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CORNWALL COUNCIL

Highway Service

Code of Practice for the Management of Highway Structures

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Management of Highway Structures

1.0 Introduction

The Structures Group of Cornwall Council's Highway Service undertakes the management of some 4000 highway structures. The overall structures stock is made up of bridges, culverts, subways, footbridges and retaining walls that support, or impinge in some way on, the highway. The principles and procedures outlined in this Code of Practice are applied in order that the County's highway structures are inspected, maintained and upgraded to underpin the provision of a safe and reliable road network.

The Council's first Structures Code of Practice was prepared primarily to seek approval for the frequency of structural inspections of highway structures and was approved by the Council Executive on 6 April 2005.

The national standard: Management of Highway Structures – A Code of Practice [ref. 1], was published in September 2005. The national code of practice is a comprehensive document summarising all aspects of structures management.

A revised second issue of the Council's Code of Practice was approved in April 2006 and included;

- a gap analysis comparing Cornwall Council practice to the recommendations of the national standard
- a record of the asset value of the structures stock
- prioritisation models for strengthening, capital maintenance and minor maintenance works

This third issue of the Council's Code of Practice for the Management of Highway Structures includes;

- a revised gap analysis comparing Cornwall Council practice to the recommendations of the national standard (see 2.10)
- a record of the asset value of the structures stock (see 3.2)
- a revised principal inspection regime (see Appendix D)
- a revised prioritisation model for minor maintenance works (see Appendix E)

This document issue also sets out where it is considered that structures management practice in Cornwall will conform to local practice rather than that recommended in the national code of practice.

2.0 Management Context

2.1 Policy Changes

Policy may need to be varied from time to time to cater for any changes in legislation, national policy or local funding restrictions. Any such variations will be presented for approval to the appropriate council committee before being adopted.

2.2 Objectives

The objectives of this local Code of Practice are to:

- Establish the level of stewardship that should be exercised by Cornwall Council in relation to highway structures;
- Harmonise policies, procedures and practices and provide a consistent approach for inspection and maintenance management while allowing flexibility to take account of local factors, priorities and choices;
- Prevent accumulation of a maintenance backlog and identify a steady-state programme of work over the longer-term;
- Encourage the use of risk management and whole life costing in the prioritisation of structures works;
- Encompass government's policy objectives of best value, resource accounting and budgeting, integrated transport, and sustainability;

2.3 Scope

The Code of Practice covers all aspects of highway structures management, except the design of new structures or upgrades to existing structures. Reference should be made to existing codes and standards contained in the Design Manual for Roads and Bridges (DMRB) [ref. 2] for guidance on design. The guidance has been drawn up specifically for highway structures associated with the adopted road network.

The proposals in this document, whilst generally applicable, have not yet been adopted for structures on the public rights of way (PROW) network.

2.4 Maintenance Strategy

The maintenance strategy is based on the gathering of information on highway structures through a programme of general and principal inspections. This information is then evaluated in order to prioritise subsequent maintenance work.

The objectives of the strategy should be:

- To deliver the statutory obligations of the authority
- To be responsive to the needs of stakeholders and the community
- To provide effective management of the highway structures asset

- To support highway management strategy and integrated transport objectives
- To support and add value where possible to wider policy objectives.

These principles are incorporated into a structures management regime with the following core considerations:

- **Safety**

  i) Complying with statutory obligations
  ii) Duty of Care

- **Serviceability**

  i) Ensuring availability
  ii) Achieving integrity
  iii) Maintaining reliability
  iv) Enhancing quality

- **Sustainability**

  i) Minimising cost over time
  ii) Maximising value to the community
  iii) Maximising environmental contribution

These three core considerations should be set within a comprehensive asset management regime, based on effective risk management, whole life costing and competitive service delivery management. Such an asset management plan is currently being considered and will be developed as one of the Codes recommendations for reaching Milestone 3 in March 2012. The Structures Asset management Plan will be written to align with the objectives of the annual Transportation Service Plan.

2.5 Duty of Care for Highway Maintenance

Much of highway maintenance activity is based upon statutory duties and powers contained in legislation and precedents developed over time as a result of claims and legal proceedings. In addition to a general duty of care, there is specific legislation which provide the basis for powers and duties relating to highway maintenance. The overarching duty is set out in Section 41 of the Highways Act 1980 and is a duty to maintain highways which are maintainable at public expense. Most claims against highway authorities relating to highway functions arise from alleged breaches of this section. Section 58 of the Act provides the Council with a statutory defence against claims where it can establish that reasonable care has been taken to "secure that the part of the highway to which the action relates was not dangerous to traffic". A systematic process of highway safety inspections, intervention and repairs applied in accordance with the County Council's policy is necessary for the statutory defence.

2.6 Health and Safety

The Health and Safety at Work etc. Act 1974, together with the Management of Health and Safety at Work Regulations 1992 and the Construction (Design and Management) Regulations 2007 (CDM) require highway authorities to carry out work in a safe manner and establish arrangements for the management of construction works.

As part of the CDM Regulations one of the duties placed on the designer is to take into consideration risks involved with the construction, maintenance and demolition of a structure. The impact of this is described in more detail in Appendix A - Designing for Maintenance.

2.7 Environmental Procedures

It is a legislative requirement for all maintenance work on highway structures, including inspections, to be undertaken giving due consideration to the environment. The Highways Act 1980, section 105A was amended in 1988 to include these requirements for highway schemes. The Council's Environmental Management System is accredited to BS EN ISO 14001. Compliance with this is overseen by the Business Planning and Transformation team. Guidance notes have been developed as part of this Code of Practice and are available to staff through the document section of the structures management database.

2.8 The Management of Risk

The management of highway structures, including the establishment of regimes for inspection, recording condition, determining priorities and programmes, and procuring maintenance repairs, should all be undertaken against a clear and comprehensive assessment of the risks and consequences involved.

Risk management requires a detailed understanding of the effects of acts or omissions. It is important that available resources are directed to where they are most effectively used, ensuring the safety of the public and minimising the risk of prosecution to the Council.

All risks have cost implications. An understanding of the structure, its size, condition, age and construction material will have a bearing on the extent of degradation or damage the structure can sustain before preventative works have to take place.

2.9 Structure Hierarchy

There is an established hierarchy for carriageways, footways and cycle ways in the County. This has been based upon traffic flows for roads, and defined priorities for footways and cycleways. In addition a further assessment has been undertaken to consider the type of road, the role of the route in a local context, and a consideration of functional factors that may influence how the road is managed.

Simply matching highway structures to the part of the network they carry would provide an easy solution to the question of defining a hierarchy of highway structures. Unfortunately this takes no account of the condition and complexity of the structures on a route. National guidance requires biennial general inspections irrespective of route, thus avoiding the need to consider the factors that affect the safety and condition of a particular structure. In addition, more detailed principal inspections are carried out every 6 to 10 years.

Ahead of most other highway authorities Cornwall Council has undertaken assessments of retaining walls that support the highway. Principles originally developed to manage sub-standard highway bridges have been used to develop a risk matrix for retaining walls. Several factors, including the importance of the route, are used to band the walls into high, medium and low risk structures. Appropriate inspection frequencies are defined according to the level of assessed risk.

2.10 National Code of Practice – Gap Analysis

In September 2005 the UK Bridges Board published: Management of Highway Structures – A Code of Practice in order to provide authoritative guidance on highway structures stewardship duties and the development of recognised good management practice.

The Code contains a number of recommendations spread across the eleven sections. These high level recommendations are broken down into specific actions which are in turn grouped together under 3 milestones. The three milestones can be regarded as an indication of an authorities' level of management practice and range from basic (milestone 1) to advanced (milestone 3). Authorities are invited to score themselves from 1 to 5 against the recommendations. A score of 3 or above shows that the action has been implemented. Scores of 4 and 5 are achieved as the actions become the routine practice of the authority.

Cornwall Council attained a score of 3 with respect to all the milestone 2 recommendations by March 2010. The Council will continue to develop structures management practice with a view to reaching milestone 3 in March 2012.

There are a small number of national recommendations that are considered inappropriate to structures management in Cornwall. These are mainly in Sections 6, 7 and 8 of the National code of Practice which deal with Inspection Testing and Monitoring; Assessment of Structures and Management of Abnormal Loads respectively. The measures that the Council will be taking in these areas are detailed in the tables in Appendix B.

3.0 Highway Structures Maintenance Strategy

The essential components of the maintenance strategy are:

- An inventory of the highway structures
- Inspections to determine the condition of those structures
- Competent staff to inspect the structures and instruct suitable maintenance work
- A system to prioritise maintenance work
- Contractors with appropriate skills to undertake the maintenance work
- Performance indicators to demonstrate the trends in highway structures maintenance

3.1 Inventory

The definition of a highway structure used by Cornwall Council is;

- culverts spanning 0.9 metres and above
- bridges spanning greater than 1.5 metres, and
- a wall where the ground above the wall is more than 1.4 metres higher than the ground in front of the wall and retains the highway.

Details of the highway structures asset are stored in the Structures Management System (SMS) database software supplied by WDM. The extent of the current inventory is summarised in the following tables:

Table 1: Structures Numbers by Highway Service Area

	Bridge	Culvert	Subway	Footbridge	Retaining Wall
West Cornwall	385	178	2	27	552
Central Cornwall	678	273	4	16	528
East Cornwall	461	189	1	15	768
Total	**1524**	**640**	**7**	**58**	**1848**

Table 2: Structures by Route Hierarchy

	Bridge	Culvert	Subway	Footbridge	Retaining Wall
A Roads	172	60	5	1	387
B Roads	169	63	0	1	261
C Roads	684	256	1	2	411
Unclassified	499	261	1	0	789
Total	**1524**	**640**	**7**	**4***	**1848**

***** 54 footbridges over railways and public rights of way

Table 3: Structures by Construction Material

	Masonry	Reinforced Concrete	Timber	Steel	Other
Bridges*	1156	734	92	48	199
Retaining Walls	1568	32	0	0	248

** includes culverts, subways and footbridges*

3.2 Asset Valuation

The value of the County's highway structures is calculated in accordance with 'Guidance Document for Highway Infrastructure Asset Valuation' (ref. 3). The monetary value of the highway structures stock is measured in terms of the Depreciated Replacement Cost (DRC) where:

DRC = Gross Replacement Cost (GRC) – Impairment

The GRC is the cost of replacement of the entire structures stock by modern equivalent assets. The cost of service diversions is not included and provision is made for more expensive types of structure, such as those listed as being of historical and architectural interest. Impairment is the monetary value of all the outstanding defects recorded during regular and special inspections, including programmed works to strengthen, replace or upgrade structures.

The valuation is calculated monthly through the WDM Structures Management System (SMS). The current value of the GRC is £880 million and the DRC is £855 million. This Indicates there is a backlog of some £25 million of work to highway structures in the County.

3.3 Inspection Regime

The Department for Transport (DfT) publishes standards to guide the Highways Agency and its Agents on the maintenance of the trunk road network. Local highway authorities, including Cornwall Council, use these standards as best practice for design and management of their highway networks. Inspection of highway structures is covered in Departmental Standard BD63/07 [ref. 4].

The guidance for inspectors on how inspections are carried out is defined at a national level by The Inspection Manual for Highway Structures [ref. 5]. Training for inspectors is under development at a national level through the Association of Directors of Environment Planning and Transport (ADEPT). No programme for the introduction of appropriately accredited training is yet available.

The DMRB has been written for the trunk road highway structure stock which contains a large proportion of reinforced concrete and steel bridges. Most of the

bridges have been constructed in the last 50 years and serve motorways and dual carriageways.

The structures on the county road network in Cornwall have very different characteristics in terms of age, size, construction materials and structural form. Only 20% are constructed from reinforced concrete or steel and, of the remainder, most are relatively small masonry arch or granite slab bridges. It is also the case that Cornwall's road network is generally less highly trafficked than the trunk road network. Historically principal inspections (PI's) were carried out on structures serving the trunk roads in the County and sporadically on bridges on the county network. Since the previous revision of this code a PI regime has been established that is designed to increase the number of principal inspections carried out on bridges within the available staff resources. The information gathered by the detailed examination of the structure carried out during a PI is essential in planning future maintenance priorities. Details of arrangements for principal inspections are contained in Appendix D.

A summary of Cornwall Council's inspection regime is given in Table 4 below.

Table 4: Inspection Frequency

Inspection	Structure type	Frequency	Tolerance	Undertaken by
Superficial	All	On demand		Inspector
General	All culverts and bridges	Every 2 years	± 6wks	Inspector/Engineer
General	High risk retaining walls	Every 2 years	± 6wks	Inspector/Engineer
General	Medium risk retaining walls	Every 4 years	±8wks	Inspector
General	Low risk retaining walls	Every 6 years	±12wks	Inspector
Principal	All Bridges with individual spans > 6 metres	Every 6 years	±12wks	Engineer
Principal	High risk retaining walls	Every 6 years	±12wks	Engineer
Special	All	On demand		Engineer
Underwater	All where depth of water prevents normal inspection	Every 2 years	±6wks	Specialist Engineer
Assessment	All	On demand		Engineer
Special BD79/06	All	Dependant on defect(s)	± 6wks	Inspector

The frequency of these inspections can be altered depending on the structures condition or if the structure fulfils certain criteria defined in Appendix C.

3.4 Structural Review and Assessment Regime

The national code of practice states that the purpose of the assessment of a highway structure is to determine the ability or capacity of the structure to carry the loads that are imposed upon it, and which may reasonably be expected to be imposed upon it, in the foreseeable future. The assessment provides valuable information for managing the safety and serviceability of highway structures.

An assessment of capacity may be required for any structure where its load carrying capacity is considered to be reduced as a result of damage or defects. Assessments will be carried out in accordance with the appropriate assessment standard from the national guidance.

The National Code of Practice suggests a steady state assessment is carried out on every structure once every 12 years. In 2009 the Council completed a major programme of assessments to compare the structural load carrying capacity of each eligible structure to the 40 tonne capacity required by Departmental Standard BD21/01 [ref. 6]. In the light of this work it is not considered necessary to undertake a programme of steady state assessments; individual assessments will continue to be undertaken as considered appropriate. This situation will be reviewed annually to ensure that if a programme of assessments is considered appropriate in future that the resource implications of that decision are presented to the Council for approval.

In addition to the assessments Structural Reviews are undertaken when certain criteria are met or every 18 years. The definition of a Structural Review and the qualifying criteria are set out in Appendix C.

3.5 Management of Sub-Standard Structures

Structures that fail assessment will be managed in accordance with guidance in BD79/06. The Management of Sub-Standard Highway Structures [ref. 7]. A formal review has been undertaken of the adoption of BD79/06 and has been reported separately. Failed structures will either be:

- Strengthened
- Replaced, or
- Restricted (in weight, height or width)

A priority ranking table, where different attributes of each structure are scored against a set of criteria, determines the order in which works are undertaken. If permanent actions cannot be undertaken within a reasonable timescale one of the following measures will be implemented until such time as permanent action can be taken:

- Formal interim measures (e.g. temporary propping)
- Monitoring, at an appropriate level and interval

The Council is currently monitoring 493 structures which have failed assessment.

3.6 Competency of Inspectors

A vital element of any structures inspection system is the inspector. The inspector is responsible for performing the required duties competently, consistently, thoroughly and safely.

Inspection of highway structures does not, at present, require any formal training or qualifications. However all inspectors should have appropriate structural inspection experience. In addition to experience, inspectors should, where practicable, receive specific training in inspection procedures and techniques. Particular training in safe working practices is essential.

The level of engineering competence of staff engaged in inspections ranges from inspector through technician to engineer. The inspection regime operated by the Council allocates inspection staff according to the risk posed by the structure in question.

The following criteria are assessed during recruitment and selection:

- knowledge of safe working practices and methods of access required for inspection
- an understanding of the behaviour of structures
- an understanding of structural failure
- ability to recognise and evaluate defects and judge when immediate action is needed
- knowledge of construction methods and materials
- knowledge of the causes of defects
- Ability to record defects accurately, clearly and consistently.

Once appointed inspectors receive on-the-job coaching and training in specific highway related topics. Initially inspections are carried out under supervision. As the inspector's performance is judged satisfactory they are able to operate more independently. Consistency of reporting by different inspectors is monitored by joint inspection exercises within the Council and with other authorities in the south west region.

3.7 Competency of Engineers

An engineer requires academic and professional qualifications together with appropriate experience. Whilst key positions will be filled by people meeting all requirements the duties can be performed by those with academic qualifications who are gaining experience and working towards professional status. These individuals will be supervised and have their work monitored.

3.8 Repair Prioritisation

Maintenance work to highway structures is considered under the following headings:

Reactive	Responding to inspections, complaints or emergencies
Routine	Repairs, painting, cleaning and other activities which maintain the structure in a steady state condition
Programmed	Planned schemes primarily of strengthening, refurbishment or replacement to improve the condition of the structure

The maintenance work required is characterised by a variety of defects in the structure. Defects are regarded as any feature or condition that prevents the continued safe, unrestricted use of a highway structure or that might accelerate the deterioration of the structure. Examples of defects would be traffic accident damage, river bed scour, missing or damaged structural components and or the whole or part of a structure failing a load carrying assessment for loads that use the route.

Most often defects will be identified during general and principal inspections by Cornwall Council staff. These defects will form the basis of programmed repair work.

Defects may also be reported by network management staff, other Council staff, the police, other organisations or members of the public. Defects reported in this way often require an urgent response where the first priority is to ensure the safety of highway users. Defects need to be recorded to ensure that they are investigated and action taken as appropriate. The Structures Group will maintain a database of structure defects.

Defects in highway structures are dealt with according to whether they require an immediate response or can be ranked against other defects and allocated a priority. In situations where the condition of a structure may affect the safety of the public an urgent response is required. This will usually take the form of temporary signing and guarding with fencing to exclude the public. Wherever possible, further remedial works will be undertaken to enable the removal of the signing and guarding within seven days. In situations where the extent of the defect is so severe as to make the removal of this temporary system inappropriate, a semi-permanent traffic management system will be installed. Such defects fall into Category 1 in Table 5.

Defects that fall into Category 2 will be assessed by Structures Group staff in accordance with the prioritisation models found on the Councils WDM SMS database. The database will record the determined priority for each defect raised. Priorities will be reviewed and moderated by the Group Engineer (Structures Maintenance). To assist Structures Group staff in giving priority to routine maintenance a revised scoring model has been produced which appears in Appendix E.

The backlog of maintenance repairs will be reviewed regularly by the Structures Asset Manager using the reporting tools available in the WDM SMS database.

Routine maintenance works will be designed and programmed in each of the three network management regions to provide, where possible, consistent workload to the term contractor. This goal should normally be achievable but may not be possible if the priorities of the required maintenance repairs are not evenly distributed across the highway network.

Strategies for a targeted approach in specific local areas will be developed to ensure development of appropriate access routes for communities and areas (e.g. Bodmin Moor Strategy – route strategy onto the Moor for heavy commercial vehicles, ref: S2846/02/100/01).

Table 5 Defect Categories

	Defect description	Response times
Category 1 Reactive (Safety)	Those defects that require prompt attention because they represent an immediate or imminent hazard or there is a risk of short term structural deterioration. These defects will normally initiate reactive maintenance.	Remedial action to make safe within 24 hours.
Category 2 Routine / Programmed (Serviceability)	Those defects which have an effect on the reliability, quality, comfort and ease of use of the road network. These will normally be placed on a programme of future works, for completion depending on availability of finance and resources. 2.1 Short term routine maintenance work. Usually completed within 2 years of reporting. 2.2 Longer term maintenance work. Programmed on a 5 year time horizon.	Completion may depend on availability of finance and resources.

The following are the main defect headings within which structure specific solutions are designed and constructed

Category 1 Reactive

- All elements – sign and make safe for safety purposes
- All elements – provide initial temporary repair for safety purposes
- All elements – provide permanent repair for safety purposes

Category 2 Routine

- Painting of parapets, bearings etc
- Vegetation removal
- Parapet and barrier repair
- Graffiti removal
- Minor masonry repairs and re-pointing
- Minor concrete repairs
- Mechanical and Electrical – servicing, cleansing and repair

Category 2 Programmed

- Replacement
- Strengthening
- Refurbishment
- Masonry repairs and re-pointing
- Concrete repairs
- Parapet replacement
- Bearing replacement
- Waterproofing or re-waterproofing
- Safety barrier/railing replacement

3.9 Contractor

The Council has a Term Maintenance Contractor which has been evaluated to have the appropriate skills to undertake highway maintenance across Cornwall. Some projects will also be tendered in accordance with the Council's Standing Orders. Contracts will only be awarded in accordance with the Council's rigorous Procurement Assurance Scheme.

3.10 Performance Indicators

A suite of national performance indicators (PI) [ref. 8] has been developed for use by the Highways Agency and other highway authorities. The indicators are:

- Condition PI

  Records the severity and extent of damage or deterioration. Can be expressed as a score for individual structures or as and index for a group of structures or the complete structures stock.

- Availability PI

  A measure of the restrictions on the highway network caused by structures that are not fully functional.

- Reliability PI

  A measure of a structures ability to support traffic loading taking into account the consequences of failure.

- Structures Backlog PI

  The monetary value of the work required to raise the performance of the structures stock to the required level of performance.

The Condition PI was introduced in 2003 and is the most widely used. Work by Structures Group staff has improved the reliability of this indicator so that genuine trends in the condition of the structures stock are now apparent. Work to harmonise reporting across authorities in the south west of England has been successful so that useful comparison across the UK should soon be possible.

The remaining three indicators were implemented in April 2006. Cornwall, along with many other highway authorities, does not yet make use of these indicators when reporting on their structures stock.

Measures of local customer service are being developed to reflect the levels of consultation and advance information given to customers as major works proceed. These will be measured along with targets to adequately assess and define ecological responsibility on all projects and address issues throughout the life of the project. Details of local targets and service levels are to be found in Appendix F.

4.0 Privately Owned Structures

In addition to Cornwall Council owned structures there are other bridge owners with assets which interact with the highway network in Cornwall. The organisations which own the majority of these structures are Network Rail, British Rail Board Residuary, Bodmin and Wenford Railway and Imerys. In some instances Cornwall Council has a duty to contribute to the maintenance of privately owned bridges. The Council's contribution is prioritised along with the CC owned structures. The assessment of all private structures was completed during 2006 and the review document for Rail Structures Progress Report was updated in 2007.

4.1 Railway Structures

- Road/Rail Interface Sites

  Road over, and adjacent to, rail sites in Cornwall have been assessed and the results reported separately; ref: Road Over Rail Bridges Maintenance Programme 2006 – S2706/PK204/072 and Road Adjacent to Rail Phase 1 Assessment Report 2005/2006. The majority of sites in Cornwall are classed as low risk. There are three sites which are classified as high risk which are Carn Brea Bridge (Pool, over and adjacent), Humphry Davy Lane (Hayle) and Carbis Bay Station. It is not currently anticipated that specific funding will be available at a national level to improve the situation at these sites. Works arising from this review will be prioritised with other structures maintenance work.

- Maintenance Liabilities for Rail Structures

  The Transport Act 1968 (part VII Bridges and Level Crossings etc) sought to clarify responsibilities for maintaining the structures that carry highways over the railways of the British Railways board and over waterways of the British Waterways Board. Part VII of the Act states that the above boards are responsible for the maintenance of the whole of a structure. Maintenance of the surfacing is the responsibility of the highway authority.

- Network Rail Liaison

  Previously the negotiation of the Highway Authorities programme of works affecting the operational Railway has proved to be difficult and time consuming. Guidance has been provided in the national code of practice. When required to undertake inspections or maintenance work on structures over or adjacent to operational railways, the bridge manager of the highway authority is required to adhere to Network Rail Procedures for outside parties. This process includes notification, possession booking and agreement of method statements with continuous liaison between the bridge manager and the appropriate operator.

5.0 Developer Promoted Structures

Cornwall Council's Intranet contains guidance notes for developers covering the design and specification of highways for adoption. Any structure that affects a public highway will be subject to the approval process described in BD2/05 [ref.9]. In these cases Cornwall Council acts as Technical Approval Authority with the Structures Group Manager administering the process. In these cases it is advisable for the developer to contact the Council as early as possible in the development stages to agree design parameters, standards and agree the level of Technical Approval required. Negotiations on whether the structure is to be adopted are undertaken by the Development Control section with technical advice provided by the design services teams including the Structures Group. The Structures Group Manager should check that adequate provision is made in any agreement for commuted maintenance sums and highway authority costs if appropriate.

6.0 Areas for Development

The national Code of Practice recommends that highway authorities should develop their highway structures management practice with a view to achieving the Milestone 3 recommendations by March 2012. The following topics have been identified which will align with the recommendations of the code and enhance good practice in the authority:

- Application of asset management principles
- Extension of risk based inspection regime to all structures
- Review of parapet provision
- Review of river bed scour at bridge sites
- Abnormal load routing arrangements
- Policy development for historic structures
- Implement availability, reliability and backlog performance indicators.

7.0 References

1. A Code of Practice for the Management of Highway Structures. The Stationery Office, September 2005.

2. Design Manual for Roads and Bridges, The Highways Agency

3. Guidance Document for Highway Infrastructure Asset Valuation. The Stationery Office, July 2005.

4. BD 63/07 Inspection of Highway Structures Part 4 Vol 3 of DMRB

5. Inspection Manual for Highway Structures, The Stationery Office, May 2007.

6. BD 21/01 Assessment of Highway Bridges and Structures, Section 4, Vol 1, DMRB.

7. BD 79/06 Management of Sub-standard Highway Structures, Part 18, Vol 3, DMRB.

8. Guidance Document for Performance Measurement of Highway Structures. Atkins report for Highways Agency and CSS Bridges Group, 2007.

9. BD 2/05 Technical Approval for Highway Structures, Section 1, Vol 1 of DMRB

Appendix A

Designing for Maintenance

Designing for Maintenance

Although much maintenance activity is undertaken on highway structures of long standing, new and improved highway schemes form an increasing proportion of the network over time. It is key to the delivery of Best Value therefore that the implications for future maintenance are a prime consideration in the design and implementation of such schemes. This is not to say that creativity should be inhibited and indeed high quality expensive materials used, for example, in heavily used centres where they may be both appropriate and offer low maintenance. It may also be appropriate to use environmentally sensitive materials in certain locations despite the possibility of higher future maintenance costs.

There are however many cases where careful consideration of maintenance implications at the design stage would have provided an equally effective outcome, but without maintenance complications either increasing costs or introducing practical difficulties, which may in fact compromise the effectiveness of the feature.

Examples include:

- Materials requiring high frequency of maintenance
- Difficulties of access for routine maintenance such as bridges over water
- Inappropriate verge treatments and drainage systems
- Safety features with high rates of deterioration

A maintainability audit could therefore usefully be developed by reference to a standard checklist, which could include the following items:

- What is the estimated design life?
- Are the design and materials suitable for the surrounding environment?
- Are the design and materials suitable for the predicted traffic use?
- Are the materials liable to fading or discolouration?
- Can the materials be readily replaced throughout the design life?
- Can the surfaces be cleaned?
- Can the structure be easily accessed for maintenance purposes?

In addition to the above, National guidance in the form of a Highways Agency Interim Advice Note 69/05 - Design for Maintenance will also be considered in the design process.

Appendix B

National Code of Practice - GAP Analysis

Milestone One Actions Sections refer to the sections in the National Code of Practice (NCoP)	Score 3 Achieved Table 11.1 NCoP	March 2010 score	Gap NCoP vs. CC	CC desired rating	Comments
Section 2: Structure Management Context					
Employ suitably qualified & trained personnel.	✓	4	1	5	Staff employed through approved interview and selection process. No national qualification for inspectors.
Provide CPD & training for all staff engaged in Structures Maintenance.	✓	5		5	Training identified through staff appraisal system & recorded on Personnel file.
Require contractors & consultants to demonstrate their staff are qualified and trained.	✓	5		5	Full CV and training history recorded with contract documents.
Maintain up to date documents on Transport policy and plans; Best Value	✓	5		5	All documents maintained by in-house technical library.
Maintain information on legal and procedural requirements.	✓	5		5	As above
Maintain Health & Safety policy. Guidance tailored to management of Highway Structures.	✓	5		5	All Health & Safety documentation maintained by the E, P & E Health & Safety
Maintain appropriate standards for maintenance.	✓	5		5	Standards adopted from Highways Agency DMRB. Vol.3 and maintained by technical library
Maintain a Technical Approval Procedure with an organisation appointed as TAA	✓	5		5	CC is the TAA.
Section 3: Structures Asset Management Framework					
Nominate a highway structures representative to asset management team.	✓	5		5	Structures Asset manager appointed July 2009
Section 4: Financial Planning and Resource Accounting					
Establish proper polices and procedures for the capitalisation of expenditure.	✓	5		5	Function of Highways Programme Manager. Reviewed monthly with Structures Manager.
Section 5: Maintenance Planning and Management					
Check inputs to maintenance planning & management process are in place.	✓	5		5	WDM SMS database
Implement formal emergency response process.	✓	3	2	5	Identified through Process Charts
Implement formal process for identification of needs.	✓	3	2	5	Asset Manager appointed to define needs and agree targets
Develop & implement an annual work plan that covers reactive maintenance.	✓	5		5	Structures Technician Area scheme lists
Identify how maintenance work should be classified.	✓	5		5	Maintenance/Capital work spilt by cost & type of work

Section 6: Inspection, Testing and Monitoring					
1. Implement regime of Routine, Safety & Acceptance inspections covering all highway structures.	✓	5		5	Inspection cycles as per Highways Agency BD 63/07
2. Implement regime of General Inspections covering all highway structures.	✓	5		5	As above
3. Implement a process whereby the inspector has a defined duty to inform the Bridge Manager of any defect that represents an immediate risk to the public safety.	✓	5		5	Duty defined in inspector/technician job specification
4. Implement a monitoring regime for all sub-standard structures.	✓	5		5	Monitoring as defined in BD79
Section 7: Assessment of Structures					
1. Complete the national programme for 40Tonne assessment loading & take appropriate actions arising from the assessments.	✓	5		5	Completed
2. Check that assessment results are properly recorded and kept up-to-date.	✓	4	1	5	Part of WDM SMS database.
Section 8: Management of Abnormal Loads					
1. Establish the roles of Abnormal Loads Officer, Structures Adviser, & Road Space coordinator.	✓	4	1	5	Post holders already in place.
2. Establish procedures to check the suitability of a specific abnormal loads to cross a structure. (BD86).	✓	4	1	5	Refer to Office procedures.
3. Establish an elementary system for management of abnormal loads.	✓	4	1	5	As above
Section 9: Asset Information Management					
1. Identify data & information needs.	✓	3	2	5	From Management of Highway Structures, A Code of Practice
2. Review current data & information.	✓	4	1	5	On going process
3. Undertake a gap analysis & schedule data capture.	✓	4	1	5	Gap analysis performed in 2006, ongoing review.
4. Establish data capture, verification, transfer & storage processes and practices.	✓	4	1	5	WDM SMS database
5. Capture essential data.	✓	4	1	5	As above
6. Establish structure files.	✓	4	1	5	File structure established.
Section 10: Framework for a Bridge Management System					
1. The BMS should have a database with a listing of all highway structures with basic inventory details recorded for each asset.	✓	5		5	WDM SMS database

Milestone Two Actions Sections refer to the sections in the National Code of Practice (NCoP)	Score3 Achieved Table 11.1 NCoP	March 2010 score	Gap NCoP vs. CC	CC desired attain ment	Evidence
Section 2: Structure Management Context					
1. Establish process for compiling, storing & maintaining information. Ensure information is readily accessible and updated to relevant staff.	✓	5		5	WDM SMS system.
2. Provide programme of CPD & training for all staff to implement Good Management Practice.	✓	4	1	5	Programme of training managed by Personnel Dept.
3. Maintain up to date documents on Resource Accounting and Budgeting requirements.	✓	3	2	5	Latest document on order in technical library
4. Maintain guidance notes on the environment and conservation requirements.	✓	3	2	5	Structures Environmental Guidance Notes
5. Maintain procedures for stakeholders consultation and involvement.	✓	4	1	5	Established consultation process as BD79
6. Produce & maintain guidance notes for dealing with other owners and third parties.	✓	3	2	5	A.I.P. documentation in place. Code of Practice – appendix H
Section 3: Structures Asset Management Framework					
1. Determine the content & scope of the Asset Management Regime that is appropriate for the stock and align with other A.M. Regimes.	✓	3	2	5	Management of Highway Structures
2. Translate strategic goals & objectives and levels of service into performance targets for Highway Structures.	✓	3	2	5	Set within LTP2
3. Identify the components of the Asset Management Regime need to be developed for Basic & Advanced A.M. planning.	✓	3	2	5	Condition of Stock available in database
4. Develop & implement components of the A.M. Regime needed to deliver the Basic A.M. planning process.	✓	4	1	5	Data within WDM SMS
Section 4: Financial Planning and Resource Accounting					
1. Prepare a medium term financial plan to support funding processes such as LTP, spending reviews etc.	✓	3	2	5	LTP budget funding

2. Prepare annual financial plan to provide a basis for setting the annual budget.	✓	3	2	5	Prepared by Structures Manager in conjunction with Highway Programme Manager
3. Adopt the recommended procedures for determining commuted sums.	✓	3	2	5	
Section 5: Maintenance Planning and Management					
1. Store the data required for maintenance planning & management in a suitable format & determine current performance.	✓	3	2	5	Under development within WDM database
2. Develop & implement a regular maintenance regime.	✓	3	2	5	As above
3. Develop & implement lifecycle plans for common forms of bridge construction.	✓	3	2	5	Masonry arch and rc construction types contributed to HAMFIG
4. Develop & implement Value Management.	✓	3	2	5	As part of involvement in MAC
5. Develop & implement an Annual Work plan that covers regular, programmed & reactive maintenance.	✓	4	1	5	Prioritised programmes in place
6. Implement a feedback loop to monitor & review delivery of the annual work plan.	✓	4	1	5	Considered at monthly Team and Cormac meetings. Close out inspections within WDM
7. Identify & implement improvements to the maintenance planning & management process.	✓	3	2	5	Condition data being incorporated into maintenance planning
Section 6: Inspection, Testing and Monitioring					
1. Implement regime of Principal Inspections at an interval of not more than six years.	✓	3	2	5	Established regime with data stored on database
2. Record the severity & extent of defects during GI's & PI's.	✓	5		5	WDM SMS database
3. Produce a full report for each PI.	✓	3	2	5	Some PI's will only be entered onto WDM SMS
4. Carry out regular in-house inspection meetings to assess the consistency & competence of inspectors.	✓	3	2	5	Tempoary inspector requires evaluation
Section 7: Assessment of Structures					
1. Implement a regime of structural reviews & reassessments as defined in the Code.	✓	3	2	5	CC policy contained in local CoP
2. Put in place a prioritised programme of structural reviews to establish the need to assess or update the assessment of all structures which have not been previously	✓	3	2	5	CC policy contained in local CoP

assessed to current standards.					
3. Store the assessment results in a Bridge Management System.	✓	5		5	Data in WDM SMS system
Section 8: Management of Abnormal Loads					
1. Establish how & to what extent the authority will use the ESDAL system. Make necessary data available to the system.	✓	3	2	5	Basic stock data supplied to ESDAL
2. Establish an advanced system for the management of abnormal loads to work alongside the ESDAL.	✓	3	2	5	Appropriate system in place for current network management needs
Section 9: Asset Information Management					
1. Capture remaining data & information.	✓	4	1	5	Data within WDM SMS system
2. Programme cyclic data & information needs.	✓	3	2	5	No information or data needs programmed at present
Section 10: Framework for a Bridge Management System					
1. The BMS should incorporate the following functional modules:					
2. User Interface.	✓	5		5	WDM SMS system
3. Report Generator	✓	5		5	As above
4. Asset Database	✓	4	1	5	As above
5. Works Management	✓	3	2	5	WDM HMS works ordering system
6. Abnormal Load Management	✓	3	2	5	Abnormal load module available in WDM SMS
7. Performance Measures	✓	3	2	5	LTP2 Annual Perfomance Review. Measured against stock condition.
8. Decision Support for short term planning & Basic A.M. planning.	✓	3	2	5	WDM SQL queries assist in decision support.

Milestone Three Actions Sections refer to the sections in the National Code of Practice (NCoP)	Score 3 Achieved. Table 11.1 NCoP	March 2010 score	Gap NCoP vs.CC	CC desirred attainment	Evidence
Section 2: Structure Management Context					
1. Continue to provide an ongoing programme of CPD.	✓	2	3	5	Under review by Personnel Department
2. Produce and maintain guidance notes on the ownership and maintenance of retaining walls and, as appropriate a protocol for dealing with cellars and vaults & flooding at culverts.	✓	2	3	5	
3. Produce & maintain a guidance notes on the sustainability requirements for the management of Highway Structures.	✓	1	4	5	
Section 3: Structures Asset Management Framework					
1. Develop & implement components of the A.M. Regime needed to deliver the Advanced A.M. planning process.	✓	2	3	5	
Section 4: Financial Planning and Resource Accounting					
1. Prepare an integrated long term Transport Asset Management Plan, Medium term Financial Plan & Annual Financial Plan as recommended. Consequences of under-funding.	✓	1	4	5	
2. Establish a regime for the asset valuation of Highway Structures in accordance with the CSS Guidance Document	✓	3	2	5	Code of practice for Management of Highway Structures
Section 5: Maintenance Planning and Management					
1. Develop & implement lifecycle plans for all groups and sub-groups of highways structures.	✓	2	3	5	
2. Develop & implement Value Engineering.	✓	2	3	5	
3. Develop & implement a Forward Work plan for the next 1 to 3 years and monitor delivery.	✓	2	3	5	
4. Organise the different components of the maintenance planning & management process into a complete & integrated process & align with the long term asset management planning process.	✓	1	4	5	
Section 6: Inspection, Testing and Monitioring					
1. Implement regime of Principal Inspections covering all highway structures. Where appropriate,	✓	4	1	5	P.I.'s carried out on structures are identified as requiring one.

use risk assessment to determine the inspection interval.					
2. Produce an inspection, testing & monitoring manual that clearly defines the inspection requirements for the authority with H&S, Environment and Conservation information recorded for each structure.	✓	1	4	5	
Section 7: Assessment of Structures					
1. Utilise assessment results in the planning & management of future maintenance programme.	✓	2	3	5	Assessment results held in WDM database
Section 8: Management of Abnormal Loads					
1. Ensure that the necessary data, including assessment results, are implemented & kept up-to-date within the B.M.S.	✓	2	3	5	Location data sent to ESDAL
2. Establish & monitor communications links between the B.M.S. and the ESDAL system as necessary.	✓	1	4	5	
Section 9: Asset Information Management					
1. Implement an on-going data and information review process.	✓	2	3	5	
Section 10: Framework for a Bridge Management System					
In addition to the above, the B.M.S. should incorporate the following functional modules:					
1. Prediction Models.	✓	1	4	5	
2. Whole Life Costing.	✓	2	3	5	
3. Asset Valuation.	✓	4	1	5	Calculate within WDM database
4. Decision Support for Advanced AM Planning.	✓	1	4	5	

Appendix C

Triggers for Inspection & Structural Reviews

Inspection Triggers – Special and Safety Inspections

Introduction

An inspection, testing and monitoring regime should minimise the risk to public safety, provide sufficient data for management of the asset and make effective use of resources. The inspection regime enables any defects which may cause an unacceptable safety or serviceability risk or a serious maintenance requirement to be detected in good time in order to safeguard the public and the structure and implement remedial actions. The regime should consist of a combination of Acceptance, Routine Surveillance, General and Principal Inspections of the whole structure and more detailed Safety and Special Inspections as necessary.

Special Inspections

There are occasions when a more specific inspection, concentrating on the condition of particular parts of the structure, is required. This is known as a Special Inspection. The need for a Special Inspection normally arises due to specific circumstances or following certain events, for example:

- When a particular problem is detected during an earlier inspection of the structure or of similar structures.
- On particular structural forms or types, e.g. cast iron structures, post tensioned structures, structures strengthened with bonded plates.
- On structures that have loading or other forms of restrictions on use e.g. restriction of traffic on bridges.
- When the necessary frequency or access arrangements for a particular part of the structure are beyond those available for General or Principal Inspections
- On bridges and walls that have to carry an abnormally heavy load, inspections may be done before, during and after passage of the load.
- Following a bridge strike.
- Following a flood or high river flows to check for scour or other damage.
- To check specific concerns, possibly based on new information, e.g. concerns over the quality of previously used batches of rebar or concrete.
- Where a post tensioned bridge has a regime of Special Inspections implemented a result of an earlier investigation or a Special Inspection is required in accordance with BA 50/93 Post-tensioned Concrete Bridges, Planning, organisation and methods for carrying out Special Inspections.

Safety Inspections

A Safety Inspection may be undertaken following Routine Surveillance or after information has been received which indicates the structure is damaged and may be unsafe. The Safety Inspection should determine the extent of the damage and whether immediate safety precautions or other action should be taken. A Special Inspection may then follow to monitor the condition and effectiveness of interim measures and to determine what repair or other actions should be taken in the longer-term.

Decreasing the Inspection Interval

When a structure is known or suspected to be subject to a rapid change in condition or circumstances, e.g. structures subject to ASR, chloride induced corrosion or sea defence structures, the default interval between inspections should be reduced accordingly. The reduced interval should be such that any significant change in condition or circumstance can be identified and assessed in time for appropriate actions to be implemented. The revised inspection regime and reasons for more frequent inspections may be limited to a specific element or feature.

Increasing the Inspection Interval

When a structure is known not to be subject to a rapid change in condition or circumstance, e.g. newly constructed or strengthened structures, the default interval between inspections may be increased. In deciding that increased interval a risk assessment should be carried out as stated below.

Risk Assessment

When considering an inspection that is different from the normal regime of inspections the engineer must first assess the risk involved if the inspection frequency was to be changed. A risk assessment should be specific to a structure or a group of similar structures. The assessment method should quantify:

- The likelihood of rapid deterioration or other incidents.

- The consequences of delayed maintenance.

Under the above two headings there are a number of other criteria that may be considered where relevant. For the likelihood of rapid deterioration or other incidents consideration must be made of the following:

- Exposure severity and external influences which may cause rapid deterioration or failure e.g. change in use/loading.
- Current condition and level of contamination, e.g. chlorides etc and how these conditions may influence the rate of deterioration. The age of the structure will also be considered.
- Material and construction type and the typical rate of deterioration these factors historically exhibit. The history of the structure should be considered and any specific characteristics it may have, e.g. flooding, scour etc.
- Severity and extent of damage due to incidents such as vehicle impact, scour and whether it is likely to lead to further deterioration.
- The potential mode of failure, e.g. granite slabs snap whereas steel generally exhibits a ductile failure mechanism.
- Extent of failure, is it global or more localised?

Assessment of the consequences of unchecked deterioration and other incidents should include the following criteria where relevant:

- Consequence of failure of the structure or its safety critical elements,
- Increased costs due to delayed maintenance resulting in more expensive maintenance work at a later date.

If the frequency of inspections is to change then the risk assessment should be recorded in the structure file and agreed by the Structures Group Manager before the frequency is changed. The frequency of inspections for the individual structures should be re-visited after every Principal Inspection or following any significant change in the structures condition.

Triggers for Structural Reviews

The purpose of a structural review is to establish or confirm the validity of a structure's, or group of similar structures, latest assessment and their adequacy to support specified loads. It should consider all available current data taking account of the known condition and the structure's inherent strengths and weaknesses. Included within this are any anticipated effects or changes and updates of assessment standards. A structural review may not be a detailed analysis of particular structures but may be a review of a group of similar structures.

The management of highway structures, of which structural reviews form part of this process, require checks against safety, serviceability and current national standards. It is therefore important to have a regime of ongoing structural reviews with a projected programme for the reviews to take place or defined triggers, events or circumstances that result in the need for a review. Triggers or events include one or more of:

- A change in national regulations governing weight limits of vehicles.
- Significant deterioration or damage being identified (typically by a regular or special inspection raised because of impact, accident or weather event).
- The structures are known or suspected to have load bearing capacities below those that are deemed to be appropriate for the class of highway supported.
- The hierarchy of the road supported by the structure has, or is about to change and significant changes in usage and/or loading is anticipated.
- It has been, or it is proposed to modify the structure.
- Records of the original design or subsequent assessment do not exist or have been discredited.
- At least every 18 years, in conjunction with a Principal Inspection.

The impact of changes to codes and standards will initially be considered through a review of types of structures before a detailed assessment is initiated. The results of assessments and structural reviews will be recorded with all relevant data and assumptions.

Appendix D

Principal Inspection Regime

Principal Inspection Regime

From April 2010 the scope of principal inspections (PI) carried out will be increased to include retaining walls that have been assessed as high risk. Previously approximately 150 bridges have received a PI every 6yrs. With the addition of high risk retaining walls into the PI list the total rises to 462 structures. The implications for increased use of staff time will be monitored through 2010/11 to assess the impact of the increased PI load.

The majority of high risk retaining walls have not received a PI before and therefore will require the removal of vegetation in advance of the inspection. This adds significantly to the cost of the inspections. The works cost of clearance will also be monitored and evaluated against the additional information gathered on the condition of the structure.

The national standard for the inspection of structures is set out in DMRB Volume 3: Highway Structures: Inspection and maintenance, Section1, Part4. BD 63/07 Principal Inspections are defined in as follows:

3.26 Close visual examination, within touching distance; utilising, as necessary, suitable inspection techniques. Report on the physical condition of all inspectable structural parts.

3.27 The authority may use appropriate alternatives to close examination for areas of difficult or dangerous access.

3.28 Alternatives to close examination must be fully documented and must provide comparable quality of inspection to close examination.

3.32 Principal Inspections must be carried out at six year nominal intervals.

In view of the above the list of bridges requiring PI's has been split into six classifications. These classify the level of examination required depending on the complexity of the structure, ease of access and if an engineers input is required. This will allow a more efficient allocation of resources without compromising the value of a principal inspection.

Principal inspections for high risk retaining walls will be resourced in a similar manner using the same system of classification. The removal of vegetation will be tackled by the following approach.

It is proposed to use a 'sample strip' approach for the inspection. A strip of wall will be cleared of vegetation for its full height. The length of the strip will be determined by considering the overall length of the wall. For long retaining walls the strip should be split and separated equidistant along its length. The Principal Inspection will be carried out by an engineer with support staff as required.

Each wall will be inspected from ground level at close proximity to the wall. Ladders may be used to access parts of the wall above ground level but, only if a risk assessment has been carry out. Binoculars may be used to view portions of the wall which cannot be directly accessed.

If significant defects are identified during the PI the Engineer can request that a special inspection (SI) is undertaken at a later date.
The SI will require the removal of all vegetation from the wall and the use of specialist access equipment or inspectors trained in rope access in order to fully assess the wall in accordance with the principles of DRMB Volume 3.

This approach is summarised in the table below:

Level of Examination						
Technician only	**Technician + Inspector**	**Engineer+ Technician**	**Multiple Team**	**Diving & Roped Access**	**Special Structures**	**Bridges over Rail**
Class 1	**Class 2**	**Class 3**	**Class 4**	**Class 5**	**Class 6**	**Class 7**
Lone working	Working in water	Working in water	Working in water	Deep water	Complex structures	Rail track possession required
Easy access		Reinforced concrete	Large structure. Confined space	Access equipment can't be used	Require special access equipment	Require special access equipmet
No specialist equipment	Some access equipmet required	Access equipment required	Access equipment required	Height of structure	May include rope access	
No report required	No report required	Report required	Report required	Report required	Report required	Multiple team required
			May require diving team			

Appendix D

Prioritisation of Maintenance Works

Prioritisation Model for Routine Maintenance

Each structure is ranked by the addition of the following scoring factors. A high score indicates a high priority.

Likelihood of Event

	Severity of Defect	
1	Not Significant	0.5
2	Minor	0.7
3	Attention	0.8
4	Urgent	1.0

	Extent of Defect	
A	Not Significant	0.5
B	Slight	0.7
C	Moderate	0.8
D	Extensive	1.0

Location	Road / Loading	
HCV Traffic Flows	Very high > 300	6
	High 225 - 300	4
	Medium 101 - 225	2
	Low 0 - 101	0
AADT Traffic Flows	AADT < 500	0
	501 - 1000	0
	1001 - 2000	5
	2001 - 5000	5
	5001 - 10000	5
	10001 - 15000	7
	15001 - 20000	7
	20001 - 25000	10
	AADT > 25000	10
C Class Road	No details	5
Unclassified	No details	3
	Not Available	0

Structure Condition	BCI (Critical)
100 – 95	0
94 – 85	5
84 - 65	10
64 - 40	20
39 - 0	30

Structure Type	
Multi-span structure spans >6m	4
Bridge >1.5m span	3
Culvert/Bridge 0.9 - 1.5m span	2
Small Footbridge	1
Oil Interceptor	1
Gantry	3
High risk retaining wall	4
Medium risk retaining wall	3
Low risk retaining wall	2

Consequence of Event

Consequence of	Delayed Maintenance	
6 months	5%	0
12 months	20%	5
18 months	50%	10
24 months	75%	20

Availability	
Available	0
Single lane closed	5
Road closure	10
Weight Restriction <40t >7.5t	5
Weight Restriction <7.5t	8

Heritage Value	
High profile structure	8
Scheduled/Listed monument	6
Local importance	4
None	0

Adjustment Factors	
Unforeseen circumstances	15
Heightened public concern	10
Councillor concerns	7

Flooding	
High risk of flooding	10
Medium risk	5
Low risk	2
None	0

Prioritisation Model for Major Maintenance Schemes

Each structure is ranked by applying the following scoring criteria and totalling the scores. A high score indicates a high priority.

Type and Condition

M1 Route Hierarchy

Road Classification	Score
Primary road	15
Strategic A road	10
Strategic B road	10
Strategic C road	10
Non strategic A road	10
Non strategic B road	5
C Road	5
Unclassified	0
Footway	0
Private road	0

M2 Structural Integrity

Integrity of Structure	Score
Imminent collapse	10
Likely fail	8
Moderate fail	5
Marginal fail	3
Full HA	0

M3 Structure Condition Indicator

Structure Condition Indicator	Score
Very Good (100 - 95)	0
Good (94 - 85)	5
Fair (84 - 65)	10
Poor (64 - 40)	20
Very Poor (39 - 0)	30

M4 Assessed Capacity

Capacity	Score
Assessment not required	0
40 Tonnes	0
25 Tonnes	3
20 to 10 Tonnes	8
7.5 Tonnes or less	10
7.5 Tonnes or less	10

M5 Structure Type

Structure Type	Score
Bridge at least 1 span >6m	4
Bridge >1.5m span	3
Culvert 0.9 - 1.5m span	2
Footbridge	1
High risk retaining wall	4
Medium risk retaining wall	3
Low risk retaining wall	2

M6 Traffic Flows

Location	Road/loading	
HGV Traffic flows	Very high >300	6
	High 225-300	4
	Medium 101-225	2
	Low 0-101	0
AADT Traffic flows	AADT<500	0
	501-1000	0
	1001-2000	5
	2001-5000	5
	5001-10000	5
	10001-15000	7
	15001-20000	7
	20001-25000	10
	AADT>25000	10
C class road	No details	5
Unclassifed	No details	3

M7 Predicted Loss to Economy

Predicted Loss to Economy	Score
High	5
Medium	3
Low	0

M8 Residual Risks to Users

Relates directly to the safety of the travelling public and anybody who may be harmed by collapse or falling parts of the structure. Considers risk to diverted traffic on less suitable routes.

Residual Risk to Users	Score
None	0
Low	5
Medium	10
High	15

M9 Availability

This score reflects the extent of Highway restrictions imposed including carriageway width, height and weight restrictions.

Availability	Score
Available	0
Restriction for 40t only	5
Restricted for 18t and above	10
Restriction for 10t and above	15

Environmental Impact

M10 Heritage Value

This score reflects the visual and historic value of the structure.

Visual/Historic Importance	Score
High profile structure	8
Scheduled/Listed monument	6
Local importance	4
None	0

M11 Adjustment Factor

This is used by the Project Manager to reduce/increase the proposed priority in exceptional cases where risk is not adequately addressed in the above.

Special conditions	Score
High	20
Medium	10
None	0
Reduction (-10)	-10

M12 Flooding

This is used when the structure is known to be within a flood risk area.

Flooding	Score
Not applicable	0
High (> 60)	20
Medium (25 - 60)	5
Low (< 25)	3

Prioritisation Model for Bridge Strengthening

Each structure is ranked by applying the following scoring criteria and totalling the scores. A high score indicates a high priority.

Type and Condition

S1 Road Hierarchy:

Road Classification	Score
Primary road	15
Strategic A road	10
Strategic B road	10
Strategic C road	10
Non strategic A road	10
Non strategic B road	5
C Road	5
Unclassified	0
Footway	0
Private road	0

S2 Integrity of Structure:

Integrity of Structure	Score
Imminent collapse	10
Likely fail	8
Moderate fail	5
Marginal fail	3
Full HA	0

S3 Consequence of Delayed Maintenance:

Measured as the % of total increased cost from the point of delay of the maintenance scheme to it's completion.

Consequence of delayed maintenance.	Score
0-20%	0
20 - 50%	5
50 - 75%	10
75 - 100%	20
100% and over	40

S4 Structure Condition Indicator:

Structure Condition Indicator	Score
Very Good (100 - 95)	0
Good (94 - 85)	5
Fair (84 - 65)	10
Poor (64 - 40)	20
Very Poor (39 - 0)	30

S5 Assessed Capacity:

Assessed Capacity	Score
Assessment not required	0
33 - 40 Tonnes	0
25 Tonnes	3
13 - 20 Tonnes	8
10 Tonnes/Group 1	8
10 Tonnes/Group 2	8
13 - 20 Tonnes	8
7.5 Tonnes	10
7.5 Tonnes/Group 1	10
7.5 Tonnes/Group 2	10
3 Tonnes or less	10
No live load capacity	10

S6 Ease of access for monitoring:

Ease of Access for Monitoring	Score
Access by diving inspection only	5
Access in summer months only	5
Access in winter months only	5
Difficult access	5
Difficult access and vegetation clearance needed	5
Wall Covered in Vegetation	5
No access	5
Restricted access	5
Restricted headroom	5
Tidal	5
Unrestricted	0

S7 Likelihood of Collapse or Element Failure:

This score is used to emphasise structures that would cause significant risk to public safety should they collapse. It is NOT an indication of the likelihood of the structure collapsing.

Likelihood of Collapse or Element Failure	Score
High	10
Low	5

S8 Interim Measures:

Interim Measures	Score
Normal (regular monitoring)	0
Special (special monitoring, TM etc.)	5

Use and Economic Impact

S9 Traffic Flows (HGV):

Traffic Flows	Score
HGV Very High (>300)	6
HGV High (225 - 300)	4
HGV Medium (101 - 225)	2
HGV Low (0 - 101)	0

S9a Traffic Flows (AADT):

Traffic Flows	Score
AADT <500	0
AADT 501-1000	0
AADT 1001 – 2000	5
AADT 2001 – 5000	5
AADT 5001 – 10000	5
AADT 10001 – 15000	7
AADT 15001 – 20000	7
AADT 20001 – 25000	10
AADT Above 25000	10
Not Available	0

S10 Predicted Loss to Economy:

Predicted Loss to Economy	Score
High	5
Medium	3
Low	0

This relates to a wider scope of factors that would be negatively impacted such as schools, the environment, any property in the vicinity as well as the economy.

Consequence of Collapse	Score
High	10
Average	7
Low	5
TBA	0

S12 Residual Risks to Users:

Relates directly to the safety of the travelling public and anybody who may be harmed by collapse or falling parts of the structure. Considers risk to diverted traffic on less suitable routes.

Residual Risk to Users	Score
None	0
Low	5
Medium	10
High	Emergency

S13 Availability:

This score reflects the extent of Highway restrictions imposed including carriageway width, height and weight restrictions.

Availability	Score
No restriction	0
Restriction for 40t only	5
Restricted for 18t and above	10
Restriction for 10t and above	15

Environmental Impact

S14 Historic Importance:

This element reflects the historic value of a structure which may be an ancient monument, a listed building or lie within a conservation area.

Historic Importance	Score
AM, Listed or conservation area	5

S15 Consultation:

The results of the consultation with Members, Parishes, NFU etc. are highlighted by this score.

Consultation	Score
Consultation as per existing strengthening process	0-10

Adjustment Factor

S16 Special Conditions:

This is used by the Project Manager to reduce/increase the proposed priority in exceptional cases where risk is not adequately addressed in the above.

Special conditions	Score
High	20
Medium	10
None	0
Reduction (-10)	-10

Appendix F

Targets and Service Levels

Targets and Service Levels

1.0 Introduction

Levels of Service and Performance Targets should summarise the strategic goals and objectives that are relevant to the Transport Asset Management Plan (TAMP) and explain how the Levels of Service and in turn the Performance Measures have been derived. Historical data such as Levels of Service and Performance Measure scores should be summarised and the medium/long term targets, taking account of future demand, should be defined.

2.0 Performance Targets

These are quantifiable targets that are defined using Performance Measures used to inform asset management planning and decision making. The Performance Targets should align with the specified Levels of Service.

3.0 Levels of Service

Levels of Service describe the quality and performance of service in easily understood terms. Examples of this are safety, accessibility and condition. Levels of service are normally defined at a network level and use information from Performance Measures.

Based on the outline parameters stated above the Targets and Service Levels will be derived from the following:

- Bridge Condition Indicators
- Public disruptions
- Safety
- Accessibility

When deriving Targets and Service Levels it is imperative that they are established at an appropriate level and they contribute towards the National and Local Strategic Goals.

4.0 Alignment with National and Local Strategic Goals

In order for the proposed Service Levels and Targets to be objective it is necessary to ensure that they align with National and Local Strategic Goals. They need to be challenging but achievable and reflect the local communities' requirements whilst providing the legal requirements expected of a local highway authority.

4.1 National Code of Practise

The Management of Highway Structures, A Code of Practise 2005 states, in section 3.0, that the Service Levels and Targets should take into consideration criteria such as road safety, congestion, availability, journey time reliability, accessibility, condition, environmental impact and sustainability. These are very broad headings but the Service Levels and Targets outlined in section 5.0 take all these criteria into consideration.

4.2 Local Strategic Goals

Cornwall Council's vision is 'A strong sustainable community for One and All' and its aims are 'to provide leadership and deliver excellent services to all the people of Cornwall by:

- Improving individual development and well being
- Fostering the success of all our communities
- Enhancing the living environment
- Promoting Cornwall to the World
- Being a strategic, ambitious, accountable and well-managed council.

The Mission Statement for the Environment Planning and Economy Department is 'Planning and Managing a Sustainable Living, Working and Travelling Environment'.

The structures targets help towards meeting all of these Local Strategic Goals by contributing towards providing a safe and reliable road infrastructure which aids in communication, for individuals and businesses helping to foster success. In doing so it contributes towards developing individuals and communities, which in turn helps promote Cornwall. The structures management system allows a strategic, accountable overview of the highway network that is part of the council's management processes.

5.0 Cornwall's Structure's Targets and Service Levels

As stated in section 3 the Targets and Service Levels, which are based on the outline parameters set out in section 3, have been derived from the following:

- Bridge Condition Indicators
- Public disruption
- Safety
- Accessibility

In order create targets from the above a brief explanation is included below together with the defined target:

1) BCI Averages:

A system where no highway bridge in Cornwall shall have a BCI Average score of 50 or less and that action or increased monitoring levels be implemented when a bridge BCI Average score is at 65 or less.

2) Public Disruption:

All highway structure schemes to have advance signing of impending works for at least 1 week (5 working days) before the start of construction/ traffic disturbance. The signing is to state the start and expected finish dates (including times in applicable), whether it is a lane or complete road closure and the nature of the works. It will be updated with new dates as and when a major programme change is defined and not less than one month before the planned completion of the scheme. A press release shall be prepared for all schemes over £100k or that involve a lane/road closure for more than 4 weeks or on traffic sensitive routes.

***Note*:** *A notice in local newspapers for all road or lane closures goes out through the Street Works Coordinators. This is not an official structures information press release and whilst it does suffice for the minor schemes, general road closures and giving the public prior warning of lane/road closures, an official press release for the more onerous schemes with greater impacts on the travelling public will be a standard service. This press release will contain more information about the scheme and its impacts.*

4) Accessibility:

There will be at least one route, capable of taking a 40 tonne vehicle, into every community with a population of over 200.

5.1 Measurement

The services levels have to be measured in order to ascertain if the targets are being meet. This is one aspect that has to be carefully thought out when setting the targets and service levels. Below are the methods that are to be used to monitor progress.

BCI Averages

The Bridge Condition Indicators are calculated through the monitoring of the highway structures as part of the asset management plan and ongoing maintenance regime.

Advance Signing

The advance signing of highway structures schemes can be ordered as part of the standard order process and requested through the works instructions. The system in place would be similar to that of the existing system for surfacing works which signs in advance of all their works. Monitoring the placement of the signs would prove difficult in some cases.

Press Release

Issuing a press release for every scheme that are over £100k or that involve a lane/road closure for more than 4 weeks or on traffic sensitive routes can be instigated and monitored from the structures office. To ensure this procedure is followed by all involved in the development of such schemes it would require an entry in the 'strengthening of highway structures' and the 'maintenance process' maps.

Accessibility

There are currently 34 structures within the county that have been officially weight restricted that the highway authority are aware of. These have been checked to ensure that access has been provided to the adjacent communities. The measure to ensure that we do not isolate any community is to considering all routes in and out of community before any bridge is weight restricted. If it is found that in weight restricting a bridge it means that a community does not have a 40 tonne route then the bridge shall be strengthened rather than restricted.