The SMA is also used to asphalt large service areas (ports, airports, shopping centres) where high resistance to wear and rutting is necessary.

COMPOSITION:

Depending on the type of traffic, it is possible to process multiple grain size curves 0/12, 0/18 and 0/22. The discontinuity position in the curves is a function of the aggregate maximum size and the filler content that may also reach 10%. The most common thicknesses are 4+6 cm.

Stabilising materials are recommended with the use of hard modified binders with percentages between 6 and 8%.



BITUMINOUS ASPHALT CONCRETE



SB - OPEN GRADE "BITUMCEMENTO" BITUMINOUS ASPHALT CONCRETE

PRESENTATION:

The "open-graded" draining bituminous asphalt concrete, filled with cement mortar, is a new technological product for the construction of "semi-flexible type" surfaces for roads, ports and airports.

It is resistant to punching shear, chemical aggression such as oil, fuel, benzene spills, etc. and also the intense heat of a scorching summer.

It is a system called "grouted macadam: filling a cobblestone" and combines the characteristics of the massiveness and strength of the cement matrix with that of the high elasticity of bituminous concrete.

INTENDED USE:

This open and filled layer is used on areas with high loads (e.g. traffic with "camalli" (dockers) in the ports of Gioia Tauro and Ancona), airport runways, aprons, helipads, industrial yards greatly affected by heavy traffic, steel factories, deteriorated concrete roofing slabs, etc.

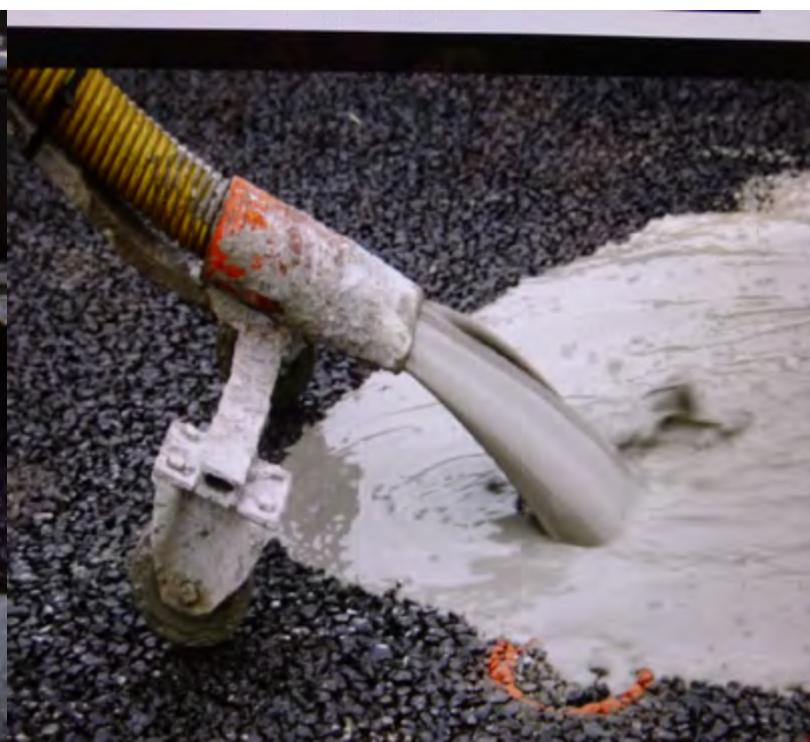
COMPOSITION:

The open-graded system consists of a draining type bituminous asphalt concrete that has the function of forming the backbone of the surface layer and subsequently by a special cement mixture intended to fill the voids of the previously placed pseudo-drainage.

The bituminous asphalt concrete is characterised by its high porosity, practically a void percentage expressed in volume equal to 28/30% and a bitumen content of around 4.0+ 4.5%.

The particular absorption of the particle size in this way ensures the creation of a network of inter-granular voids intended to receive the cement mortar which in turn produces a massive finished product called "bitumcemento" (bituminous-cement). The final average thicknesses are between 4 and 8 cm, in particular cases it may have a greater thickness.

The laying of the cementitious mixture, thanks to its unique fluidity, is carried out either with an automated machine (see figure) or by hand using gravity to make the grout penetrate into the lower draining layer.



BITUMINOUS ASPHALT CONCRETE



• • • **SB - REDSIN** • • • RED BITUMINOUS ASPHALT CONCRETE

PRESENTATION:

The use of "red colour" compacted mat has spread due to highlighting the bituminous concrete on limited applications and to achieve colour effects on areas and places not subject to considerable stress taking into consideration its poor performance characteristics.

INTENDED USE:

The use of such bituminous asphalt concrete is limited to areas such as parks, gardens, avenues, villas, squares and sports areas, etc. For many years, now urban surfaces been required to perform important functions through the use of colour, for example dedicated lanes both for those using scooters, bicycles, prams, etc.. and also to contribute to the channelling of slow traffic.

COMPOSITION:

The lithoid elements are common alluvial calcareous aggregates of a compacted mat, that is, sand, grit and fillers, all mixed to a traditional bituminous binder, but with the addition of "iron oxide". Attention must be made in particular to the use of the filler (passing through a 63 micron sieve mesh) in a parameterised quantity between 8% and 10%, related to the total weight of the inert mixture. This is because the filler has a significant influence on the mechanical strength, both through the completion of the particle size (reduction of voids) and in the reduction of viscosity and the susceptibility of the bitumen. From experience, iron oxide or sesquioxide is used depending on the established quantity of bituminous binder (60/70% of the bitumen content).

As an alternative to the "red" blends, Fagnano Spa can provide a full range of coloured concrete mixes: yellow, green, blue, etc. Colours created ad hoc on customer request are available on highlighted folders.



::: **SB - OPTIMISED GRADED CONCRETE** • • • IMPROVED WEARING COURSE

PRESENTATION:

This concrete mix is always produced in accordance with UNI EN 13108-1 at the packing plant of Fagnano Spa strictly using premium category aggregating and hard modified bitumen.
The particularity of this surface concrete with closed mixture is that it maintains its massive properties over time which increases stability and a greater mechanical resistance to deformation.

INTENDED USE:

It is recommended to be used where the last layer of bituminous asphalt concretes are exposed to extreme and very low thermal conditions and in all cases in which it is advisable to prevent viscoplastic deformation.

COMPOSITION:

- Large aggregate (≥ 2 mm) made from stone chippings derived from the crushing of alluvial gravels with resistance to crushing $\leq 20\%$ with polyhedral elements and sharp edges.
- Small aggregate (≤ 2 mm) consisting of calcareous sands mainly obtained from crushing with $ES \geq 70$.
- Mineral additive (filler) from crushing of limestone rocks or cement replaceable, hydrated lime, or hydraulic lime.
- Bituminous binder: PMB with penetration at $25^{\circ}\text{C} \leq 45$ dmm and softening point $PA \geq 75^{\circ}\text{C}$.

