APPROACH PRINCIPLES COLLABORATION DEVELOPMENT

the Kent design guide

making it happen - sustainability (sustainable solutions)

overview

This part of making it happen includes guidance and information about sustainable highway construction solutions for residential and industrial developments.


sustainable solutions

Sustainable Solutions

We are committed to the implementation of sustainable solutions wherever economic and viable, without compromising the quality of the finished works.

An Environmental Management System that meets the requirements of BS EN ISO 14001, if the development involves the construction of more than 5 dwellings, will support sustainable developments.

There are a number of ways in which you can control or influence the sustainability impact of developments. The table opposite provides a number of areas where your influence will impact upon the various categories of sustainability. Greater value and improved benefits can be provided for little additional cost through linking sustainability and highway design issues such as traffic calming and landscaping.

It is anticipated that you will utilise a risk-based approach to identify where sustainable solutions can be provided to include, but not be limited to the following areas:

- **Material Specification** - material efficiencies over lifetime (design and lean construction); construction and operational technology
- **Resource Management** - procurement of materials, re-use of materials directly or as secondary products; recycle materials to avoid landfill; supply chain sustainability practices and performance
- **Community Impact** – noise, light and dust from construction traffic; volume of traffic and timings; use of local labour and suppliers
- **Workforce Occupants** - training and development needs – skills and knowledge; health and safety
- **Environmental Impacts** - spillages and other emissions to land and water; water run-off; construction impact on habitats and species and SUDs solutions

Table A - Sustainability Categories

Sustainability Activity	Indicative Issues for Developers in Kent
Emissions to Air	• Vehicle emissions on main roads and slow traffic • Noise levels from road surfaces • Construction traffic in concentrated areas
Land Contamination	• Spillages and other emissions to land • Management of existing areas of contamination
Workforce Occupants	• Recruitment and retention of staff • Training and development needs – skills and knowledge • Health and safety
Local environment and community	• Value of natural heritage and landscapes • Construction traffic impacts along routes • Local community dialogue through decision making process
Lifecycle of products / service	• Material efficiencies over lifetime – design and lean construction • Lifecycle cost analysis and climate change implications
Energy Management	• Energy consumption in construction and use • Fuel usage for vehicles in the construction and maintenance process
Emissions to water	• Road run-off from construction • Flooding and flood risk
Use of resources	• Procurement of materials • Use of materials from local sources
Waste Management	• Re-use of materials directly or as secondary products • Recycle materials to avoid landfill • Responsible and effective disposal of waste generated
Marketplace	• Benchmarking of progress • Payment of suppliers • Supply chain sustainability practices and performance
Human Rights	• Flexible working • Stakeholder consultation
Biodiversity	• Access to the local community • Construction impact on habitats and species

Sustainability Action Plans

We are particularly keen to work with and encourage you in any way possible to promote implementation of a successful Sustainability Action Plan.

The Plan is a process to identify the sustainability risks and set in place means to reduce and mitigate their impacts. The areas identified under sustainable solutions should be used as a starter. The flowchart opposite provides a process through the various stages of putting together an active plan.

You should identify those areas which can provide real benefits to the sustainability performance of your project. Details and examples are provided throughout this document on such ideas and are captured together as a series of Key Performance Indicators (KPIs) for the Project.

You are encouraged to submit your Sustainability Action Plan with your proposals for the development. During construction the Sustainability Action Plan will need to be updated as a result of the inevitable changes. Evidence from the Site Waste Management Plan and Resource Action Plan will be invaluable in this process.

The types of indicators should reflect the areas that you have direct control over – materials, waste, procurement activities, stakeholder feedback (complaints and commendations) – and indirect impacts where a reduction in the sustainability impact can be made.

The development and implementation of the sustainability indicators is best performed through an Environmental Management System such as ISO14001. The process depends initially upon the identification of the risk areas and capture of the significant risks, based upon the direct and indirect influences.

The chosen indicators will therefore support the global plans, with specific deliverables impacting upon day to day management and operation of the highways. In addition, a number of indicators are recommended to support each strategic target, to provide a driver for the various stakeholders involved in the delivery of the activity.

Sustainability act flowchart

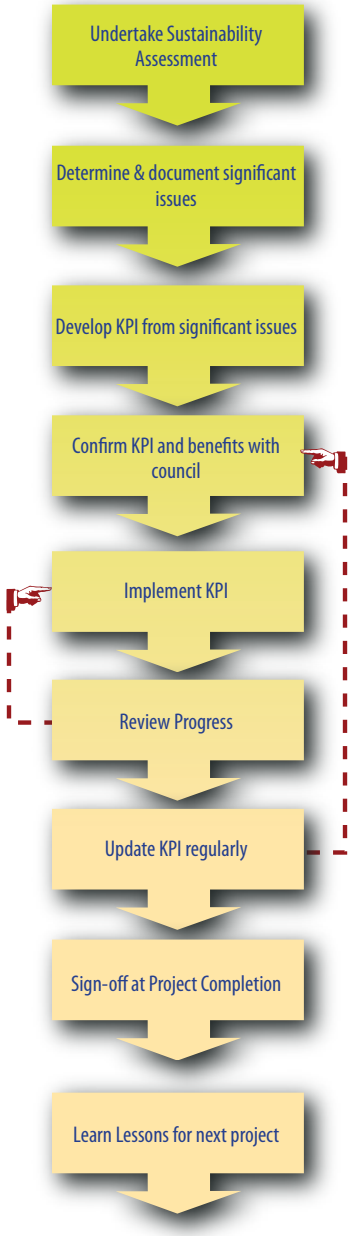

Table B - Target Indicators

Strategic Issue	Waste minimisation
Operational Issues	• Where are materials sourced - can recycled materials be sourced? • How much waste is generated - what volumes against types and from which activities? • How much waste goes to landfill currently and can any be avoided? • Can improved usage of materials avoid the generation of waste in the first instance?
Indicators	• Waste cost per £m work performed • Waste volume to landfill per £m work performed

Typical Performance Indicators are shown in the table below alongside a metric and a description to calculate the metric. These are examples, and more relevant indicators may be available for the project to deliver greater value to you.

Table C - Typical Performance Indicators

Activity/ Indicator	Metric	Description
Green House Gas	• Metric tonnes GHG emissions by value of works	• Calculated from vehicle mileage and use of fuel during works
Waste	• Metric tonnes waste generated by value of works • Waste re-used, recycled, composted as a percentage of the whole waste generated	• Calculate from the waste transfer notes provided • Reused materials identified through the Site Waste Management Plan
Aggregates	• Metric tonnes aggregates used by value of works • Aggregates re-used, recycled as a percentage of the whole aggregates used	• Purchased materials • Reused materials identified through the Site Waste Management Plan
Complaints /satisfaction	• Number of complaints received for noise, vibration, dust and mud by value of works (unresolved after 4 weeks)	• Log of complaints and process to resolve.

Material Specifications

The standards for the construction thicknesses and the choice of materials detailed in the highway pavement and specification section are indicative of the minimum standards that will be acceptable to us.

We expect, however, you to meet outcome-based specifications to achieve the sustainability targets within this guide. You should demonstrate your commitment towards sustainability by considering alternative construction methods and materials, which satisfy the principles of sustainability, but retain similar performances to those of a more traditional approach. Each site will have its own individual characteristics, which will need to be evaluated accordingly. We would require evidence of this evaluation to be provided.

We have a committed approach to sustainable solutions and can provide an approval process that includes a technical assessment of the re-used or recycled content product and the method of recycling, together with laboratory appraisals and field trials where necessary.

Almost every application can utilise recycled and secondary materials (WRAP publication - Specifying recycled materials in local authority contracts for highways maintenance: good practice) including:

- aggregates;
- pipework;
- fill material;
- block paving;
- drainage media; and
- landscaping materials such as compost.

You are responsible for any costs associated with the approval process and any relevant specification required. Specifications can be produced, where required for specific development needs and contract control purposes.

There are a number of Kent specific clauses denoted by the suffix AK. These are additional to those within the latest Department of Transport Specification for Highway Works, and are included on our website. Commentary regarding these clauses is included at the end of the section.

Principles of Resource Management

In engineering terms resource management could be achieved in the following ways:

Table D - Principles of Resource Management

Action	Responsible Management
Material Avoidance	Avoid materials being generated in the first instance. Examples include packaging waste
Minimising of Materials	Use only the minimum materials necessary for the development and, where practicable, the thinnest pavement design of the available permitted options. (see notes a)
Reduction of Waste	You can effectively reduce the wastage of materials by introducing regular audits to monitor and control site activity more closely, e.g. materials ordering and site practices. (see Waste Minimisation)
Recovery of Materials for Re-Use	Where any site clearance or demolition is involved, you should initially maximise the recovery and re-use of any materials within the confines of the site or alternatively off-site. (see note c)
Use of Industrial by products /recycling	Hydraulic Binders reuse waste from industrial processes that might otherwise have to be disposed of to landfill. (see note d) Incinerator Bottom Ash, glass cullet, rubber crumb, processed demolition waste and other industrial by- products may also be available for use in construction reducing the need for disposal to landfill. Topsoil for use in verges can be made from recycled construction and demolition waste and recycled composted green waste.
Re-Use and Recycling of Site arising Materials	Acceptable methods of recycling include:- cold processing on or off-site and cold and hot processing off-site. (see notes e - i)
Use of materials containing recycled constituents	Materials for pavement construction in sub-base, base or surfacing layers can contain a proportion of recycled material. The supplier can inform you of this proportion.

Principles of Resource Management

Notes:

(a) The use of a capping layer using stabilised soils or stabilising the existing ground with cement or other hydraulic binder may reduce or eliminate the need to import granular material or sub base.

(b) Our Standard Specification, which augments the Specification for Highway Works, contains additional or revised clauses to assist you in implementing sustainable alternatives. These clauses are included on our website. about these is indicated at the end of this section.

(c) Acceptable materials for re-use include kerbs, channels, gully grates and pots, manhole and inspection covers, as long as they are of equivalent specification, in good order and appropriate for the location. We may consider other street furniture as well.

(d) As an alternative to Portland cement, pozzolanic (hydraulic bound) materials are now included in the standard specification and British Standards. These incorporate binders such as slags or Pulverised Fuel Ash (PFA) which are industrial waste products. They may need the addition of small quantities of lime to activate them. Benefits resulting from their use include reduction in the total quantities of materials needed to be brought on site as a result of the reduction in pavement thickness, giving savings on transportation costs and energy usage. Hydraulic bound materials are less prone to cracking and creating potential future maintenance problems.

(e) In-situ processing techniques as described in the following notes can be particularly 'environmentally friendly' as they eliminate the cost and energy usage on transporting materials to site. They can also increase operational speed on site, reduce local traffic congestion and transportation costs. Services to carry this out are widely available from specialist contractors.

(f) Cold processing on site using lime or lime and cement may be used to form capping layers and sub base in accordance with Clauses 614, 615 and 643 to form capping material and Clause 810 to form sub base. These techniques may be used to improve the road foundation and reduce or even eliminate the need for imported granular material.

(g) Cold processing on site methods, in accordance with Clause 810, can be carried out on existing materials or on crushed demolition materials, planings or other imported materials to produce structural pavement layers. They can be used in a wide range of carriageway and footway locations as described in the Pavement and Specification Section.

(h) Cold processing off-site produces materials which, when combined with foamed bitumen or bitumen emulsion, in combination with other additives, can be used as road base layers on most residential roads and distributor roads, in accordance with Clause 991AK and 996AK. These materials are generally manufactured from processed demolition materials, crushed and screened arisings from road maintenance activities or asphalt millings.

(i) Hot processing off-site, in accordance with Clause 902 produces new bitumen bound materials with a percentage of recycled material, usually planings or crushed asphalt plant material, which can be used in place of materials with no recycled materials content.

Waste Minimisation

We expect you to have policies and plans that ensure - as far as is practicable - that waste generated as a result of the construction is minimised, reused within the site or recycled.

As part of the environmental management system you are legally bound to know and keep records of:

- how much waste is being created;
- the methods of disposal;
- the competence of the company disposing of it; and
- the destination for the waste.

In order to do this you must monitor the amount of waste produced on site by carrying out a waste audit as the work proceeds. This has also been found to be enlightening both environmentally and financially and helps to develop a strong commitment by site staff to minimising waste and recycling.

Waste may be generated on site for the reasons given below:

1. Ordering too much material

This may be because of past experience with contamination, inaccurate tolerances on construction layers, risk consequent on having too little material and having to order more at higher cost, error in bills of quantities or drawings or inaccurate ordering.

2. Delivery

Products may arrive on site with excess packaging or they may be damaged during off-loading or storage. Materials may be off-loaded at the wrong location so that during uplifting and moving, some are damaged, contaminated or wasted.

3. Storage

Granular materials (drainage material, sub base, sand bedding and the like) should be stored on a hard base to avoid contamination and waste. They also benefit from being sheeted to prevent significant moisture change.

Palletised products need a hard base and good transport access to minimise damage

Brittle products like clay/concrete pipes must be protected from damage by machinery. Specials and ancillary products need to be stored safely. Electrical equipment and materials that need to be kept dry e.g. cement should be kept under cover.

4. Use at the jobsite

If a surfeit of materials is laid out on site, it is necessary to retrieve the excess and return to store This is particularly applicable to kerbs, channels and to pavers and slabs.

5. Segregation of waste

Inert and non-hazardous waste may be taken to a recycling centre by skip (e.g. topsoil, plastic, wood, paper, plasterboard). After discussion with the recycling centre, separate skips for recyclable inert waste and the other materials could be provided.

6. During Installation

Poor installation practices can lead to product/material damage which is unnecessary and could be avoided. It can also lead to an excess of expensive materials being used. An example of this is poor preparation of the sub-base leading to excessive surfacing materials being used. Poor planning can make machine laying of surfacing difficult. Hand laying commonly leads to waste as materials go cold. The use of cold mix asphalt is recommended to reduce waste.

Reuse of Secondary Aggregates

There are a wide range of secondary aggregates produced and available in the UK. The materials shown below should be used wherever possible.

Table E Suitability of Secondary Aggregates for reuse

Layer Materials	Bulk Fill	Capping Layer	Sub-base	Cement Bound Roadbase Material	Bituminous Bound Material [Asphalt]	Concrete Aggregate	Surface Dressing Aggregate
Crushed Concrete	✔w	✔w	✔	✔	✔	✔	✘
Asphalt Planings	✔w	✔w	✔r	✔r	✔	✘	✘
Demolition Waste	✔	✔	✔	✔	✘	✔r	✘
Blast Furnace Slag	✔w	✔r	✔	✔	✔	✔	✔r
Steel Slag	✔w	✔	✔	✔	✔	✘	✔
Phosphoric Slag	✔w	✔	✔	✔	✘	✘	✘
Burnt Coll. Spoil	✔r	✔r	✔r	✔	✘	✘	✘
Unburnt Coll. Spoil	✔r	✔r	✘	✘	✘	✘	✘
Pulverised Fuel Ash	✔	✔r	✘	✔	✘	✔	✘
Incinerator Bottom Ash	✔r	✔	✔r	✔	✔	✔r	✘

Notes ✔ may be used without restriction

✔r may be used with restriction. Restrictions may be related to traffic levels as specified in this document. Not all materials within this heading meet the requirements of the specification, some materials may generate leachate problems requiring EA approval.

✔w means the use of this material in this application is not taking maximum advantage of its properties

Site Waste Management Plan

You must plan to re-use materials by detailing their intentions for waste minimisation and re-use in Site Waste Management Plans. This must cover all the materials used in the construction of the development including those used for the construction of the roads and footways, buildings and especially their furbishment.

A Site Waste Management Plan (see DTI guidance) will be required before work commences, describing the waste volumes to be generated and the recycling and disposal of the materials. On completion, volumes of recycled content purchased, recycled and landfilled materials must be collated.

Site Waste Management Plans, in particular, should identify materials used in high volumes, irrespective of cost and materials of high value irrespective of quantity. These categories of materials are likely to show the maximum benefit from being targeted for waste minimisation and recycling. The kind of information to be collected is described in the highway pavement and specification section and can be summarised for management action. A system will need to be developed which is site specific but does not generate excessive bureaucracy.

The subjects to be covered in Site Waste Management Plan may include:

- Who in the organisation is responsible for managing sustainability in the contract;
- Details of the training he or she has received;
- How information on sustainability is to be conveyed to staff working on the contract;
- How sub-contractors are made aware of, and encouraged to participate in the Sustainability Action Plan;
- What systems are used to control and minimise transportation, water and energy costs;
- How much material is expected to be taken to landfill and what action has been taken to minimise this. (This is usually measured in cubic metres);
- How much recycled materials are contained in the products you propose to incorporate in the works. This is usually measured in tonnes. NB products such as plastic drainage materials may contain recycled constituents which can contribute to the overall total (see WRAP guidance);
- Which recycling centres will be used for processing materials surplus to use on site;
- How product suppliers' packaging eg. pallets, are recovered;
- Who will carry out waste audits during construction and how often; and
- Who is responsible for taking action as a result of the waste audit.

Studies have shown that it is beneficial to take positive action and give consideration at the planning stage as to how much waste might be produced on site and what happens to it.

Community Impacts

All impacts on the local community such as disruption to existing highways etc must be considered as part of the design process. Typical impacts include noise and dust during the course of construction; traffic from increased congestion and construction traffic along the route; as well as damage to the local flora and fauna.

Working hours may also cause problems. Night working will cause nuisance to residents from light pollution and noise.

Early dialogue with the local community is recommended over working hours, timescales and the potential disruption which may take place. It is also recommended that a contact number be provided for any issues, complaints or commendations which may take place.

The issues affecting the local community must be identified and captured at the design stage and managed to mitigate these effects as far as possible. Evidence of this should be demonstrated through the Sustainability Action Plan. Issues likely to occur include:

- Have all interested parties and statutory bodies been identified and consulted?;

- Have key potential issues been identified?;
- Has systems been put in place for employee dialogue?;
- Has care been taken to avoid nuisance, noise, air etc. particularly avoiding certain times of day or year?;
- Has effective systems been developed to record and deal with complaints and issues?;
- Has the use of a considerate contractors / construction scheme been considered?;
- Has design parameters been considered to avoid or reduce nuisance?; and
- How will the development enable access to the natural environment / public green spaces?

Workforce

The workforce should be properly trained and competent, to ensure they understand and implement the requirements of ISO 14001. They must also hold CSCS Cards. They need to be made aware that materials are properly stored, are handled correctly to reduce damage and waste and that waste has a value if it is not mixed.

Sustainability practices must also be incorporated within the supply chain process, including reviewing the practices used. Local contractors will be used where possible to minimise additional transport needs and movement. In particular, for smaller contractors and suppliers, payment of suppliers against agreed timescales is important. Issues to consider include:

- Have local suppliers and contractors been used?;
- How will the development support local employment and skills development?;
- How will the development make physical, social and economic improvements?; and
- How will it reduce the need to travel and increase connectivity and access?

Environmental Impacts

The environmental impact of a scheme should be considered in the design as part of the Sustainability Action Plan. The inclusion and use of environmental areas can significantly increase the visual impact of a development and change its perception.

Some of the main issues which should be reviewed will include:

- How will access to green spaces be improved?;
- How will the development impact on the existing biodiversity?;
- What opportunities are there to enhance biodiversity at the site?;
- Has the Local Biodiversity Action Plan been consulted?;
- Will indigenous vegetation be used for landscaping?;
- Will the landscaping require a high maintenance regime, including seasonal issues?;
- Have important habitats or areas supporting key species been identified and methods for their protection agreed?; and
- Has a method for containing and removing noxious plants been agreed.

Retaining existing vegetation can give a scheme a feel of maturity as well as minimising its environmental impact (above left). Comprehensive landscaping schemes on larger development sites allow the scope for enhancing the biodiversity of an area (top right). Sensitive landscaping in smaller public areas can have the same impact (right)

Resource Highway Construction Questionnaire

Site Name:

1. What percentage of recycled material is contained in the products we buy?

a)	Concrete for Kerbing		
b)	Capping Layer		
c)	Sub-base	Footway%	Carriageway%
d)	Roadbase/Binder course	Footway%	Carriageway%

2. How much of the material required for the highway construction can come from the job itself or contain recycled material?

Capping [t]	Sub-base[t]	Bound Base [t]	Footway surfacing [t]
Capping [%]	Sub-base[%]	Bound Base [%]	Footway surfacing [%]

3. How much material arising from the earthworks is removed from site and what percentage is this of the total excavated?

Topsoil [cu m]	Suitable Fill [cu m]	Other Fill [cu m]
Topsoil%	Suitable Fill%	Other Fill%

4. What method is being used to make existing subgrade suitable as a capping layer or sub base

5. Will planings be created as part of works? If yes what will you do with them?

Take to Asphalt Plant ☐	Recycling Centre ☐	Reuse on Site ☐	Dump ☐

6. Where is the nearest inert waste recycling centre for arisings?

7. Do product suppliers take back pallets and packaging?

Paving Blocks ☐	Kerbs/ Channels ☐	Street Furniture ☐	Ironwork ☐

8. Have you created storage areas for materials to prevent contamination/damage?

Topsoil ☐	Sub-Base ☐	Drainage Materials ☐	Paving Slabs/Blocks ☐
Kerbs / Channels ☐	Ironwork ☐	Lighting columns / signs ☐	Palleted materials ☐

9. Who is responsible for managing sustainability on the job?

Job Title	Resident on Site ☐
Training Received	

Enabling Specification Clauses

The Specification for Highway Works is now being updated frequently. You must use the current version at all times. In particular central Government is committed to a sustainable procurement agenda and as far as is possible for motorway and trunk roads, Specification clauses have been introduced which use the latest European standards. Sustainability is often supported by using performance related clauses which set some level of performance for the material rather than giving a recipe of constituents. This gives you more choice of materials.

Nevertheless, residential and industrial developments are less demanding in materials performance than motorways and trunk roads and additional clauses have been prepared to assist you to maximise the opportunities for sustainable highway construction.

Where Suffix AK is used, it means the Clause is published by us and is additional to those in the Specification for Highway Works.

Cement Stabilisation to form Capping. Lime Stabilisation to form Capping Clause 614 and 615

Commentary: These clauses are used to control the operations of the specialist stabilising sub-contractor who will bring to site a large rotavator/pulverisor to mix in the chosen binder. The quantity of binder will depend upon the moisture content, plasticity and grading of the existing soils. Since a large part of the cost is in the mobilisation of the plant it is prudent to plan the roadworks to maximise the work at any one visit. It may be possible to upgrade the performance of the existing soil to the standard for a sub base or even a road base material. This is covered by Clauses in the 800 Series. The material shall also be checked for installed performance in accordance with Clause 888AK.

Earthworks, Environmental Bunds and Landscape Areas Clause 619 and 620

Commentary: These clauses provide the mechanism for disposing of soil on site that is not suitable for road construction, where the ground has to be regraded. Where it is necessary for the material below the topsoil and above road formation to be removed, this must be used within the site wherever possible. The steepness of the side slopes on landscaping features, such as mounds or bunds, will determine the properties required of the material. The design should attempt to allow all the material excavated to be reused within the site and the required parameters set accordingly.

Granular Sub base

The Specification for Highway Works includes four unbound sub base materials [Clauses 803 to 806]. These materials may be used but must comply with the requirements for performance categorised sub base in accordance with Clause 888AK

Performance Categorised sub base Clause 888AK

Commentary: This clause has been developed in Kent to permit the contractor to use the material from local recycling centres and processors of inert waste, as well as suppliers of locally produced or imported quarried sub base. It includes for example, processed construction and demolition waste and asphalt millings and suitable incinerator bottom ash. It permits small quantities of contaminants such as wood. The clause demands the supplier gets approval in principle and the performance of the layer must be checked after installation using the Portable Dynamic Plate. At this stage any test failure could also be as a result of poor moisture content or grading control by the supplier, or poor compaction on site. It is equally applicable to sub base using quarried stone as recycled and secondary aggregates.

Bound Sub bases Clause 810 to 840

Commentary: The Specification for Highway Works includes as sub base granular materials bound with Portland cement [CBGM] or combinations of slag and fly ash with lime or gypsum; hydraulic bound materials [HBM] in Clauses 810 to 840. These may be used having been mixed off site or may be manufactured in-situ. The performance is monitored by compaction into a mould, curing in the laboratory and testing. In-situ performance is measured by the degree of compaction measure by calibrated nuclear gauge.

Lime and cement stabilised clay Clause 643 Lime and cement stabilisation to form Capping Clause 892AK Lime and cement stabilisation to form Sub base

Commentary: Clay is a particularly common sub-soil in Kent. The use of Lime to convert the Clay into a pseudo-granular material is well established. More recently work has shown that the performance of this product when mixed with Portland cement can easily exceed that of granular capping material and even sub base. The process is normally carried out in-situ using site arising clay but clay can be brought to site if some is available locally. It is important that clay used has a low sulphate and sulphur content as specified, otherwise failure will occur. This can be checked by site sampling and simple tests.

Bound Base Materials Clause 810 to 840

Commentary: The same combinations of CBGM or HBM may be used as bound base materials provided they meet the necessary strength requirements.

Permanent Cold Lay Base (PCLB) Material Clause 991AK and 996AK

Commentary: PCLB is made with a cold bitumen binder and up to 100% recycled aggregates, typically millings or processed arisings from road maintenance activities.

Clause 991AK refers to structural grade off site mix that has strength equivalent to hot mix asphalt and may be used in all applications but has no storage life as it contains a small quantity of Portland Cement.

Clause 996 AK refers to storage grade material which is identical but without the addition of Portland cement. This material may be identical to material which has a HAUC (HAPAS) Certificate for reinstatement material. It is not as strong as hot mix asphalt but is perfectly acceptable, and is the preferred material for use in all classes of road excluding Local Distributor Roads, or in footway construction. It has the additional advantage that small quantities may be purchased without waste or deterioration when laying slowly in confined areas by hand.

References for implementing sustainability

Waste and Resources Action Programme (WRAP): 0808 100 2040 **www.wrap.org.uk** has a wide range of documentation and assistance with recycling, reuse and sustainability, with information tailored to specifiers and contractors. Whilst the Programme covers a wide range of sustainability issues the Aggregain site is particularly relevant to the construction industry. In particular it contains:

- AggRegain Specifier: This tool helps specifiers and buyers choose the right aggregate for the right application and then download detailed technical notes, purchase orders and case studies;
- Supplier Directory: Find suppliers of recycled and secondary aggregate products;
- Case studies: Currently this site accesses 100+ detailed case studies illustrating the cost savings and comparative performance benefits of using recycled and secondary aggregates; and
- The Quality Protocol for the Production of Aggregates from Inert Waste. All producers should be producing aggregates in accordance with this protocol which is mandatory in the SHW.

CIRIA, 020 7549 3300 **www.ciria.org.uk** produces a range of best practice guides and training documentation on construction, including:

- C512 Environmental handbook for building and civil engineering projects. Part 1: design and specification;
- C513 The reclaimed and recycled construction materials handbook;
- C528 Environmental handbook for building and civil engineering projects. Part 2: construction phase;
- C529 Environmental handbook for building and civil engineering projects. Part 3: demolition and site clearance;
- C 633 Sustainable construction - implementing targets and indicators. Experiences from CIRIA's Pioneers' Club; and
- SP 134 Waste minimisation in construction - Design Manual: SP 133 - Site Guide.

Constructing Excellence a website funded by dti. -

www.constructingexcellence.org.uk contains a wealth of information concerning best practice in waste minimisation and sustainable construction, including:

- DTI (2004) Site Waste Management Plans (SWMP) - Guidance for Construction Contractors & Clients - Voluntary Code of Practice; and
- DTI (2000) Building a Better Quality of Life - a strategy for more sustainable construction.