Hydraulically Bound Mixtures

Cement Bound Granular Mixtures (CBGM)  
EN14227-1 / SHW 800
An Introduction To Cement Bound Granular Mixtures (CBGM)

Reduce your asphalt costs by using HBM as a base course replacement

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 Highway 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, TRL
Advantages of Using Day Aggregates Hydraulically Bound Mixtures

Day Aggregates 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 soils, demolition waste)
- No Aggregate Levy
- CO2 savings compared to traditional aggregate sub base use
- Assistance in meeting clients requirements for ‘green’ procurement
- HBM’s manufactured and used in accordance with the Specification for Highways Works 800 Series 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

Day Aggregates HBM’s can be used in the following applications:

ADOPTABLE HIGHWAY

WEARING COURSE

BINDER COURSE

HBM

HBM / CAPPING / SUBBASE

BLOCK PAVING

BLOCK PAVING

BEDDING SAND

HBM

CAPPING / SUBBASE

HARDSTANDING

HBM

HBM

CAPPING

FOOTPATH

WEARING COURSE

HBM

HBM
Example of cost saving incorporating CBGM

The diagram below illustrates the potential cost saving 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

![Original Design Diagram]

Adopted Design

![Adopted Design Diagram]
Laying Method
Method Statement – Production, Transportation and Placement of Hydraulically Bound Mixtures.

Production – Mix-In-Plant 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.

The enclosed information is for guidance and full notes can be found within the Specification for Highways Series 800 & NG 800 (Notes for Guidance).

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 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 8 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.

Cold and 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 material 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 n/mm² 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.
Adoptable Road
Case Study – Flexible Composite Pavement Construction

Customer - Volkerfitzpatrick Ltd
Site - London Sustainable Industries Park, Dagenham
Client - London Thames Gateway Development Corporation
Constructed - January 2013
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
Case Study – Flexible composite pavement construction

Customer - Byrne Contractors Ltd
Site - Holborough Lakes, Snodland
Client - Berkeley Homes
Constructed - June 2013
Project - Residential Road
Product - CBGMA C8/10

Project Description
Transformation of former chalk quarry into 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
Block Paving
Case Study - Hydraulically Bound Mixtures - CBGM

Customer - Volkerfitzpatrick Ltd
Site - Royal Mail Sorting Office, Croydon
Client - Royal Mail
Constructed - January 2012
Project - Construction of HGV / Van Park
Product - CBGM B – C12/15

Project Description
The scope of works was to construct HGV 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
Footpath
Customer - LG Construction Ltd
Site - Various Sites, Kingston, Surrey
Client - Kier Highway Services Ltd
Constructed - April 2017
Project - Footpath Refurbishment
Product - CBGM A C5/6

Project Description
Reconstruction of the Royal Borough of Kingston controlled footpaths. The adoption of CBGM was approved to replace the subbase and binder element within the works. Cost and environmental benefits were achieved utilising this construction method.

Key Benefits
• Replacement for Subbase and Binder Course
• 95% Recycled
• Speed and ease of installation
• Overall cost reduction of 20%
Customer - Empire Works / EM
Site - A24 Epsom Road, Sutton
Client - Transport for London
Constructed - February 2013
Project - Footpath Construction / Refurbishment
Product - CBGM A C5/6

Project Description
Reconstruction & 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 Britpave Parking Areas & Hardstandings (1)
- Replacement for Asphalt Binder Course
- Speed and ease of use during placement
- Recycled Product / Cost Savings
Case Study – Roller Compacted Concrete (RCC)

Client - Day Aggregates Ltd
Site - Various sites
Constructed - 2012 / 2013
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 & 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 m²
- Manufactured with primary, recycled & secondary aggregates
Case Study - Hydraulically Bound Mixtures - CBGM / RCC

Customer  -  Rochford Paving  
Site  -  New Retail Store, Charlton  
Client  -  Ellmer Construction  
Constructed  -  February 2012  
Project  -  External Service Areas & Car Parking  
Product  -  CBGM A 3/4 – CBGM B 5/6 - C40 (RCC)

Project Description
Construction of 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.

1300 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 & Base Course Asphalt.

Key Benefits
- Alternative to PCC pavement construction
- Cost savings by excluding need for formwork/ rebar / labour
- Placement by excavator and roller – ready use within 24 hours
- Reuse of site won granular fill – avoiding landfill costs
Case Study – CBGM Access Road

Client - Going Green Restoration Ltd
Site - Belhus Landfill Site, South Ockendon
Constructed - November 2012
Project - HGV 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 program and operational disruption.

1500 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

Follow Up – December 2015

Installation – November 2012
The RCC was placed at 200mm in two layers on a Type 1 foundation layer.
Case Study - Roller Compacted Concrete (RCC)

Customer - Hochtief Murphy JV
Site - C310 Plumstead Portal
Client - Crossrail
Constructed - February 2012
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 7000 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 / 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.

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