Hydraulically Bound Mixtures

Cement Bound Granular Mixtures (CBGM)

EN14227-1 / SHW 800

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An Introduction to Cement Bound Granular Mixtures (CBGM)

Reduce your asphalt costs by using HBM

If you are constructing a road or car park with a flexible asphalt design or base course asphalt under block paving we can significantly reduce your material purchase costs by supplying HBM as a replacement for the base course asphalt and unbound sub-base layers. In many cases the depth of construction can be reduced, saving disposal costs.

The constituent aggregate is 100% recycled providing a sustainable solution to your pavement project.

Additionally a HBM base creates a 'flexible composite' construction rather than a fully 'flexible' construction which can result in a longer service life for the road or car park.

What is a Hydraulically Bound Mixture?

The term Hydraulically Bound Mixtures is used to describe soil or aggregate mixtures that incorporate binders based on Cement, Lime, Gypsum and Fly Ash. They are termed Hydraulically Bound Mixtures due to the hydraulic reaction which hardens and binds the mixture in the presence of water.

You may already be familiar with Cement Bound Material (CBM). This is now classified in the Highways Agency (HA) and European Standards documents as CBGM and is one of four main designation mixtures that can be used in pavement construction.

We produce this material to HA specifications and EN standards through our high capacity production unit and can advise you on the best solution for your project.

What next?

Ideally, consulting engineers will incorporate the flexible composite option within their designs.

Send us your current design with as much information about the project as possible and we will reply with an alternative suggestion for your engineers to consider.

HBM design documents include Highways Agency HD26 and IAN 73, KCC Design Guide, Surrey CC Design Guide, Britpave and Transport Research Laboratory (TRL).

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Advantages of using Hydraulically Bound Mixtures

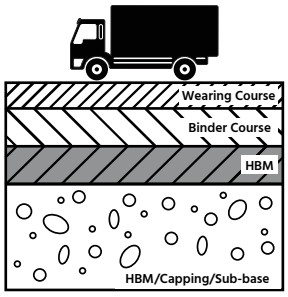
Hydraulically Bound Mixtures can be used in a variety of paving applications and offer many advantages over existing products.

- Can contain up to 100% recycled aggregate
- Some mixes allow the re-use of site won materials (e.g. granular)
- No Aggregate Levy
- CO_2 savings compared to using traditional aggregate sub-base
- Assistance in meeting clients requirements for 'green' procurement
- HBM is manufactured and used in accordance with the Specification for Highways Works 800 Series and can be approved for national use without the need for trials with individual street and road authorities
- Plant for laying and compaction of HBM is similar to that required for laying and compacting other paving materials such as unbound layers and bituminous bound products

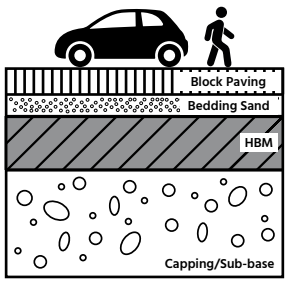
Applications

HBM can be used in the following applications:-

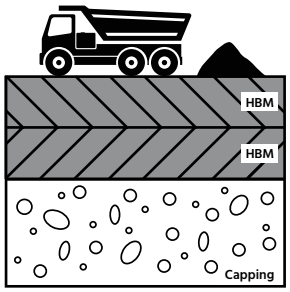
Adoptable Highways



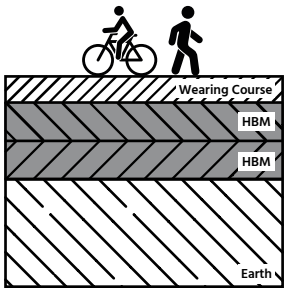
Block Paving



Hardstanding



Footpaths



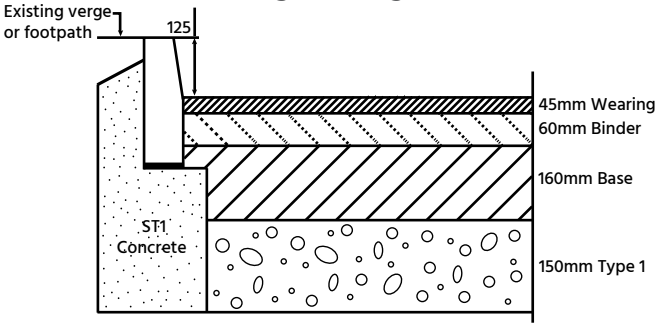
Cost Saving Example

The diagrams below illustrate the potential cost saving when incorporating CBGM within road construction.

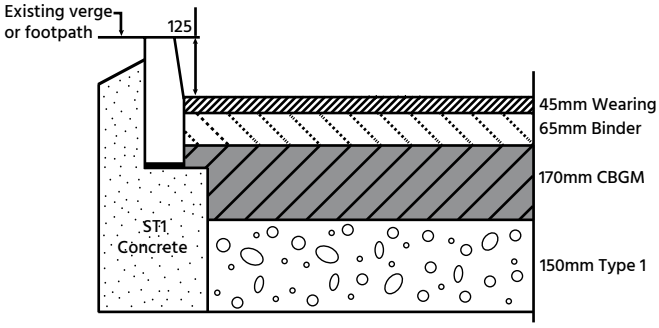
Using the traffic loading information and CBR values of the existing design it was possible to replace the base course asphalt with CBGM which significantly reduced material costs by 30%.

A slight increase in binder was required to comply with the Highways Design Document (HD26).

Original Design



Adopted Design



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Method Statement - Production, Transportation and Placement of HBM

Production - Plant Mixed Method

- We produce in a stationary mixing plant that batches by weight and mixes in a forced action mixer, allowing sufficient time in the mixer to produce a homogenous mixture
- The mixing plant has an automated surveillance and data collection system
- HBM is transported directly to the point where it is to be laid and protected from the weather during transit and whilst awaiting tipping

Placement

- Layers shall be laid using a paver; alternative means of placement must be agreed by the overseeing organisation
- Placement shall be carried out in a way that avoids segregation and drying out of the surface
- The minimum compacted lift thickness shall be 150mm
- Making up of the level after initial compaction shall not be permitted for single lift working or the uppermost lift of multiple lift working
- The edge of previously compacted HBM shall be vertical and straight before fresh HBM is laid against it
- Compaction of HBM shall be carried out by vibrating roller/pneumatic-tyred roller (PTR) and consist of a minimum of eight passes
- On completion of compaction the surface shall be closed, free from ridges, cracks, shear planes, loose material and any other visible voids or ruts

Full notes can be found within the Specification for Highways Series 800 and Notes for Guidance 800.

This information is for guidance only

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Method Statement - Production, Transportation and Placement of HBM

Cold & Wet Weather Working

- The temperature of the HBM shall not be less than 5°C at the time of laying
- Shall not be laid on a frozen surface
- Laying shall cease when the air temperature falls below 3°C and not resumed until the rising temperature reaches 3°C
- In the case of heavy or persistent rain, production shall cease and any laid materials shall be compacted immediately

Curing, Protection and Trafficking

On completion of compaction of the bound layer the finished surface should be protected either by the overlaying of a bituminous layer or by spraying with a bitumen emulsion spray. Trafficking may take place providing the material has been laid in accordance with Clause 813.11 and compliance is met as set out in Series 800 Guidance notes 812/16.

Induced Cracking

This may be necessary in the finished bound layer where required in Appendix 7/1.

Recommendations require mixes equalling or exceeding 10 newtons/mm^2 to be induced cracked in fresh material after initial compaction. The transverse cracks shall be induced by grooving the material to form straight vertical grooves not more than 20mm wide, to a depth of between one half and two thirds of the layer thickness over the full width of the pavement and at 3m intervals. Bitumen emulsion shall be poured or sprayed into the grooves. During final compaction of the mixture the surface groove shall be fully closed throughout its length.

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Case Study - Cement Bound Granular Mixtures (CBGM)

Customer	LG Construction Ltd
Site	Various Sites, Kingston, Surrey
Client	Kier Highway Services Ltd
Project	Footpath Refurbishment
Product	CBGM A C5/6

Project Description

Reconstruction of the Royal Borough of Kingston's controlled footpaths.

The adoption of CBGM was approved to replace the sub-base and binder element within the works.

Cost and environmental benefits were achieved utilising this construction method.

Key Benefits

- Replacement for sub-base and binder course
- 95% recycled
- Speed and ease of installation
- Overall cost reduction of 20%

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Case Study - Cement Bound Granular Mixtures (CBGM)

Customer	Toppesfield Ltd
Site	J19, M1 Catthorpe Interchange
Client	National Highways
Project	Road Improvements
Product	CBGM C5/6 & C12/15

Project Description

Improvement project providing additional relief roads, bridges, and realignment of existing carriageways.

CBGM was specified as a sub-base within a flexible-composite design. An on-site batching plant was erected to provide a local sustainable source.

Key Supply Information

- 10,000 tonnes supplied
- High production on site batching plant
- Manufactured to SHW800 & EN14227-1
- Paver installation

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Case Study - Cement Bound Sand (CBS)

Customer	Kier McNicholas Ltd
Site	Dartford, Kent
Client	UKPN Ltd
Project	HV Power Installation
Product	Cement Bound Sand (CBS) 14:1

Project Description

The scheme provides high power cable installation to a housing and commercial development. Day Aggregates provided 1,500 tonnes of loose tipped cement bound sand in compliance with the Energy Network Association's Technical Specification.

Specification

Cement bound sand is specified to ensure the thermal conductivity around the cable is a known value and will remain consistent throughout the length and life of the cable.

The material should comply with the Energy Network Association's Technical Specification (ENA TS 97-1).

Installation

Contractors should ensure compaction is achieved to the required specification and regular testing is carried out to maintain continuity of this.

Cement bound sand is produced with a low moisture content so performance will be reduced if not installed within two hours from arrival on site. Covering of the stockpile may help prevent drying out.

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Case Study - Flexible Composite Pavement Construction

Customer	Byrne Contractors Ltd
Site	Holborough Lakes, Snodland
Client	Berkeley Homes
Project	Residential Road
Product	CBGM A C8/10

Project Description

Transformation of a former chalk quarry into a residential development.

Construction of adoptable roads, footpaths and sewers. CBGM was approved for use as the base course asphalt replacement within the road construction.

Key Benefits

- Aid to green procurement
- Cost savings
- Laid with 360° excavator

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Case Study - Flexible Composite Pavement Construction

Customer	VolkerFitzpatrick Ltd
Site	London Sustainable Industries Park, Dagenham
Client	London Thames Gateway Development Corporation
Project	Access & Road Infrastructure
Product	CBGM B – C8/10

Project Description

Transformation of a 142 hectare brownfield site into a self-sustainable industries park for emerging technologies.

Scheme included construction of access roads, parking and associated works.

Key Benefits

- Replacement for base course asphalt
- Cost savings by value engineering
- 95% recycled product
- Laid using asphalt paver

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Case Study - Hydraulically Bound Mixtures, CBGM

Customer	Empire Works/EM
Site	A24 Epsom Road, Sutton
Client	Transport for London
Project	Footpath Construction/Refurbishment
Product	CBGM A C5/6

Project Description

Reconstruction and refurbishment of TfL controlled highways and footpaths.

A sustainable and cost efficient alternative to current asphalt construction was sought.

CBGM offered cost and environmental benefits utilising recycled aggregate as the base product.

Key Benefits

- Design in accordance with the Britpave HBM and stabilisation technical guide: 1. Parking areas and hardstandings
- Replacement for asphalt binder course
- Speed and ease of use during placement
- Recycled product/cost savings

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Case Study - Hydraulically Bound Mixtures, CBGM/RCC

Customer	Rochford Paving
Site	New Retail Store, Charlton
Client	Ellmer Construction
Project	External Service Areas & Car Parking
Product	CBGM A 3/4, CBGM B 5/6, C40 (RCC)

Project Description

Construction of a new DIY outlet including concrete service yard area and car parking. A valued engineered option was sought to reduce costs and unnecessary landfill of granular fill excavated on site.

1,300 tonnes of granular fill was treated and manufactured into a CBGM A 3/4 for use as a sub-base on haul roads and over-site areas. This formed part of the permanent works.

Roller compacted concrete was supplied as an alternative to the standard PCC method of service yard construction.

Two layers of HBM were incorporated in the construction of the car park to replace the sub-base and base course asphalt.

Key Benefits

- Alternative to PCC pavement construction
- Cost savings by excluding need for formwork, rebar and labour
- Placement by excavator and roller – ready to use within 24 hours
- Re-use of site won granular fill – avoiding landfill costs

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Case Study - Hydraulically Bound Mixtures, CBGM

Customer	VolkerFitzpatrick Ltd
Site	Royal Mail Sorting Office, Croydon
Client	Royal Mail
Project	Construction of LGV / Van Park
Product	CBGM B – C12/15

Project Description

The scope of works was to construct LGV and light vehicle parking bays. A HBM alternative design was agreed to replace base course asphalt beneath a concrete block paved finished surface.

The material was supplied in accordance with the SHW and BSEN 14227 and laid using the traditional method of placement and compaction.

Key Benefits

- Replacement for base course asphalt
- Cost savings by value engineering
- Placement by excavator and roller in restricted space

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Case Study - Roller Compacted Concrete (RCC)

Client	Day Group Ltd
Site	Various Sites
Project	Heavy Duty Pavements
Product	Roller Compacted Concrete (RCC)

Project Description

Construction of internal haul roads, aggregate storage bays and general hardstanding areas.

A solution was sought to minimise disruption and time delays whilst constructing concrete pavements within several of the Company's aggregate and bagging units.

Following a review of pavement construction options it was concluded that RCC is the preferred method of construction.

Key Benefits

- Speed and simplicity of construction by laying through an asphalt paver
- Ready to use in seven days
- No requirement for formwork, dowels or reinforcement
- Cost savings of over 30% per m^2
- Manufactured with primary, recycled and secondary aggregates

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Case Study - Roller Compacted Concrete (RCC)

Customer	Going Green Restoration Ltd
Site	Belhus Landfill Site, South Ockendon
Project	LGV Access Road
Product	Roller Compacted Concrete (RCC)

Project Description

Construction of composite access road to landfill site to service 300 lorry movements per day.

A value engineered solution was sought to minimise programme and operational disruption.

1,500 tonnes of RCC was manufactured with recycled aggregate and installed using a high density paver.

Key Benefits

- Speed and simplicity of construction
- Manufactured with recycled aggregate
- Construction savings of 30% versus flexible construction
- Low maintenance

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Case Study - Roller Compacted Concrete (RCC)

Customer	Hochtief Murphy JV
Site	C310 Plumstead Portal
Client	Crossrail
Project	Portal Tunnel & Associated Works
Product	Roller Compacted Concrete - CBGM A

Project Description

Site enabling works team required a material to construct haul roads and laydown areas to withstand heavy plant movements over a seven year period.

The solution was 7,000 tonnes of roller compacted concrete placed by bulldozer and heavy weight roller (a paver can be used if finished levels are critical). This system is commonly used on large scale paving schemes within ports and commercial buildings.

Key Benefits

- Alternative to PCC pavement construction
- Cost savings by excluding need for formwork, rebar and labour
- Placement by excavator and roller – ready to use within 24 hours

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Day Aggregates supplies natural and recycled aggregates
to the construction and civil engineering industry.