BLACKPOOL COUNCIL

Surfacing and Structural Maintenance Procedure

Delivering a safe and sustainable highway network

9/14/2011

Procedure to be followed for programmed maintenance in relation to carriageway construction and resurfacing.

Introduction

The principles for this document focus on the Strategic Road Network for Blackpool.

Background

- The strategy covers the structural maintenance and resurfacing of the highway network including carriageways, footways, cycleways, pedestrianised areas and other un-trafficked surfaced areas. It does not cover the construction and maintenance of highway structures e.g. bridges, retaining walls etc.

- **Definitions**
  - Carriageway - surface used by vehicular traffic
  - Footway – surface used by pedestrian traffic (including vehicle cross overs)
  - Cycleways – surface specifically for the use of pedal cyclists
  - Pedestrianised areas – surfaces used by pedestrians, with access for vehicles only during defined times for the purposes of deliveries, refuse collection, street cleaning and maintenance activities in relation to highway and utility apparatus

- The document links to the corporate strategy in relation to safety, environment, sustainability, the minimisation of required resources, whole life costs and the principals of highway asset management.

- The document uses the guidance established in the National Code of Practice for Highway Maintenance Management July 2005

- The council by working alongside their surfacing, long term partnering maintenance contractor – Tarmac, seek to wherever possible;
  - Reuse existing construction with minimum disturbance to form part of the new construction
  - Recycle existing site construction materials for use within the specifications for the new materials to be used. Recycle all surplus site materials for use elsewhere within the industry, thus removing/minimising disposal quantities and costs.
  - Use thinner and stronger construction layers
  - Design and implement maintenance regimes to optimise whole life costs for specifications used
  - Source all new aggregates, that are required for use on a contract, from suitable quarries closest to the site/production plant

- **Standards/specifications**
    - National standards and specifications are to be used wherever possible. These include
        - Construction Design and Management (CDM) Regulations
        - Specification for Highway Works
            - Volume 1 – Specification
            - Volume 2 – Notes for Guidance
        - Design Manual for Roads and Bridges – Volume 7: Pavement design and maintenance
        - BS594987 – Asphalt for roads and other paved areas – Specification for transport, laying and compaction
        - BS EN 13108 – Bituminous mixtures – material specifications
        - BS PD 6691 – Guidance on the use of BS EN 13108
        - Road Note RN42 – Best practice guide for durability of asphalt pavements
        - BBA/HAPAS guidelines and certifications

    Other standards and specifications will be used as and when appropriate and will be referred to when used during the design process.

- Blackpool Council policies and strategies linked to this document include;
    - Policy for Highways Maintenance Management Plan
    - Local Transport Plan
    - Road Safety Strategy
    - Skid Resistance Policy

- The public procurement directive does not permit any public body to require the use of a particular proprietary product. Any such requirements must be specified in performance terms. The requirements for BBA/HAPAS certification provide links to performance terms.

- When using this document all users must comply with their responsibilities under the Construction Design and Management Regulations to provide designs that are safe to construct, safe to use and safe to maintain.

Design Guidance notes

- The main principles to work with include the following

    - To produce a design that is safe in terms of

        - Construction
        - Use
        - Maintenance

    - To minimise the environmental impact
        - Factors which impact on the environment include
            - Use of new quarried materials
            - Insitu recycling
            - Off- site recycling
            - Use of existing pavement structure
            - Ride quality
            - Transport distances

    - To maximise the durability of the construction to achieve the required design life

    - To understand and focus on whole life costs and the principles established within the highway asset management plan

Use of materials

The focus of all designs will be to minimise the use of new aggregates wherever possible by

- Using the existing construction to form structural layers within the finished design
- Using insitu recycling of existing structural layers to form new structural layers within the finished design
- Recycling existing surfacing materials on site (or as close to site as possible) to produce new binder course material for re-use as part of the new construction
- Recycling surplus site materials which can then be re-used within the industry. This will reduce the disposal of materials in terms of quantity and cost

Safety

- Skid resistance

- The skid resistance policy follows the guidance given in HD28/04 and is amended to meet the requirements of the local network and conditions
- Skid resistance values stem from a combination of the macro-texture of the road surface and the micro texture of the aggregate used. Surface course site specific requirements should be included in the design specification for the surface course to be used on individual contracts i.e. surface texture measurement and minimum polished stone value for the aggregate
- Appropriate site specific skid resistance levels will contribute towards achieving road safety targets to minimise the number of road casualties

- **Hazards during construction and on-going maintenance**
  - Manual handling – all contractors will have to demonstrate their methods of managing, controlling and monitoring compliance for manual handling operations. The handling of kerbs and modular paving, handling and screeding of hot materials and hand laying hot bituminous materials are some of the areas of work that need to be controlled and managed to avoid accidents occurring.
  - The use of plant and tools associated with vibration in relation to hand/arm and whole body is to be avoided wherever possible. Where the use of such plant and tools cannot be avoided then control measures must be in place to minimise the exposure level of any/all operatives to prevent exposure levels being exceeded. All contractors will have to demonstrate their methods of compliance with the health and safety regulations

- **Toxic materials**
  - The main source of toxic materials, which are used in road construction today, are pigments. The following principals should be followed
    - Avoid using pigments wherever possible
    - Where coloured surfacing is required
      - Use natural coloured aggregates
      - Only use pigments where there is no alternative

- **Utility apparatus**
  - The introduction of cycle lanes onto existing carriageway surfaces has presented the following problems in some areas
    - Vehicle wheel tracks have been moved further away from the edge of carriageway. This has resulted in utility apparatus

including manhole covers now being directly in the wheel track line (wherever possible positions would have been designed to avoid wheel tracks)

- The re-alignment of wheel tracks can also create problems with the position of longitudinal joints in surfacing courses, which would have originally been designed to avoid wheel tracks
- The installation of advanced stop lines at existing traffic signal controlled junctions, to create cycle embayments, can result in traffic signal loops being wrongly configured in terms of offset distance from stop lines
- Careful consideration must be given to the implications in relation to the above points and the detrimental effects that changes to the alignment may cause in terms of life expectancy of the existing pavement, to enable a detailed cost analysis to be undertaken and changes made to the asset management data as and where necessary.

Maintenance

General

- Blackpool Inventory – existing road lengths

Principal A class Roads	055km
Other Classified Roads (B and C class)	035km
Unclassified Roads	351km
Back streets	072km
Total length	513km

- The above road types and lengths along with their needs, priorities and usage have been further analysed to create a strategic road network (SRN) for Blackpool.

SRN length	??? km

- The asset value of the whole network has been estimated at £?????million. Each road or group of roads will need to have its' age, life expectancy and replacement costs assessed. The above figure includes
    - The length and width of all carriageways
    - Carriageway sectional construction depths and types
    - The length and width of all footways
    - Footway sectional construction depths and types
    - Kerb/edging types and lengths
    - Verge widths and lengths
    - All details relating to dedicated surface water drainage
    - Street furniture inventory
    - Street lighting, traffic signals, controlled crossings and illuminated sign inventory
    - Value of land used

- There is a financial cost to the community as a consequence of road casualties. The maintenance design process should take into account the potential savings from casualty reductions

Table 1 below shows potential savings from the prevention of different accident types. The data comes from "Road Casualties Great Britain" published by DfT. The figures do not include any costs relating to delays/disruption to other traffic.

The total cost for Blackpool in 20?? For ??? road casualties was £??????????. This is a national cost burden

Casualty Type	Potential Saving (2007 estimated prices) £	
Fatal	1,522,218	
Serious	171,042	
Slight	13,184	
Damage only	1,697	

Table 1. Savings from the prevention of casualties (per casuality)

- **Asset management**
  By using highways asset management, the cost of maintenance can be calculated on a “whole life costing” basis. This enables the lowest total expenditure cost over the life of the pavement construction to be evaluated. This in turn maximises the value of the asset.
  If decisions are taken, which prevent the optimal maintenance regime being implemented, then the cost implications can be calculated. As a consequence the total asset value will be determined i.e. has it increased or decreased.

- **Data gathering**
  The following are the systems that will be used to gather data, which will then be used to support the on-going development of the asset management plan and to also support identifying the maintenance requirements, priorities and the decision making processes for scheme specific designs and specifications.

  - Scanner
  - Deflectograph
  - Falling weight
  - Coarse visual inspection (CVI)
  - Scrim
  - Routine inspections
  - Ground radar (existing construction)
  - Cores (linked with ground radar)
  - Traffic counters

  Where required, consultation with emergency services, utilities, the public and others will be undertaken to link in to the design and specification processes. Accident data will be reviewed in conjunction with discussions with the road safety section.

- **Additional data sets to be used during the design process**
    - Accident data
    - Traffic flows (cv/l/day – standard axles)
    - Details of existing maintenance treatments
    - The design should include any/all traffic safety improvements including but not limited to safer routes to school, public transport etc
    - The programming of schemes must follow consultation with the PFI contractor, EON, who are currently engaged on a full replacement programme for street lighting, traffic signals, controlled crossings and illuminated signs between 2010 and 2015
    - The standards and specifications listed on pages 2/3 and the data gathering systems listed on page 8 will also be used where appropriate

Principles for Condition Rating and Scheme Selection

Section 3 of the Highways asset management Plan 2009 outlines the principles used to attach condition ratings to the network, as shown in the table below

Grade	Description	Maintenance Action Required	
1	An asset offering good residual life reflecting new construction, or reconstruction, or an older asset that is structurally sound with no serviceability defects	No maintenance works required	Green
2	An asset in a transitional stage where the condition becomes less predictable. The condition of asset could be classed as average and the visible appearance / condition may have extensive degradation, distress or depressions	Some form of maintenance work is required within 5 years or less	Amber
3	Failure of the asset either in part or whole with little or no residual life. High cost to repair, could be dangerous and may require extensive basic maintenance	Major maintenance works are required	Red

Table 2. Condition rating

Roads in grade 3condition – these roads are already in need of significant structural maintenance work in part or in whole that would lead to design treatments, which will aim to achieve 20 years plus for design life, linked to intervention treatments within appropriate timescales, to support this design life.

Roads in grade 2 condition – these roads still have a number of years of structural design life left and need to have treatments identified that will maximise the future design life to achieve or exceed the original.

Roads in grade 1 condition – these roads although needing no maintenance at the present time, should have outline appropriate maintenance treatments identified with approximate timeframes, to enable longer term planning to be looked at.

All the above should have whole life cost estimates reviewed in conjunction with current asset value to demonstrate the performance in terms of overall asset value. It is equally important that when maintenance treatments are applied, future maintenance treatment options, along with the timings for such options, are identified. This is essential in terms of whole life costings and forward planning.

Maintenance Options

The following are the maintenance options to be used

- Carriageway
    - Structural overlay – to increase the strength of the completed construction to meet current/revised standards for the design loadings. The vertical alignment of the carriageway is raised to accommodate the overlay depth required. Because of the dense urban road network within Blackpool, overlays normally mean footways have to be reconstructed and accommodation works undertaken as a result of the revised vertical alignment
    - Full depth reconstruction – the existing construction is removed and replaced. Depending on the existing ground conditions this can include new capping layers and sub-base. The depth and positions of all existing services need to be determined, to enable measures to be taken to protect them during construction.
    - Inlay – the replacement of the existing surface course or top layer binder course and surface course
    - Machine patch repairs – where with the exception of isolated patches the existing carriageway is structurally sound, then a programme for machine patching will be prepared and implemented based on priority

- Footway
    - Reconstruction – use of type 2 sub-base with a flexible binder course and surface course, construction to accommodate vehicle crossings to domestic and commercial properties will be increased to cope with

vehicle loadings as appropriate. If there is a requirement for a footway to be able to cope with regular vehicle override, as a consequence of the narrowness of the carriageway, then consideration should be given to strengthen the first metre of footway to support this additional loading.

- Where existing modular footways are to be reconstructed then flexible surfacing materials will be used. The only exceptions to this will be in the defined pedestrianised areas, which lie within the town centre, conservation areas or outlying district centres.
- Inlay – the replacement of the existing surface course or treatment to the existing surface course to extend its' life.
- Patch repairs - where the existing footway is structurally sound, then a programme for hand lay patching will be prepared and implemented based on priority.

- Cycleways and pedestrian/prestige areas
  - Maintenance treatments will be based on both the construction and materials used at the time of construction linked to the as built details.

- General
  - All treatment options should be based on a cost benefit analysis
  - The optimum treatment will be based on what the objectives of the treatment are e.g. to improve the skid resistance, to improve the surface water drainage, to reduce noise levels etc
  - Detailed historical records compiled as part of the highways asset management plan coupled with good experience of treatment options is invaluable. This can reduce the need for detailed loading analysis
  - Blackpool has a significant number of carriageways that are of concrete construction, which have had flexible overlays constructed over the years. Before replacing or applying further overlays, the stabilisation of the existing slabs must be determined and treatment of voiding and construction joints undertaken as part of the maintenance option.
  - Carriageway treatment options can be wide ranging from a relatively straight forward option of patch and leave to a full reconstruction or thick overlay to give a new design life of 20 to 25 years. A summary of options is given in the table below. More detailed information for treatment types is given in HD31 for flexible roads and HD32 for rigid roads.

Treatment option	Strengthen carriageway	Improve ride quality	Reduce noise	Improve skid resistance	Improve surface water run off	Make pavement structure less permeable	Thickness mm
Reconstruction	yes	yes	Depends on surface course used	yes	yes	yes	300 - 750
Overlay	yes	yes	Depends on surface course used	yes	yes	yes	90 +
Retread	yes	yes	no	yes	yes	yes	75 - 100
Inlay	Notional increase depends on materials used	yes	Depends on surface course used	yes	yes	yes	40 - 100
Thin surfacing (HAPAS)	Notional increase depends on materials used	yes	yes	yes	can do	normally	15 50
Retexturing	no	no	no	Yes in short to medium term	Depends on system used	no	0

Table 3. Examples of treatment options

Surfacing

Surfacing performs the following functions

- Strengthens the structure of the pavement
- Waterproofs the pavement structure
- Provides ride quality
- Provides skid resistance

The profile and the macro/micro texture of the finished surface course controls the quality in relation to the last two points.

In terms of carriageway surfacing the road network has been split into two classifications the Strategic Road Network (SRN) and other lightly trafficked residential roads. The lightly trafficked residential roads are those classified as Type 4 under the New Roads and Street Works Act. This would equate to roads carrying less than 100 cv/l/d. The vast majority of Blackpool's residential roads carry considerably less than this figure.

- **Lightly trafficked residential roads**

  Following detailed discussions with various council departments/divisions, members and the long term maintenance partnering contractor, the treatment option selected for these roads, based on cost analysis and value for money, will be a thin inlay using a HAPAS approved surface course. This option will be discussed and reviewed prior to the commencement of any works at the beginning of each financial year. Whole life cost analysis should be undertaken as part of the design.

- **Strategic road network**

  The roads under this grouping will be viewed on an individual basis with options to be considered based on the results of the condition surveys undertaken. Anticipated future treatments to enable the design life to be achieved or exceeded need to form part of the design process. The full whole life costs should then be analysed to conclude the design process. These costings plus the timings of future treatments should be linked in to the asset management plan

- Basic outline design questions
  - Condition of existing pavement structure
  - Estimate of life left in existing pavement structure
  - What design life do you want to achieve
  - What treatment options are there to achieve that life

- To achieve that life will other treatments have to be applied within a defined time period
- What are the costs for
  - The initial treatment
  - The “follow on” treatment at today’s prices?
- What is the value of the existing structure which is to be left in place
- Are there budget constraints that will prevent you applying the optimum treatment to give the required design life.
- If so what are the consequences of undertaking a lower standard of treatment
  - In terms of cost of the initial treatment
  - Effect on any follow on treatments
  - Effect on design life to be achieved
  - Effect on value of asset

For consideration as an example

Estimated maintenance strategies

Material type	Est maintenance treatment	Approx. timing for treatment year	Performance indicator intervention criteria		Unit Cost	Duration of work	remarks
	Code		Code	value			
	CS	3, 6, 12	SC + StC	5%			Seal cracs in years 3,6,12 with expected patching, complete cold mill and replace after 15 yrs
	PA	8	StC	all			
	CMR	15	RU	15mm			

Estimated maintenance treatment	Code	Performance indicator	Code
Crack sealing	CS	Rutting	RU
Patching	PA	skid resistance	SKR
Retexture	RT	surface cracking	SC
Slurry seal	SS	structural cracking	StC
Thin overlay	TO	ride quality	RQ
Overlay or cold mill and replace	CMR		

Life cycle cost analysis

- Design, select and document the most affordable means of accomplishing the specified objective
- Evaluate pavement preservation strategies. The costs of each strategy can be evaluated relative to the anticipated effects it will have on extending the life of the pavement and delaying expensive reconstruction costs
- Apply the principles of “value engineering”
- Plan and programme maintenance treatment works to balancing costs against off peak work against reduced traveller delay costs