CYNGOR
monmouthshire
COUNTY COUNCIL
sir fynwy

# Monmouthshire County Council
# Highway Management Plan

PART I

# Index

## Part A Overarching Principles



## Part B Highways



## Part C Structures



## Part D Lighting

## Appendices

Appendix A  Monmouthshire County Council Highway Asset Maintenance Policy

Appendix B  Monmouthshire County Council Highway Asset Maintenance Strategy

# Part A Overarching Principles



Introduction

Communications
Learning from events

Performance Management
Performance management

Financial Management Priorities and Programming
Financing of highway maintenance
Budgeting principles

Priorities and programming

Sustainability
Sustainability and highway maintenance
Materials products and treatments
Environmental management
Materials utilisation
Waste management and recycling
Air quality and pollution control
Nature conservation and biodiversity
Plants and injurious weeds
Environmental intrusion
Environmental consultation and assessment
Factors to consider for sustainability
Procurement

# Introduction

## Principles and Context

This document reflects the principles and recommendations set out in the document Well Managed Highway Infrastructure a Code of Practice published by the UK Roads Liaison Group in October 2016

Well Managed Highway Infrastructure a Code of Practice replaces Well Maintained Highways, Management of Highway Structures and Well-Lit Highways.

The introduction of the new Code of Practice sees a move towards a more risk based approach to Highway Maintenance

The introduction of those Risk based management systems based on Local Levels of Service will be introduced to the Authority progressively with the intention that all systems will be in place by October 2018 as recommended by the new Code of Practice

## Terminology

Within this document the following terms are used

- Highway which includes road or street
- Authority meaning Monmouthshire County Council
- Footway that part of the highway over which the public have a right of way on foot only
- Housing Act footway
- Footpath used to describe a Public Right of Way (PROW)
- Cycle Route

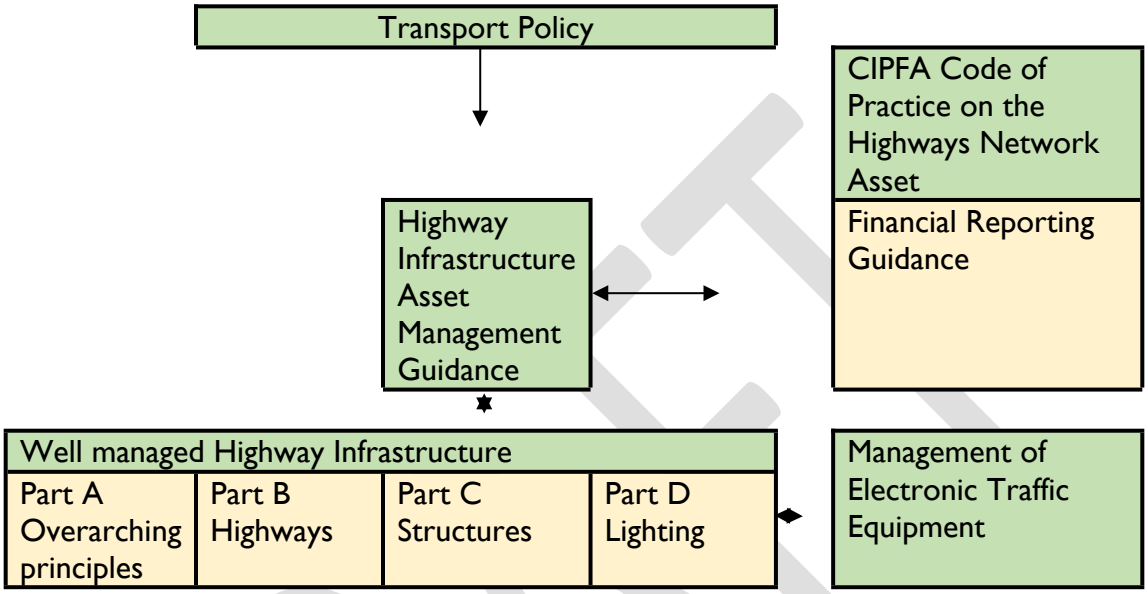
## Maintenance Practice

The main types of maintenance are as follows

- reactive – responding to inspections, complaints or emergencies;
- routine – regular schedule, generally for lamp replacement, patching, cleaning, grass cutting and landscape maintenance, cleaning bridge drainage;
- programmed – flexibly planned schemes primarily of reconditioning or structural renewal;
- regulatory – inspecting and regulating the activities of others;
- Winter Service; and
- resilience and emergencies

## Guidance Hierarchy

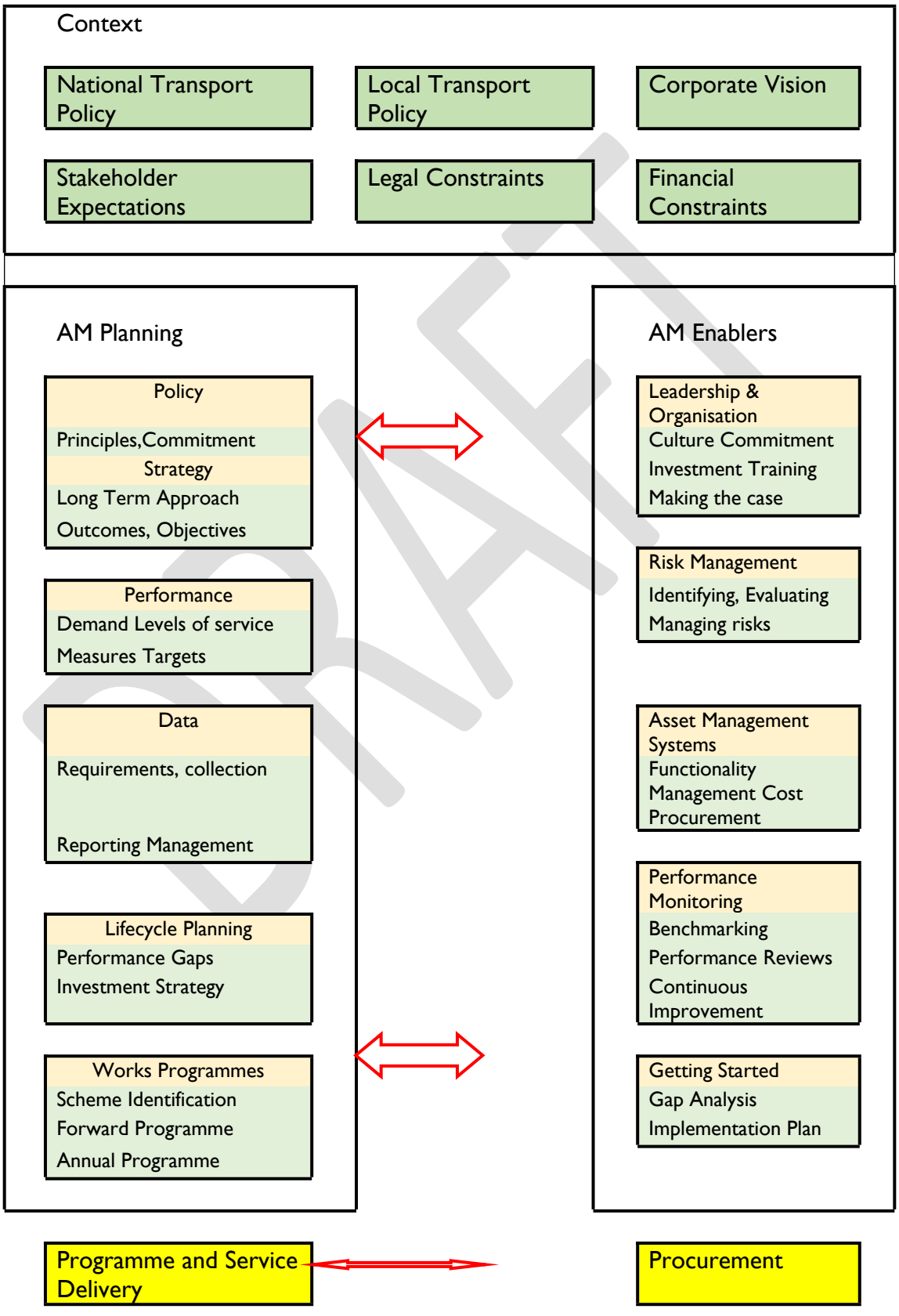
Hierarchy of Guidance Documents




The above figure sets out the relationship of the suite of documents produced by the United Kingdom Roads Liaison Group.

# Policy Framework

## Asset Management Framework



The Asset Management Framework comprises activities and processes that are necessary to develop, document, implement and continually improve asset management within the Authority.

Monmouthshire adopts many of those elements but there are still areas where improvements can be made. In addition it is considered that opportunity exists to streamline and better document practices. An outline framework is set out above which will assist in making those improvements.

## Asset Management Policy

Monmouthshire County Councils Asset Management Policy is set out in Appendix A of this document. That Policy demonstrates how Asset Management contributes to the Authorities Strategic Objectives.

## Asset Management Strategy

The Authority has developed an Asset Management Strategy which is aligned with the corporate vision and sets out how asset management contributes towards achieving that vision

## Stakeholders and Communication

Effective communication with stakeholders is considered to be essential element in the delivery of a Highway Maintenance Plan which is based on Asset Management principles.

The Authority currently consults with various community led groups, County, Town and Community Councillors, Statutory Undertakers, National bodies such as National Resources Wales adjacent Authorities and Welsh Government itself but this is done in a relatively ad-hoc manner.

In order to improve its consultation practices it is proposed that the Authority will link with the National Highways & Transport (NHT) Public Opinion Survey. The NHT survey is a collaborative venture by a significant number of Local Highway Authorities which provides an opportunity for residents to comment on the services provided by their Highway Authority.

The survey results are publicly available on the survey website. The repeatability of the surveys will allow the Authority to monitor the impact of service improvements Results are gathered under the themes of Accessibility, Public Transport, Walking and Cycling, congestion, Road Safety Highways Maintenance and Enforcement.

## Other Authorities

Monmouthshire is bounded by the following Authorities

- Herefordshire
- Gloucestershire
- Powys
- Newport
- Torfaen
- Blaenau Gwent

The responsibility for the management of assets on those boundaries e.g river bridges is recorded but there is no formal documentation in place which sets out the detail of how those maintenance arrangements will be managed.

It is therefore proposed to set out a management agreement which will formalise arrangements in those areas.

Monmouthshire also has agreements in place for aspects of service to be carried out by certain adjacent Authorities e.g. winter maintenance.

Monmouthshire will also give consideration to the needs of adjacent Authorities within the development of its own network hierarchy. For instance routes which are of a relatively minor importance within Monmouthshire County Councils network may be of major significance to its sister Authorities i.e. the A 4136 Staunton Road which is used by Quarries within Gloucestershire to access the Trunk Road network.

## Integrated Network Management

Within its Highway network and maintenance planning Monmouthshire will seek to make improvements to the overall network where those opportunities exist.

Within the planning and programming of maintenance schemes any opportunities that exist to add value to the safety priority integrity or quality of the following areas will be considered.

- Crossing facilities
- Cycle routes
- Public transport facilities
- Signage

## Risk Based Approach

Monmouthshire intends to adopt a risk based approach and a risk management regime for all aspects of its Highway Maintenance activities using the HMEP as a framework.

This approach will include

- Operational maintenance activities
- Safety Inspections
- Condition Inspections
- Levels of service
- Repair prioritisation
- Replacement programmes

## Information Management

It is recognised that the management of information plays a vital role in the management of Highway Infrastructure

This information can come from a wide range of sources and it is essential that systems are put in place not only to manage that information but also to enable the information to be used to inform management decisions. Monmouthshire makes extensive use of the information available to it, i.e. records of construction and maintenance treatments, safety inspection and direct reports from customers, but it is clear that opportunities exist to formalise and improve on the processes currently being used.

It therefore intends to review its management and use of that information, linking with corporate initiatives in order to improve its practices in that area.

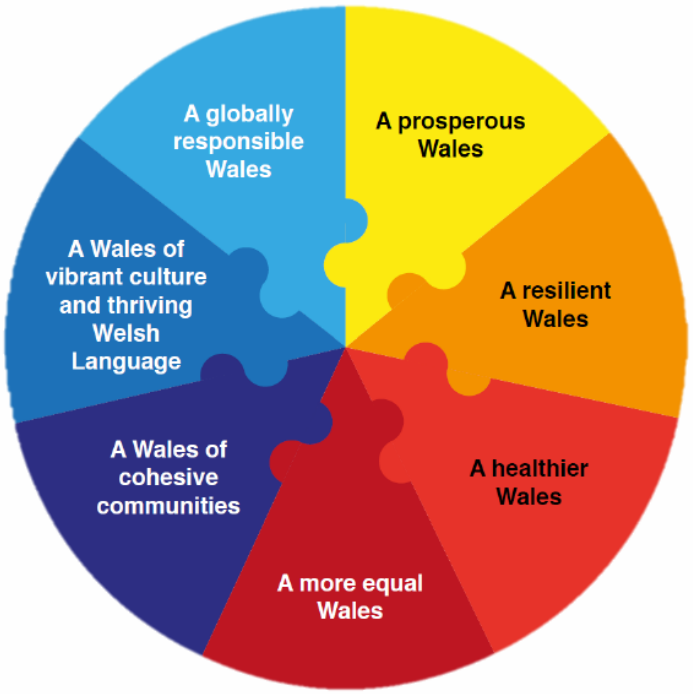
The Authority has been proactive in providing data protection training to its staff to ensure that they are aware of the need to identify and protect information which could impact on the safety and security of individuals.

## The Well-Being of Future Generations Act

The Well-being of Future Generations Act requires us to improve social, economic, environmental and cultural wellbeing, in accordance with the sustainable development principle. This should ensure that present needs are met without compromising future generations in meeting their own needs.
In planning our services we must consider, but also demonstrate that we have applied the following sustainable governance principles in our decision making:

Balancing short term needs with long term needs.
Using an integrated approach, balancing social, economic and environmental needs.
Involving others and taking their views into account.
Working in collaboration with others.
Putting resources into preventing problems

The Act defines seven well-being goals to which public bodies should maximise their contribution by setting and publishing well-being objectives and in taking all reasonable steps to meet those objectives. They are shown in the diagram below.




# Legal Framework

## General and specific requirements

General duties and powers are dealt with in this part of the document. Duties and powers related to specific assets, e.g. highways, structures and lighting, are dealt with in sections B, C, and D of this document.

Much of highway infrastructure maintenance activity is based upon statutory powers and duties contained in legislation and precedents developed over time as a result of claims and legal proceedings. Some important aspects of these statutory powers and duties are noted in this section. The UK Highway Liability Joint Task Group has developed guidance on Highway Risk and Liability Claims.

## General requirements

## Duty of Care

There are many specific duties and powers, but even in the absence of specific duties and powers, authorities have a general duty of care to users and the community to maintain the highway in a condition fit for its purpose.

## Health and Safety

The Health and Safety at Work Act 1974, or equivalent, together with the Construction (Design and Management) Regulations 2015, or equivalent, provide for a requirement for highway, traffic and street authorities to carry out work in a safe manner and establish arrangements for the management of construction works.

All those involved in the planning, management and delivery of highway infrastructure maintenance services receive training and regular updating, as necessary, in health and safety requirements of the service.

## Localism

The Localism Act 2011 predominantly applies to England and to lesser degree Wales. Within Wales the following sections of the Act apply.

- Planning and Enforcement
- Local referendums on levels of Council Tax
- Housing Revenue Account HRA and HRA subsidy

None of those areas apply to Highways.

## Best Value

The Local Government Act 2000, or equivalent, provides for the general duty of best value and aims to improve local services in terms of both cost and quality.

## Duties and Powers for Highway Maintenance

There are a number of specific pieces of legislation that provide the basis for duties and powers relating to highway maintenance.

## Main Highways Provisions

The Highways Act 1980, sets out the main duties and powers of Highway Authorities. In particular it imposes a duty to maintain highways maintainable at public expense under Section 41

The Act provides a defence against action relating to alleged failure to maintain on grounds that the authority has taken such care as in all the circumstances was reasonably required to secure that the part of the highway in question was not dangerous for traffic.
Where an authority exercises a power to install new infrastructure, e.g. lighting, safety barriers, etc, it will become responsible for its maintenance.

## Winter Service

The Highways Act 1980, set out duties for Winter Service.

## Traffic Management

The Traffic Management Act 2004, sets out a number of provisions including local authority duty for network management, permits for work on the highway, and increased control of utility works.

The Act establishes a duty for local traffic authorities 'to manage their road network with a view to achieving, so far as may be reasonably practicable having regard to their other obligations and policies, to secure the expeditious movement of traffic on the authority's road network, and to facilitate the expeditious movement of traffic on road networks for which another authority is the traffic authority'. The term 'traffic' specifically includes pedestrians, so the duty requires the authority to consider all road users.

## Utility Companies

Various companies and agencies have statutory powers and obligations to work in the highway. Their activity in the highway is regulated by the New Roads and Streetworks Act 1991, and by the Traffic Management Act 2004.

## Public Rights Of Way

Responsibilities for Public Rights of Way (PROW), authorities are required to maintain records and ensure that ways are adequately signposted, maintained and free from obstruction.

## Related Powers and Duties

Duties and powers contained in the Highways Act, or equivalent, sit within a much broader legislative framework specifying a wider range of duties and powers. These include:

- New Roads and Street Works Act 1991;
- Road Traffic Regulation Act 1984;

- Traffic Signs Regulations and General Directions 2016;
- Road Traffic Act 1988 – provides a duty for Highway Authorities to promote road safety, including a requirement to undertake accident studies and take such measures as appear appropriate to prevent such accidents occurring;
- Road Traffic Reduction Act 1997;
- Flood and Water Management Act 2012 – aims to reduce the flood risk associated with extreme weather. Provides for better, more comprehensive management of flood risk for people, homes and businesses;
- Transport Act 2000 – designation of quiet lanes or a home zones;
- Active Travel Act (Wales) 2013 – legislates for the provision of routes designed for cycling and walking;
- Wildlife and Countryside Act 1981 – environmental and countryside issues with which highways operations must comply;
- Environmental Protection Act 1990 – provides the statutory basis for other environmental issues, in particular waste management, with which highway maintenance operations must comply
- Clean Neighbourhoods and Environment Act 2005.

There is also a framework of legislation not specifically related to highways functions, but dealing with wider community issues with which the services are involved. These include, or equivalents:

- Equality Act 2010;
- Criminal Justice and Public Order Act 1994;
- Human Rights Act 1998;
- Freedom of Information Act 2000;
- Local Government Acts
- Civil Contingencies Act 2004

# Strategy and Hierarchy

## Highway Infrastructure Asset Management Strategy

Monmouthshire's Highway Infrastructure Asset Management Strategy is based around the UKRLG Highway Infrastructure Asset Management Guidance (HIAMG) Part B

The Asset Management Strategy sets out how the asset management policy is to be achieved, how long term objectives for managing the highway are to be met and how the strategy is to be implemented, including setting targets and measuring performance as well a setting out the benefits of investing in the highway infrastructure.

The core objectives for the maintenance strategy are

## Network Safety

Complying with statutory obligations
Meeting user's needs for safety

## Customer Service

User experience/satisfaction
Communication
Information
Levels of service

## Network Serviceability

Ensuring availability
Achieving integrity
Maintaining reliability
Resilience
Managing condition

## Network Sustainability

Minimising cost over time
Maximising value to the community
Maximising environmental contribution

The Customer Service objective will apply to the highway service overall, as users may not be able easily to distinguish between maintenance and improvement works. Management of highway infrastructure assets affects Customer Service through a variety of factors within each of Network Safety, Network Serviceability and Network Sustainability.

Each of the Network objectives can be affected to a different extent by several different highway maintenance operations. For example:

- network availability can be affected by weight restricted structures, resilience of improvement and maintenance works, Winter Service, regulatory activity, deficiency of drainage systems and by planning and programming of maintenance schemes;
- network integrity can be assisted by consistent, joined up and effective permanent and temporary signing, by ensuring consistent standards of maintenance on cycle routes between segregated and non-segregated sections, and providing consistent accessibility standards, for example through the use of dropped kerbs on key pedestrian routes, especially those used by disabled people, older people, or those using prams; and
- environmental contributions can be made through verge management plans, maintaining local distinctiveness through use of local materials, reducing sign clutter, use of recycled products, noise-reducing surfacing, energy efficient light sources, and profiled street lighting levels.

Every aspect of maintenance for each element of the highway infrastructure has the potential to contribute to some extent to a number of the above objectives. For example, the contribution to the safety objective is affected by:

- the condition of the asset;
- the resilience of the asset;
- the time for attending to defects recorded in inspections and reported by users;
- the quality of management and service delivery;
- the effectiveness of materials and treatments used; and
- the effective co-ordination of programmes with works affecting the highway by utilities, developers or other local authorities.

## Components of a highway maintenance strategy

The principle components of a highway maintenance strategy are

A detailed inventory of all elements to be maintained
A defined hierarchy for all elements of the network
A clear framework of levels of service

## Network inventory

Highway Authorities have a legal duty to maintain a register of roads that are maintainable at public expense.

There is also a requirement to maintain information for the purpose of

- Identifying streets which are considered to be traffic sensitive, where work should be avoided at certain times of the day.

- Identifying structures and other assets which have special engineering difficulties associated with them and where special consideration needs to be given when work is planned

- Identifying reinstatement categories to be used by Statutory Undertakers in the reinstatement of street works.

Accurate inventory information on road lengths is also required annually by Welsh Government and is also used for valuation purposes in the Annual CIPFA returns.

The Authority has well developed inventories of Highway Assets particularly relating to Highways, Structures and Street Lighting. Work is ongoing in relation to other asset groupings but due to the extensive nature of these asset groups particularly highway drainage assets, assembly of a complete listing is likely to take many years.

## Functional hierarchy

A network hierarchy based on asset function is the foundation of a risk based maintenance strategy.

It is acknowledged that a series of related hierarchies should be defined which includes all elements of the highway network, including carriageways, footways, cycle-routes, structures, lighting and rights of way. The hierarchy will take into account current and expected use, resilience, local economic and social factors such as industry, schools and hospitals.

These hierarchies will be based on the actual use of each infrastructure asset. For example carriageway hierarchies based on A B R and unclassified designations may not now truly reflect the current importance of those routes within the overall network, this underscores the need for these hierarchies to be reviewed regularly.

The hierarchy of structures is inevitably linked to the hierarchy of the route that the structure serves.

There will also be a need to develop hierarchies for resilience and for winter service. These may be based on the hierarchies used for general maintenance purposes but are likely to require modification in order to take into account operational and topographical factors.

## Carriageways

Carriageway Hierarchy has not been determined by road classification, but by functionality and scale of use. Table one below sets out the carriageway hierarchy which has been adopted.

Table 1 – Carriageways

| Category | Type of Road General Description | Description |
|---|---|---|
| Strategic Route | Trunk and some Principal 'A' class roads between Primary Destinations | Routes for fast moving long distance traffic with little frontage access or pedestrian traffic. Speed limits are usually in excess of 40mph and there are few junctions. Pedestrian crossings are either segregated or controlled and parked vehicles are generally prohibited. |
| Main Distributor | Main Urban Network and Inter-Primary Links. Short – medium distance traffic | Routes between Strategic Routes and linking urban centres to the strategic network with limited frontage access. In urban areas speed limits are usually 40mph or less, parking is restricted at peak times and there are positive measures for pedestrian safety |
| Secondary Distributor | B and C class roads and some unclassified urban routes carrying buys, HGV and local traffic with | In residential and other built up areas these roads have 20 or 30 mph speed limits and very high level of pedestrian activity with some crossing facilities including zebra |

| Category | Type of Road General Description | Description |
|---|---|---|
| | frontage access and frequent junctions | crossings. On street parking is generally unrestricted except for safety reasons. In rural areas these roads link the larger villages, bus routes and HGV generators to the Strategic and Main Distributor Network. |
| Link Road | Roads linking between the Main and Secondary Distributor Network with frontage access and frequent junctions | In urban areas these are residential or industrial interconnecting roads with 20 or 30 mph speed limits, random pedestrian movements and uncontrolled parking. In rural areas these roads link the smaller villages to the distributor roads. They are of varying width and not always capable of carrying two-way traffic. |
| Local Access Road | Roads serving limited numbers or properties carrying only access traffic | In rural areas these roads serve small settlements and provide access to individual properties and land. They are often only single lane width and unsuitable for HGVs. In urban areas these roads typically form a loop road around an estate with cul-de-sacs and no through road streets branching off them. |
| Minor Road | Little used roads serving very limited numbers of properties | Locally defined roads<br>In urban areas - these are typically estate roads with no through access. |
| Green Lane | Little used roads – typically serving no properties | An un-metalled rural Route serving field access |

The local hierarchy has been developed with reference to the following factors.

Character and volume of traffic
Current and proposed usage
Routes to important local facilities and the strategic network
Designation as a traffic sensitive route
Accident history
Regular use as a diversion route e.g. flood route
Special characteristics of certain assets on the route e.g. historic structures
Vulnerable users or people with special needs e.g. elderly peoples homes
Ceremonial routes

## Footways

Footway hierarchy will not necessarily be determined by classification, but by functionality and scale of use. The table set out below has been established using Officers direct knowledge of the footway network.

| Category | Category Name | Description |
|---|---|---|
| 1 | Primary Walking | Major Town and city centres +30 number shops. |
| 2 | Secondary Walking | Small retail shopping outlets +5 shops, large schools and Industrial outlets +500 pupils or |

| Category | Category Name | Description |
|---|---|---|
| | | equivalent pedestrian movements. |
| 3 | Link Footways | Urban access, busy rural, all other schools. |
| 4 | Local Access | Rural footways, non-feeder footways in housing |

In a similar manner to carriageways the Local footway hierarchy has been developed with reference to the following factors

Pedestrian volume
Designation as a traffic sensitive route
Current and proposed usage
Contribution to the quality of public space and street-scene
Age and distribution of the population, proximity of schools or other establishments attracting higher than normal numbers of pedestrians
Accident and other risk assessments
Character and traffic use of adjoining carriageway

It is planned to undertake footfall surveys, particularly on minor routes using electronic counting the result of which will enable more accurate categorisation of the footway routes.

## Cycle Routes

Monmouthshire's Cycle Route hierarchy has been loosely based on the recommendations given in Well Managed Highway Infrastructure where categorisation is based around location which reflects the differing risks associated with shared, partially segregated and fully segregated cycle routes.

| Category | Description |
|---|---|
| A | Cycle lane forming part of the carriageway typically a designated strip adjacent to kerb. |
| B | Cycle track a highway route for cyclists not contiguous with the public footway or carriageway. Shared cycle/pedestrian paths, either segregated by a white line or other physical segregation or un-segregated |

Well managed Highway Infrastructure also recognised the need to establish categories based on use and although routes in Monmouthshire are low usage Monmouthshire has become a venue for cycle road racing.

Further guidance relating to the carriageway hierarchy can be found in **Part 2 Highway**

With this activity in mind close co-operation with event organisers has been fostered in order to ensure that selected routes are adequately prepared prior to these events.

## Bridges and Structures

The hierarchy applied to Bridges and Structures is clearly linked to the Carriageway Hierarchy as these structures form part of those routes forming the Highway network as a whole.

However where those structures fit within the overall Bridges and Structures Hierarchy can be influenced by factors outside of the carriageway hierarchy such as whether the structure has an intrinsic historic significance or is of major strategic significance to a neighbouring Authority where the structure is in shared ownership.

Other factors considered include

position on the carriageway, footway, cycle route or PROW hierarchy;
type of asset, e.g. bridge, tunnel, retaining wall, earth structure, etc.
obstacle crossed, bridge span, retained earth height;
critical asset, historic structure, permanent weight, height, width or swept path restriction;
construction material, e.g. concrete or steel bridge, arch, slab or beam/girder bridge, concrete or stone walls, etc;
other local factors

## Street Lighting

Factors to consider include:

position on the carriageway, footway, cycle route or PROW hierarchy;
type of asset, e.g. street light, subway light, illuminated traffic sign or bollard, cable system, etc;
construction material, e.g. aluminum, concrete or steel lamp columns;
lamp and control type;
highway use, casualty and crime statistics during hours of darkness; and
otherlocal factors.

## Public Rights of Way

Factors to consider include:

byways open to all traffic (BOAT);
long distance trails and designated recreational routes;
rights of way;
strategic link path;
recreational path;

surface type; and
other access rights.

Some PROW may be metalled and within or on the fringe of urban areas. To recognise users' requirements for consistency, these will be considered for maintenance consistent with a similar footway and be incorporated in the footway hierarchy, irrespective of their designation

## Resilient network and minimum winter network

Monmouthshire intends to define a 'Resilient Network' which will receive priority through maintenance and other measures in order to maintain economic activity and access to key services during disruptive events. Monmouthshire is currently reviewing its network management plan which will identify regular diversion routes, these routes will be identified within the resilient network.

The process for identifying the Resilient Network will consider which routes are absolutely essential and which can be done without for a time. In defining this network It is implicit that these decisions will not simply follow road classification or categorisation. The process will engage key business and interest groups and involve the community. See also Section Network Resilience of this document.

The Resilient Network is likely to include:

those routes crucial to the economic and social life of the local or wider area;
take account of repeat events, e.g. flooding; and local factors.

A minimum Winter Service network has already been defined, and is set out in the winter service plan. This will provide a minimum essential service to the public, including links to the strategic network, access to key facilities and local communities, and other transport needs.
Where practicable the Authority will seek to maintain public and school bus routes if only on the basis of a minimum service.

Issues that will be considered when defining resilient and minimum Winter Service networks are:

Identification of all key infrastructure including private asset infrastructure. For example, water treatment works may require chemical deliveries to ensure continuity of water supply but may not be on the primary treated road network.
Prioritisation of carriageways, cycle routes and footways across the Authorities network in a robust manner
Route links to adjacent Authorities networks, will there be continuity across boundaries.

## Critical Infrastructure

Critical infrastructure are those assets where failure would result in significant impact on the local and possibly national economy.

Although the Authority is aware of those assets that fit this category it intends to catalogue those assets and undertake a risk analysis identifying the factors that could impact on their performance. Some of the potential threats to the function of critical infrastructure include climate change, flooding high winds drought and rising sea levels.

Those assets identified as critical assets may well be elevated to a higher category, than similar non critical assets.

## Lifecycle/designing for maintenance

The Authority will take lifecycle costs into consideration when assessing options for maintenance, on new and improved highway schemes.

The future maintenance costs of such new infrastructure will be an important consideration in the design of future schemes.

However where wider regeneration objectives are sought, for example in improving the quality of public space and streetscape high quality materials may provide appropriate, low maintenance and cost effective treatments in terms of their contribution to those objectives.

Unusual maintenance requirements and costs associated with schemes or materials brought forward for approval should be identified so that they can be taken into account at the time. This is particularly important where new highways are being assessed for adoption and may be reflected in commuted sums for any higher than usual future maintenance costs sought from developers. The Association of Directors of Environment, Economy, Planning and Transport (ADEPT) has published guidance that aims to provide advice on the commuted sums mechanism through which developers are required to contribute to future maintenance of areas adopted by local authorities.

## Road/rail incursion

Work has taken place with Network Rail to identify areas where there is the potential for road/rail incursions to take place.

This exercise identified a number of potential sites where works may be required to mitigate the potential risk.
The sites identified were subsequently risk ranked but only one of those sites met the criteria where mitigation works were required.

That structure was to be replaced as part of the Network Rail South Wales electrification project so the new works will address the issues relating to road/rail incursions.

## Abnormal loads

An abnormal load is considered to be a vehicle that is outside the classification of normal permitted traffic by virtue of its gross weight, length, width or axle configuration according to current road vehicles regulations.

Monmouthshire has powers to direct movement of abnormal loads and submission of a notification by a haulier enables the movement to take place legally.

The movement of abnormal loads is managed to ensure that the load effects induced by the abnormal loads do not exceed the load bearing capacity of the structures on the route

Where structural considerations show that the abnormal load may only marginally exceed the capacity of the structure on the route it may be possible to put in place mitigation measures to allow the load to be safely accommodated.

The suitability of an abnormal load to travel along the proposed route should be checked by the haulier in relation to any height restrictions from overbridges and restrictions on manoeuvrability along narrow roads and sharp bends etc.

In certain cases e.g. vehicles wider than the traffic lane, abnormal loads should be escorted to provide appropriate warning to other traffic.

Escorting may be undertaken by the police or by the haulier as allowed for in the code of practice Self Escorting of Abnormal Loads and Abnormal Vehicles

The management of abnormal loads is co-ordinated between the

1. Abnormal Loads Officer: the person responsible for receiving notifications of movements from Hauliers, ensuring that such notifications are assessed and that the Haulier is advised if there is any reason why a proposed movement should not take place.

2. Structures Advisor: The Engineer who will assess or arrange an assessment of the impact of the abnormal load on the network

3. The Traffic Manager: who is responsible for co-ordination of all traffic management on the highway

In order to efficiently manage the movement of abnormal loads across its network the Abnormal Loads Officer uses the Electronic Service Delivery for Abnormal Loads (ESDAL) software package.

## Future maintenance considerations

It is clear that the manner in which highway works are designed, specified or undertaken can have a significant impact on the long term performance of the network with regard to serviceability and whole life costing. Where highway works are to be designed and implemented the following factors shall be given due consideration.

| Issue | Check | Action |
|---|---|---|
| **Scope and Scale** | | |
| Intended life of Scheme | Is the scheme long life or temporary and likely to be affected by future development | Choose materials and products relevant to the life of the scheme |
| Nature of Scheme | Is the scheme a unique prestige project or a routine standard one | Choose materials and products relevant to the type of the scheme |
| Scope of Scheme | Has the scheme been value managed to consider all possible marginal benefits | All significant schemes to be value managed |
| Use of Scheme | Is the scheme likely to be subjected to particularly heavy duty traffic use with high rates of wear | Select design and materials to mitigate these affects as far as possible |
| Cost of Scheme | Have the costs of future maintenance been calculated and included in future budgets | Identify any extraordinary maintenance costs and report these alongside construction costs |
| **Design Aspects** | | |
| Pedestrians and cyclists | Do footways and cycle routes fit desire lines | Design to reflect desire lines |
| Heavy Goods Vehicles | Is footway paving likely to be overridden by HGV or other parked vehicles | Design to resist applied loads of design out overruns or parking. |
| Grassed and planted areas | Are grassed and planted areas of a size and position to be effectively maintained | Redesign or remove as necessary |
| Trees | Have trees been selected and positioned to avoid future problems with | Reselect or reposition as required |

| | | |
|---|---|---|
| | roots obstruction of leaf/fruit fall | |
| Traffic Signs | Are traffic signs required to be illuminated or can they be reflectorized | Maximise use of reflective signs to reduce energy cost |

| **Maintenance Operations** | | |
|---|---|---|
| Maintenance Regime | Does the scheme require a specialist maintenance regime | Identify costs of specialist regime and where appropriate consider cheaper alternatives |
| Cleansing | Does the scheme require a specialist cleansing regime | Identify costs of specialist regime and where appropriate consider cheaper alternatives |
| Traffic Management | Will maintenance require specialist traffic management | Identify traffic management costs and minimise wherever possible possibly through co-ordination with other works |
| Maintenance Access | Is there a safe and convenient access for plant and personnel | Redesign scheme to ensure that access is both safe and conveneient |
| **Materials and Products** | | |
| Specialist Materials | Are the materials used of standard or specialist in nature | If specialist materials are to be used ensure availability for future maintenance |
| Durability of Materials | Does the durability of the materials provide substandard sufficient or excessive life. | Select materials relevant to the intended life and nature of the scheme. |
| Failure mechanism | How will the material/product approach the failure condition slowly/quickly | Programme safety and service inspections on basis of risk assessment. |
| Life extension | Are there any processes which could be used to extend useful service life at economic cost. | Investigate cost benefit of using life extension products. |
| Replacement practicability | Are there likely to be any difficulties in replacing failed sections | Undertake risk assessment and plan for likely difficulties |
| Replacement cost | Is the cost of replacement likely to be disproportionately high | Consider alternative materials or products |
| • **Reuse and Recycling** | | |

| | | |
|---|---|---|
| Practicability of reuse | If the scheme is a short life scheme what is the scope of reusing materials and products | Choose reusable materials and products wherever possible. |
| Practicability of recycling | What is the scope for recycling materials and products | Where reusable materials and products are not appropriate use recyclable wherever posssible. |

# Risk Based Approach

## Principles and considerations

Within Monmouthshire risk will be managed in line with the recommendations of UKRLG Highway Infrastructure Asset Management Guidance (HIAMG) Part C

Management of highway infrastructure maintenance, including setting policy, strategy and levels of service, establishment of inspection and condition assessment regimes, determining priorities and programme, procuring the service and the management of all associated data and information should all be undertaken against a clear and comprehensive understanding and assessment of the risks and consequences involved.

In line with the Code of Practice Well-managed Highway Infrastructure Monmouthshire County Council will adopt a risk based approach in accordance with local needs (including safety) priorities and affordability.

## Development of a risk based approach

Monmouthshire intends to develop a risk based approach to the maintenance of its highway infrastructure. The analysis of the risks will be documented and a Risk Action Plan prepared which will consolidate the risk register evaluation, mitigation to be undertaken, resources timeframes and responsibilities.

The Risk Action Plan will be reviewed on a bi annual basis with the review being documented.

## Risk Management Approach

## Risk Management Process

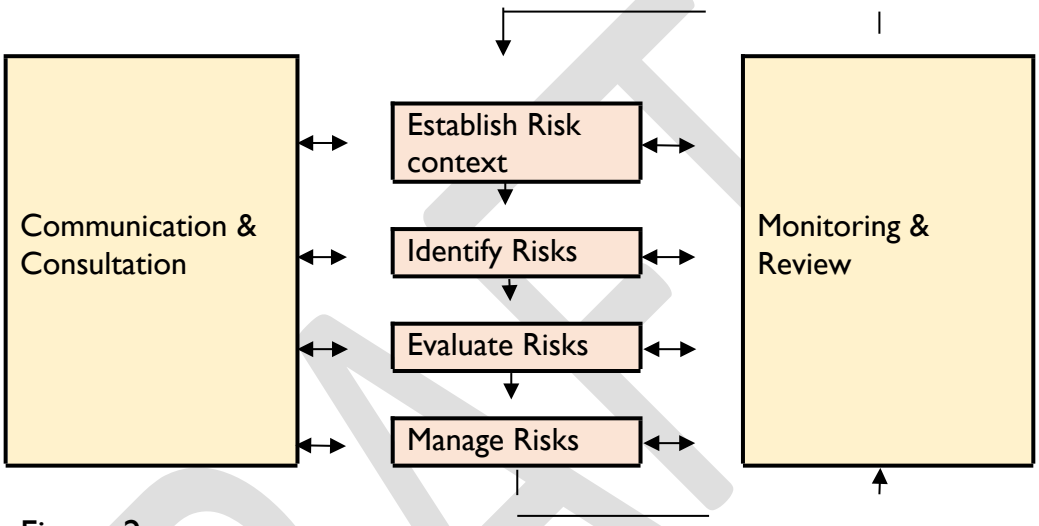



Figure 2

| Risk Management Process |
|---|
| The figure shows that two parts of the process, Communications & Consultation and Monitoring & Review, persist throughout the risk management process and can impact on all stages. |
| These could be internal discussions that lead to a new risk being identified, or customer engagement reporting issues on the network which may require a review of inspection frequency. |
| The risk management process will have regular reviews but should also be agile enough to respond as a part of day-to-day management, embedding the risk-based approach in an authority's operations. |
| The explanations below of the various elements of the process give generic examples of actors, actions, activities and roles which could be involved at each part of the process. |
| At each stage in the process actions may be required to ensure that risks remain at tolerable levels, or are exploited to an organisation's advantage. |
| This will only occur where clear responsibility and accountability is defined and understood, and acted upon for each and every individual risk. |

## Establish Risk Context

| |
|---|
| The authority's corporate risk management approach, appetite and framework/process will all need to be clearly understood. |
| Risk will be managed at many different levels within each Highway Authority, but when implementing a truly risk-based approach the wider risk context must form the start of the process. |
| Risk management should support the delivery of organisational objectives and as a result, the risk management approach and risk appetite will be owned by the executive and senior management – this will set the context within which risk-based highway management can be developed. |
| The wider context may include the influence of partners, suppliers, customer groups, Local Enterprise Partnerships, Local Resilience Forums, Government Departments and other issues such as economic circumstances, climate change or political aspirations. |
| Whilst part of the context, these issues should always be viewed through the filter of the organisation's risk management approach. |
| The authority's designated corporate risk manager will be a key point of contact, as will departmental and team risk management leads |
| Government departments, stakeholders, partners and customers may all form part of the groups relevant to the risk context, whilst not setting it directly. |
| The monitoring and review; and communication and consultation aspects of the process can be used to manage these interactions. |

| Risk Assessment |
|---|
| Risk assessment comprises three stages, these may be recorded on a risk register as a tool to provide a statement of risk management at any particular time, but each aspect is a separate consideration. |
| |

## Competencies and training

All staff engaged in asset management activities within Monmouthshire possess the appropriate competencies. However where staff new staff join or existing staff are deployed into this area an audit of their skill sets will be undertaken any training required provided.

Consultants will also be required to provide evidence of the appropriate competencies of their staff**.**

## Inspections and surveys

Monmouthshire recognises that the establishment of an effective regime of inspection, survey and recording is an important component of highway infrastructure maintenance. The types and frequency of inspection, items to be recorded and nature of response, are defined in line with the relative risks associated with potential circumstances of location,.

The inspection, survey and recording regime provides the basic information for addressing the core objectives of highway maintenance namely:

network safety;
network serviceability; and
network sustainability.

It also provide the basic condition data for the development of maintenance programmes.

All elements of the inspection and survey regime are applied systematically and consistently, which is particularly important in the case of network safety, where information may be crucial in respect of legal proceedings.

## Categories of inspection and survey

The Authority undertakes the following inspections:

- Safety inspections which are designed to identify all defects likely to create danger or serious inconvenience to users of the network or the wider community.

- Bridge inspections comprise detailed inspections tailored to the requirements of particular highway assets and elements to ensure that they meet requirements for serviceability.

- NRSWA inspections, intended to maintain network availability and reliability.

- Footway condition surveys

- Annual SCANNER surveys to determine the condition of routes and to supply reporting data to Welsh Government.

- Assessment of structures is to determine the ability or capacity of the structure to carry the loads which are imposed upon it, and those which may reasonably be expected to be imposed upon it in the foreseeable future.
- Annual Scrim Surveys to determine the skidding resistance of surfaces

- Ad hoc surveys in response to specific events for example, where flooding has been identified as a risk in a specific area.

## Management systems, recording and monitoring of information

Monmouthshire's Asset Register is constantly under review, some asset groups are well defined e.g. street lighting, structures etc. Others are less well documented and in the case of drainage assets are likely to take many years before a complete register is in place.

The register takes the form of a number asset management systems which together form the complete register.

The Authorities Mayrise system also provides for recording service requests, complaints, reports or information from users and other third parties.

All inspections are recorded with relevant data such as : time, weather conditions, and the person conducting the inspection.

The efficiency, accuracy and quality of information and records maintained by authorities is crucial both to the effective management of the service and to the defence of claims against the authority for alleged failure to maintain.

## Safety inspections

Safety inspections are designed to identify all defects likely to create danger or serious inconvenience to users of the network or the wider community. Defects identified will include those that are considered to require urgent attention as well as those where the locations and sizes are such that longer periods of response would be acceptable.

Monmouthshire has determined frequencies of inspection through a risk-based approach that reflects the characteristics of the particular asset or asset group, e.g. carriageway, footway, structures, lighting, etc, and their position in the hierarchy.

The safety inspection regime forms a key aspect of an authority's approach to managing liabilities and risks. The parameters which are considered for a safety inspection regime are:

- frequency of inspection;
- items for inspection;
- type of traffic and intensity;
- method of inspection; and
- nature of response.

Frequencies for safety inspections of individual network sections or individual assets should be based upon consideration of:

- category within the network hierarchy;
- type of asset, e.g. carriageway, footway, embankment, cutting, structure, electrical apparatus, etc;
- critical assets;

- consequence of failure,
- network resilience;
- incident and inspection history;

Where asset condition has deteriorated significantly, consideration for increasing the inspection frequencies for those assets.

## Defect recording and repair

All defects observed during safety inspections that provide a risk to users are recorded and the level of response determined on the basis of risk assessment.

The methodology behind the assessment of risk is set out in its safety inspection guidance.

Defects which are considered to require urgent attention are corrected or made safe at the time of the inspection, if reasonably practicable.

Defects that do not represent an immediate or imminent hazard or risk of short term structural deterioration will be undertaken as part of a planned programme of works with their priority determined by risk assessment.

## Reporting by the public

Feedback from members of the public is an important source of data on the condition of all aspects of the highway network. Monmouthshire has been particularly proactive in this regard introducing the 'Appy Ap' for smartphones which enable users to more readily connect with the Authority.

This source of data can be used to complement dedicated inspection and survey techniques outlined above, however further work is needed to ensure that processes and systems in place are robust to ensure:

- an efficient system for logging and managing such reports should be used;
- appropriate quality assurance measures are in place to check reports by the public and maintain auditability of data; and
- suitable communication is provided to contributors to both acknowledge receipt of any submitted information, and also feedback on how it has been used (for example, any resulting maintenance activity).

Further guidance relating to the Safety Inspections can be found in **Part 2 Highways**

### Works programme

Within Monmouthshire works programming will follow the guidance given in the UKRLG Highway Infrastructure Asset Management Guidance, Part B section 10

## Network Resilience

### Overview

Monmouthshire's road network is an important part of the County's infrastructure enabling the successful operation of many social and economic activities

Resilience is defined as the 'ability of the community, services, area or infrastructure to detect, prevent and, if necessary to withstand, handle and recover from disruptive challenges.

There are four components to resilience

Resistance- preventing damage (e.g. flood wall)
Reliability- operations under a range of conditions ( e.g. earthworks stabilisation)
Redundancy- availability of backups or spare capacity (e.g. a suitable diversion route)
Recovery- enabling a fast response and recovery (e.g. temporary bridges)

### Resilient network

It is recognised that it is not practicable to either assess or build resilience across all elements of the highway network.

It is therefore planned to define a 'resilient network' which will be developed based on the following considerations

- Connectivity between major communities
- Links to the strategic highway network
- Connectivity across Authority boundaries where appropriate
- Links to transport interchanges

- Access to emergency facilities including fire and rescue, Police, Ambulance Services and hospitals
- Links to critical infrastructure (water treatment works)
- Principal public transport routes, access to rail and bus stations.
- Other locally important sites

In defining this 'resilient network' the following factors will be considered

- The risk of specific asset failure which would lead to closure or restriction on the operation of the resilient network.
- The likelihood of such failure due to the assets physical attributes and its location (e.g. design capability / capacity. Condition, geology, catchment characteristics).
- The socio economic consequences of failure
- The potential for community severance.
- The suitability and length of any diversion route.
- Potential for damage to statutory utility plant.
- Magnitude of repair costs
- Route usage including traffic types and volumes.
- Repair timescales

## Climate change and adaptation

The key climate changes for the UK as set out in the UK climate projections 09 are

All areas of the UK get warmer and the warming is greater in the summer than in winter

Annual precipitation remains unchanged but more of it will fall in the winter with drier summers for much of the UK

Sea levels rise

Monmouthshire will take into account how the various climate change variables such as intense or prolonged rainfall, hotter temperatures, and higher wind speed will impact on the highway assets being managed and the likelihood of the events occurring. The greatest generic risks to closure or restriction are likely to be

Flooding (pluvial, fluvial, groundwater or coastal)

Landslips

Bridge scour

Widespread tree fall

Carriageway heat damage

Falling power or communications lines

The locations of where these events are likely to occur on the resilient network will be identified. Likely sources of information to conduct this exercise will be historic records of flooding and landslips, flood risk management plans and records of past incidents of weather related damage.

Analysis of the data will show where some risks can be mitigated either through capital investment increased maintenance levels or improved routine inspection.

All identified mitigation actions will be prioritised on the basis of the greatest return on the investment in terms of reduced risk.

## Planning for responding to network disruption

Monmouthshire Emergency Management Plan was updated in 2017, the aim of this plan is to set out the Council's approach to the management of emergencies and to provide information to guide and support the Council's Emergency Response Teams.

The Emergency Management Plan is one of a set of integrated plans used by the Council to ensure that staff, managers and officers from the emergency services and other organisations meet their responsibilities within a co-ordinated overall response.

As part of these integrated plans Monmouthshire has produced a plan detailing its Adverse Weather Arrangements (2017) and for the purposes of this plan a severe weather event in the Monmouthshire area will include storms and gales, low temperatures and heavy snow, heat wave, drought and flooding.

This plan also links with the following plans

- Gwent LRF Severe Weather Arrangements
- Gwent LRF Gwent Flood Arrangements
- Gwent Major Incident Response Arrangements
- Monmouthshire County Council Emergency Management Plan
- Monmouthshire County Council Directorate Emergency Plans
- Monmouthshire County Council Emergency Contacts Directory

Monmouthshire recently experienced very severe and prolonged periods of rainfall. These weather events tested the Authorities drainage infrastructure resulting in flooding of highways and in some cases properties. As part of its flood management role the Authority prioritised and reviewed those events and put in place remedial works and improved monitoring arrangements. In some areas real time CCTV monitoring was deployed which has enabled the Authority to review those sites and take any necessary action in advance of forecasted severe weather.

The Authority works closely with other agencies such as National Resources Wales in order to co-ordinate its response and is considering how catchment management measures could be deployed in concert with the NRW, who are also responsible for extensive forestry holdings, and other landowners to better manage run-off from those areas and the consequent effects on the downstream highway infrastructure.

The Authority also has powers available to it through the Land Drainage Act 1991 and the 1994 amendment in relation to the functions of internal drainage boards and local authorities and the Flood and Water Management Act 2010 to ensure that owners of private drainage assets adequately maintain those assets.

The Authority contributes to dealing with flood events as follows:

- signing and maintaining diversions;
- inspection, clearance and maintenance of drainage systems, including outfalls.
- encouraging property owners to protect their own property;
- provision and installation of sandbags and other protection in certain cases;
- general support to emergency services; and
- liaising with energy and communications suppliers.

The risk posed to the network during periods of high winds are more difficult to establish, however the Authority as part of its safety inspection arrangements and in co-ordination with aboricultural advice identifies any trees that due to their condition may present a risk of obstruction to the network during such events. Appropriate action is taken following the identification of such risk.

Monmouthshire contributes to dealing with the consequences of high winds as follows:

- signing and maintaining temporary closures and diversions;
- clearance of fallen and potentially dangerous trees;
- clearance and removal of debris;
- assistance with temporary support and repair of buildings;
- general support to emergency services; and
- liaison with energy and communication suppliers.

## Collaboration

Monmouthshire adopts an integrated approach to the management of severe weather and civil emergencies

It works with the community, partner organisations and all parts of the Highway Authority at planning, response and recovery stages, including across boundaries, this approach has been shown to enhance resilience and help to mitigate the impact of threats to network operation. Examples of this approach are agreement of diversion routes, and provision of mutual aid between authorities. Lines of communication with other asset owners situated across, over or under the highway are also in place.

Monmouthshire is a member of the Gwent Local Resilience Forum (GLRF), and as a category 1 responder plays a key role in the establishment of risk management planning. The GLRF is responsible for the production of the community risk register and associated risk management plans. The GLRF is made up of the following bodies

GLRF Membership (Cat 1)

Emergency Services

- Heddlu Gwent Police (GLRF Co-ordinator)
- South Wales Fire & Rescue Service
- Wales Ambulance Service (NHS) Trust
- British Transport Police
- Maritime & Coastguard Agency

Local Authorities

- Blaenau Gwent County Borough Council
- Caerphilly County Borough Council
- Monmouthshire County Borough Council
- Newport City Council
- Torfaen County Borough Council

Health Sector

- Aneurin Bevan University Health Board
- Public Health Wales

Government Agencies
- Natural Resources Wales (NRW)

GLRF Membership (Cat 2)

Utilities
- British Waterways
- British Gas
- Dwr Cymru Welsh Water
- National Grid
- SWALEC
- Scottish Power Energy Systems
- Wales & West Utilities

Transport
- Network Rail
- Arriva Trains Wales
- First Great Western

Telecoms
- British Telecommunications (BT)
- O2
- T Mobile
- Orange
- Vodafone

Others
- Army
- Navy
- Royal Air Force
- Volunteer Groups

Government Agencies
- Welsh Government (WG)

Further details of the GLRF and its activities are set out in the following documents

- GLRF Constitution and business plan 2016/18
- GLRF Gwent Major incidents response arrangements 2016
- GLRF Severe Weather Arrangements 2017

Trees from neighbouring land blown over in high winds are a frequent cause of blocked roads and associated disruption. Trees adjacent to the highway form part of the regular round of safety inspections and any trees that are identified as posing a potential problem are referred to the Authorities Hedge Officer for onward referral and action by the Neighbouring property owner.

Similarly, poorly maintained neighbouring drains or surface water run-off from adjacent fields are a common cause of road flooding. Contact is made with the owners where the network is vulnerable to disruption emanating from their property to advise them of their responsibilities and liability.

## Communications

The Authority has produced the Corporate Communications Severe Weather Protocol document which sets out its approach to how communications are to be managed in advance of and during such events.

The protocol requires each front line service to have designated an officer to act as a communications lead for that service.

Within the Highways Department this role is undertaken by Paul Keeble, Group Engineer, Highways Flood Management.

The Highway Service is responsible for updating its own web page which is dated and time stamped to ensure that viewers are confident about the currency of the information and information regarding gritting routes are posted on the severe weather dashboard.

In addition Service updates are posted on social media twitter and Facebook

The Authority receives forecasts of extreme weather from the Meteorological Office, National Resources Wales and also monitors weather conditions locally through the Vaisala weather monitoring stations.

These forecasts help to ensure that the Authority is prepared for potential disruption.

Details of severe weather events on elements of the network are published on the Authorities website so that road users are aware of potential impacts

Although the Authority currently disseminates this information available to it, it is clear that with an ever changing communications landscape that opportunity exists to review current practices and improve them.

The review would see the development of a communications plan which would set out how information including weather and flood forecasting

would be received into the Authority and how that information is passed to highway users through a range of media.

### Learning from events

The Authority will review its response to severe weather following actual events in order to continually improve its response planning to these events.

## Performance Management

### Performance management

The Authority intends to collect the performance management data as defined by APSE. The collection of this 'common' data will assist in improving its services via benchmarking with other Local Authoriites throughout England and Wales.
This framework will support the Asset Management Strategy, and will set out performance measures and targets to enable monitoring of the strategy and of performance.



## Financial Management Priorities and Programming

Financial plans should be linked to asset management strategy and prepared both for short term activities, such as routine maintenance, and for medium and long term activities, such as preventative maintenance and asset replacement.

### Budgeting principles

Budgeting principles should provide the necessary level of flexibility to deliver value for money. They should be set out based on the following considerations and principles:

- the differing life expectancies of various treatments and the future implications of these for the balance of capital and revenue funding;
- the seasonal and weather sensitive nature of many treatments and the service as a whole;
- the uncertainties in prediction of out-turn costs for Winter Service and the need for financial year-end flexibility;
- the need for resilience against the increasing trend in weather related incidents; and the need to make provision for emergencies.

### Priorities and programming

Monmouthshire actively shares information and coordinates its short and long term programmes of work with adjacent Authorities and Statutory Undertakers. This co-ordination is administered through the Network Manager whose role it is to minimise the impacts of those bodies operations on the network and each other.

The Authority develops a four year rolling programme of works both for its carriageway, footway and bridge maintenance programmes.

This programme is reviewed annually so that current asset conditions are used to best reflect immediate need and to give a more accurate representation of future requirements.

## Sustainability

### Sustainability and highway maintenance

Highway maintenance has a significant role to play in achieving sustainable development.

The Authority is to develop a policy for developing sustainability within highway maintenance in collaboration with the Authorities Sustainability Offcier. This policy will link the strategic objectives of the Authority with the materials practices and processes used in the maintenance of the highway network.

### Materials products and treatments

In specifying materials or treatments for highway maintenance Monmouthshire will consider the suitability of those materials and treatments in terms of their durability, appropriateness within the built environment, sustainability and the requirements of industry specifications.

Highway maintenance works will seek to utilise materials and treatments which are in keeping with their setting and in particular the contribution that those works can make within conservation areas.

A palette of materials has been agreed for use in the Monmouth Conservation Area with Monmouthshire's Planning Department and this approach is to be applied to the remaining main urban centres.

## Environmental management

In pursuing the objective of network sustainability Monmouthshire County Council will seek to maximise the environmental contribution made by highway maintenance.

The Authority will seek to manage in an environmentally sensitive way the following areas

- carbon costs and energy reduction
- noise;
- materials utilisation;
- waste management and recycling
- air quality and pollution control;
- nature conservation and biodiversity; and
- environmental intrusion.

## Materials utilisation

Wherever practicable and cost effective Monmouthshire will seek to utilise

> Local materials in order to reduce transport costs, support the local economy, and to maintain local character. This approach is of particular importance for visible materials in conservation areas.
>
> Products made from recycled materials

It is recognised that sustainable purchasing may have cost implications and these costs will need to be carefully considered against the environmental benefits.

## Waste management and recycling

Within its highway maintenance activities Monmouthshire will seek to

> Retain and re-use materials on site to avoid the environmental implications of transport and disposal.

Maximise the 'value' of re-used materials rather than use for low grade purposes wherever possible.

Make use of recycle in place processes in appropriate situations

Ensure that the quantity of material that cannot be re-used or recycled is minimised and disposed of appropriately

## Air quality and pollution control

Monmouthshire recognises that its operations have the potential to cause noise, air or water pollution. It addresses these risks through its suite of risk assessments and method statements.

Where necessary the authority seeks advice from National Resources Wales NRW and its own Environmental Health Department.

Where its operations cause environmental unavoidable inconvenience to the community, it seeks to mitigate this wherever practicable, for example by phasing and scheduling of works to avoid sensitive periods.

## Nature conservation and biodiversity

Monmouthshire is widely recognised as having a rich range of species and habitats and the contribution that highway verges makes to biodiversity should not be underestimated.

In the management of highway verges consideration will be given to

Balancing the need to preserve the natural habitat with the need to maintain road safety

Any special requirements relating to Sites of Special Scientific Interest (SSSI)

The timing of cutting operations on all verges to take account of the flowering and seeding of wild flower plant species.

Identifying areas of verge that need not be cut in order to benefit wildlife

Management of trees in the urban areas to take into account landscape and environmental considerations

Monmouthshires Countryside team has produced a biodiversity action plan which seeks specifically to mitigate the effects of works on the Public Rights

of Way Network nonetheless provides valuable information which can be utilised in a wider highway maintenance context.

## Plants and injurious weeds

Where injurious weeds are present on the highway the Authority will take action to inhibit the growth or spread of those weeds.

The Authority will also seek to work with adjacent landowners to ensure that weed control measures are undertaken simultaneously to avoid recontamination across boundaries

There are five prescribed weeds these are

Ragwort
Broad leaved dock
Curled dock
Creeping thistle
Spear thistle

## Environmental intrusion

Monmouthshire will actively seek to reduce signage clutter and to remove redundant signs when planning highway infrastructure maintenance activities.

## Factors to consider for sustainability

The Authority is committed to promoting sustainability within its highway maintenance activities. It will develop this approach using the following tables as a framework.

| Issue | Check | Action |
|---|---|---|
| **Scope and Scale** | | |
| Intended life of scheme | Is the scheme long life or 'temporary' and likely to be affected by future redevelopment? | Choose materials and products relevant to the life of scheme. |
| Nature of scheme | Is the scheme a 'unique' prestige project or a 'routine' standard one? | Choose materials and products relevant to the type of scheme. |
| Scope of scheme | Has the scheme been 'value-managed' to consider all possible marginal benefits? | All 'significant' schemes should be value managed. |
| Use of scheme | Is the scheme likely to be subjected to particularly 'heavy duty' traffic use with high rates of wear? | Select design and materials to mitigate these affects so far as possible. |

| | | |
|---|---|---|
| Cost of scheme | Have the costs of future maintenance been calculated and included in future budgets? | Identify any extraordinary maintenance costs and report these alongside construction costs. |
| **Design Aspects** | | |
| Pedestrians and cyclists | Do footways and cycle routes fit the actual paths used? | Redesign to reflect actual paths to avoid erosion and later replacement. |
| Heavy goods vehicles | Is footway paving likely to be over-ridden by HGV or other parked vehicles? | Where necessary use heavy duty paving or prevent over-riding to avoid frequent costly replacement. |
| Grassed and planted areas | Are grassed and planted areas of a size and position to be effectively maintained? | Redesign or remove where necessary to avoid future poor appearance and later resign. |
| Trees | Have trees been selected and positioned to avoid future problems with roots, obstruction or leaf fall? | Reselect or reposition where necessary to avoid potentially expensive future problems. |
| Traffic signs | Are traffic signs required to be illuminated or can they be reflectorised? | Maximise use of reflective signs to reduce energy costs. |

| | | |
|---|---|---|
| **Maintenance operations** | | |
| Maintenance regime | Does the scheme require specialist maintenance regime? | Identify cost of specialist regime and, where appropriate, consider cheaper alternatives. |
| Cleansing | Does the scheme require specialist cleansing regime? | Identify cost of specialist regime and, where appropriate, consider cheaper alternatives. |
| Traffic management | Will maintenance require special traffic management? | Identify traffic management costs and minimise wherever possible, possible through co-ordination with other works. |
| Maintenance access | Is there safe and convenient access for plant and personnel? | Redesign scheme to provide safe and convenient access. |
| **Materials and products** | | |
| Specialist materials | Are the materials used for the scheme of standard or specialist nature? | If specialist materials used ensure availability of future replacements. |
| Durability of materials | Does the durability of the materials provide substandard, oblique, sufficient or excessive life? | Select materials relevant to the intended life and nature of the scheme. |
| Failure mechanism | How will material/product approach the failure condition – slowly/quickly? | Programme safety and service inspections on basis of risk assessment. |
| Life extension | Are they any processes which could be used to extend useful service life at economic cost? | Investigate cost benefit of using life extension products. |
| Replacement practicability | Are there likely to be any difficulties in replacing failed sections? | Undertake risk assessment and plan for the likely difficulties. |
| Replacement cost | Is the cost of replacement likely to be disproportionately high? | Consider alternative materials or products. |
| **Reuse and Recycling** | | |

| | | |
|---|---|---|
| Practicability of reuse | If the schemes is a short life scheme what is the scope reusing materials and products? | Choose re-useable materials and products wherever possible. |
| Practicability of recycling | What is the scope for recycling materials and products? | Where re-useable materials and products are not appropriate, use recyclable wherever possible. |

## Procurement

The procurement delivery model adopted within Monmouthshire as defined in the Highway Maintenance Efficiency Programme (HMEP) Procurement Route Choices is an In-House + Top up model. In essence the Authority directly provides a large proportion of the necessary highway services itself with the resources being 'topped up' through competitive tendering of both works contracts and consultancy support.

For works procurement use is made of the South East Wales Framework where direct awards using a schedule of rates or awards through mini competition are made.

# Part B Highways



Part B Highways

## Introduction

Introduction

The following asset types are covered in part B of this document

carriageways
footways
public rights of way
cycle routes
highway drainage systems
embankments and cuttings
landscaped areas and trees
fences and barriers
traffic signs and bollards
road markings and studs

# Legal Framework Highways

## Highway specific legal considerations

The Highways Act 1980 sets out the main duties of Highway Authorities in England and Wales. In particular, Section 41 imposes a duty to maintain highways maintainable at public expense.

Section 58 provides for a defence against action relating to alleged failure to maintain on grounds that the authority has taken such care as in all the circumstances was reasonably required to secure that the part of the highway in question was not dangerous for traffic

## Winter service

The statutory basis for Winter Service in England and Wales is addressed through Section 41 (1A) of the Highways Act on the 31st October 2003, by Section 111 of the Railways and Safety Transport Act 2003. The first part of Section 41(1) reads:

a) 'The authority who are for the time being the Highway Authority for a highway maintainable at the public expense are under a duty, subject to subsections (2) and (4) below, to maintain the highway.

b) (1) In particular, a Highway Authority are under a duty to ensure, so far as is reasonably practicable, that safe passage along a highway is not endangered by snow or ice'.

Section 150 of the Highways Act 1980 also imposes a duty upon authorities to remove any obstruction of the highway resulting from

'*accumulation of snow or from the falling down of banks on the side of the highway, or from any other cause*'.

In addition, the Traffic Management Act 2004 placed a network management duty on all local traffic authorities to do all that is reasonably practicable to manage the network effectively to keep traffic moving. In meeting the duty, authorities should establish contingency plans for dealing promptly and effectively with unplanned events, such as unforeseen weather conditions, as far as is reasonably practicable.

Given the scale of financial and other resources involved in delivering the Winter Service, it is not considered reasonable either to:

provide the service on all parts of the Network.

ensure carriageways, footways and cycle routes are kept free of ice or snow at all times, even on the treated parts of the network.

# Asset Management Information Highways

## Principles and considerations

A highway asset management system is essential to deliver an effective and efficient approach to asset management. This should have the capacity to cover all of the asset types outlined in the introduction to part B highways.

Monmouthshire has a variety of systems in place to meet its particular needs and responsibilities. It also has arrangements with third party providers in respect of traffic and accident analysis.

The Authorities management systems for highway asset management and those for structures and lighting support a holistic approach to managing the network.

UKPMS is the national standard for pavement management systems, where the usage of the word 'pavement' refers to the technical definition of 'the collective term for all hardened surfaces within the highway, including carriageways, footways and cycle routes'.

The Authorities Pavement System WDM is accredited to the UKPMS standard and meets the current national standards with respect to:

- Loading network, inventory and condition data, including data collected by:

  Visual surveys coarse visual inspections CVI ;
  SCANNER Surveys ;
  Footway Network Surveys (FNS);
  SCRIM;
  Deflectograph.

- Data processing

- Condition reporting, including national reports for Wales and local reports for unclassified roads and footways

- Financial reporting to support asset management, including

  Inventory reports;
  Accumulated and annual depreciation of carriageways; and
  Supporting information for footways, cycle-tracks and paved verges.

# Asset Condition and Investigatory Levels Highways

## Principles and Considerations

Each element of the network could have different condition requirements, a minimum one to satisfy the need for safety, and higher ones, designed to meet local requirements for serviceability or sustainability, as part of the asset management strategy adopted by the authority.

The following paragraphs set out the suggestions for the nature of contributions made by each element of the network towards safety, serviceability and sustainability.

## Condition of carriageways

The condition of the carriageway fabric can contribute to the core objectives as follows:

Network Safety

Nature, extent and location of surface defects;
Nature and extent of edge defects; and
Nature and extent of surface skidding resistance.

Network serviceability

Nature and extent of surface defects;
Ride quality of the surface; and
Resilience of the network.

Network sustainability

Surface noise attenuation characteristics;
Nature and extent of surface defects;
Nature and extent of carriageway deflection; and
Usage and verge creep

Condition standards and targets for the A B R and unclassified routes are not formally set within Monmouthshire. Works are determined on a needs based appraisal which considers funding, public priority, just in time interventions, maintenance inputs, condition data, safety inspections and engineering judgement.

Investigatory levels for surface and skidding resistance are set out in the Authorities Skid Resistance Policy.

## Condition of footways

The condition of footways can contribute to the core objectives as follows:

Network Safety

Nature, extent and location of surface defects;
Nature and extent of kerb and edging defects; and

Network serviceability

Nature and extent of surface defects;
Extent of encroachment and weed growth
The level of friction provided by the surface;.
The quality of the surface
Integrity of the network

Network sustainability
Convenience and ease of use;
Nature extent and location of surface defects;
Extent of damage by over-running and parking; and
Rural footways being lost to grass ingress

Condition standards and targets for footways are not formally set within Monmouthshire. Works are determined on a needs based appraisal which considers funding, public priority, just in time interventions, maintenance inputs, condition data, safety inspections and engineering judgement.

When Monmouthshire undertakes works on footways it will seek to maximise the positive impact of those works by ensuring that any opportunities to aid social inclusion, particularly improving accessibility for older and people with disabilities and also the use of prams and pushchairs are taken up.

Proposed treatments may include the provision of dropped kerbs in suitable locations and textured paving adjacent to crossing points which can be provided at marginal cost during the course of works.

In some locations the presence of roadside trees may compromise the surface regularity of the footway. In these situations a reduced level of surface regularity may be deemed acceptable in order to preserve the trees which can add much to the street scene

## Condition of cycle routes

The condition of cycle routes can contribute to the core objectives as follows:

Network Safety
Nature, extent and location of surface defects; and
Nature and extent of kerb and edging defects.

Network Serviceability
Nature and extent of surface defects;
Extent of encroachment and weed growth;
The level of friction provided by the surface particularly with regard to ironwork;
The quality of the surface; and
Integrity of the network.

Network Sustainability
Convenience and integrity of the network;
Nature extent and location of surface defects;
Extent of damage by over-running and parking; and
Cycle routes being lost to grass ingress / verge creep due to usage.

Condition standards and targets for cycleways are not formally set within Monmouthshire. Works are determined on a needs based appraisal which considers funding, public priority, just in time interventions, maintenance inputs, condition data, safety inspections and engineering judgement.

## Condition of public rights of way

The requirements for PROW will be determined as part of a Rights of Way Improvement Plan (ROWIP), in consultation with the Local Access Forum established by the Countryside and Rights of Way Act 2000.

## Condition of highway drainage systems

The condition of highway drainage systems can contribute to the core objectives as follows:

Network Safety
Accumulation of water on carriageways, footways and cycle routes.

Network Serviceability
Accumulation of water on carriageways, footways and cycle routes.

Network Sustainability
Polluted effluent from clearing of highway drainage should not be directed into watercourses;
Authorities have a duty to prevent nuisance and danger to adjoining landowners by flooding and should also work with others in the wider community to minimise the future risk of flooding;
Inadequate drainage of the highway structure will reduce effective life and increase maintenance liability; and
Integrity of systems, root ingress, blockage / collapse, exceedance.

Highway drainage elements fall into five main categories:

- gullies, grips and ditches, which may be obstructed by the growth of vegetation or damaged by traffic. In most cases the responsibility for maintenance of ditches will rest with the adjoining landowner;
- culverts under roads which may be affected by blockage, subsidence or structural damage;
- other piped drainage which may be affected by blockage or subsidence;
- sustainable urban drainage systems, which may require special maintenance attention for maximum effectiveness; and
- surface boxes and ironwork for both drainage and non-drainage applications, which may be affected by subsidence or obstructed access.

The Highway Maintenance Efficiency Programme (HMEP) has produced guidance on the management of highway drainage assets. And the Authority is

considering using this guidance when making decisions on the management of drainage assets.

Excavation arising's from highway activities including road sweepings are disposed of through a disposal contract with GD Environmental.

Gully emptying's are disposed of directly to one of the Viridor sites and processed through that tender.

Tidal flooding of the A466 occurs at Tintern on a regular basis. The flooding occurs due to the effect of spring tides which can be further exacerbated by the influence of barometric pressure and winds in the Severn estuary.

The Authority identifies those tides likely to give rise to flooding and crews are set on standby for those dates. Residents are provided with the dates identified.

The road is closed during the period of inundation which lasts no more than 15 minutes with appropriate warning signs being set in place.

Incidents of Highway flooding are investigated and any improvements required to infrastructure or the maintenance regime is put in place.

If the event is attributable to the actions of a third party or deficiencies in their private assets the matter is taken up with them.

## Condition of privately owned infrastructure

Responsibility for defective infrastructure, e.g. ironwork, cabinets and poles, where this is part of the apparatus installed by a utility company lies with the company.

Defects identified during inspection or from users are formally notified to the respective utility

## Condition of embankments and cuttings

The condition of embankments and cuttings can contribute to the core objectives as follows:

Network safety
Risk of loose material falling to injure users or damage facility.

Network serviceability
Risk of damage or service interruption.

Network sustainability
Damage or loss of habitat;
Interruption or pollution of watercourse;
Extent of damage and reduced life; and
Integrity of structure.

Parts of Monmouthshire are prone to landslip with events often occurring during intense or prolonged periods of rainfall. The areas which are susceptible to these events have been documented and in areas where the risk of disruption is greatest permanent monitoring has been put in place. The establishment of these remote monitoring systems is as a result of a collaborative approach to the problem with the Authorities term consultants and the British Geological Survey,

During prolonged periods of rainfall additional inspections of the at risk embankments are made.

## Condition of landscaped areas and trees

The condition of landscaped areas and trees can contribute to the core objectives as follows:

Network safety
Obstruction to user visibility and legibility of traffic signs;
Fallen trees or overgrown vegetation that physically obstructs part of the highway;
Falling branches from trees;
Leaf fall from trees causing slippery surface; and
Root growth affecting surface regularity.

Network serviceability
Potential for service interruption; and
Quality of user experience.

Network sustainability
Landscape conservation;
Mitigation of climate change effects;
Support for habitat and biodiversity;
Problems of root growth for surface, structure and highway drainage; and
Maintaining healthy trees, root severance, ivy clearance.

Safety inspections incorporate highway trees, including those outside but within falling distance of the highway, where it is judged that these trees present a risk to the highway the owner of the tree is contacted and advised of the problem. Despite this proactive approach trees can still present a risk during periods of severe weather and during these conditions any problems that arise are dealt with reactively by the crews tasked with this duty.

The obstruction of street lighting and traffic signs can be a major safety risk to users. A risk based inspection process should be developed to identify such obstructions. Trees and other foliage should be trimmed back to allow the lighting to function and the signs to be legible, while maintaining the shape of the tree wherever possible.

Within the County there are many highway verges which have ecological significance, these areas have been scheduled by the Country side team with specific instructions with regard to their ongoing management in order to minimise the impact of Highway operations on them.

All verge sites are cut with regard to the preservation of wild flower diversity and it is only in areas where highway safety would be compromised that full cuts are made such as in visibility splays.

Weed growth in footways and cycle routes, is managed with an annual programme of weedspraying. The use of weed-killers is closely controlled with only spot treatment generally being made.

Noxious weeds are dealt with on an ad hoc basis. All weed spraying is carried out in accordance with the Control of Pesticides Regulations 1986. Only approved pesticides are used, and these are chemicals listed in the Plant Protection Products (Sustainable Use Regulations) 2012.

The Authority seeks to minimise the impact of its activities on the environment wherever possible and will be undertaking a review of the DEFRA Best Practice Guidance Notes for Integrated and Non-chemical Amenity Hard Surface Weed Control, to determine if further reductions in the amount of pesticides can be made.

The trimming of private hedges and trees that are encroaching into the carriageway is controlled through Section 154 of the Highways Act 1980

Any trimming or felling required must be undertaken in accordance with the requirements of the European Birds Directive (2009) and the Wildlife and Countryside Act 1981, which includes protection for birds, their nests and other relevant legislation.

## Condition of fences and barriers

The condition of fences and barriers can contribute to the core objectives as follows:

Network safety
Integrity and location of safety fencing for vehicles, pedestrians and all road users.

Network serviceability
Risk of livestock disrupting traffic.

Network sustainability
Appearance and condition of fencing.

The potential for vehicle safety on fence failure is significant and particularly so adjacent to railways and at approaches to bridges over railways.

Impact of failure to pedestrian barriers will increase with volumes of vehicles and pedestrians, especially children, and again where railways, rivers and similar high risk features are concerned.

All high risk situations which have been identified though a risk assessment of these assets may require a more robust inspection regime to be put in place along with a commensurate high level of condition.

## Condition of traffic signs and bollards

The condition of signs and bollards can contribute to the core objectives as follows:

Network safety
Identification of risk to users; and
Separation of potential traffic conflicts.

Network serviceability
Contributes to ease of use; and
Contributes to network integrity.

Network sustainability
Support of sustainable transport mode;
Contribution to local economy; and
Heavy traffic routing can optimise maintenance.

Information on sign condition is provided through the regular Safety Inspections undertaken on all routes. Signs that are identified as being defective are replaced/cleaned as required by the Authorities Operations Teams.

## Condition of road markings and studs

The condition of road markings and studs can contribute to the core objectives as follows:

Network safety
Route delineation, particularly in darkness and poor weather; and
Potential for damage and injury if loose.

Network serviceability
Ease of use, particularly in darkness and bad weather.

Network sustainability
Support of sustainable transport modes;
Edge delineation to reduce edge damage; and
Movement of wheel tracking to reduce localised damage.

The condition of road markings and studs is collected through the regular Safety Inspections undertaken on all routes with each defect being categorised by risk. Road markings or studs that are identified as being defective are replaced/cleaned as required by the Authorities Operations Teams.

All mandatory road markings existing before resurfacing or surface dressing are catalogued for replacement as soon as reasonably practicable following the completion of work.

Where any delay in replacement is experienced then temporary markings /signs are used. During resurfacing 'No Road Markings' boards are displayed until all markings have been replaced.

## Regulatory functions

Regulatory functions such as traffic orders associated with parking and vehicle movement can contribute to the core objectives as follows:

Network safety
Risk to users and adjoining property.

Network serviceability
Minimising and signing of obstruction.

Network sustainability
Inconvenience to disabled people; and
Structural damage from parked heavy vehicles.

In Wales the introduction of the statutory duty for network management introduced by the Traffic Management Act has significantly increased the emphasis on regulatory activity. A range of Codes of Practice also provide fairly clear guidance on required levels of service.

## User and community response

User and community responses can be considered at three levels:

- user and community satisfaction with arrangements for their engagement in the policy development process;
- user and community satisfaction with the delivery of the highway maintenance service; and
- authority response to user and community contact in person, or by phone, mail and email.

It is widely recognised that Highway Authorities should have an effective public communications process that provides clarity and transparency in their policy and approach to repairing potholes. This should include a published policy and details of its implementation, including the prevention, identification, reporting, tracking and repair of potholes.

It is also suggested that dimensional definitions for potholes be adopted as part of any maintenance policy.

Monmouthshire does not have such a policy in place at the moment but it plans to develop its current practices into one.

# Inspection Assessment and Recording Highways

## Introduction

The approach adopted by Monmouthshire has been documented and approved by the appropriate senior decision makers

All inspection and assessment results are recorded and accessible through the authorities Mayrise system within the Highways Maintenance Module.

## Safety Inspections

Monmouthshire undertakes its inspections in a manner in which the defects for each asset type can be clearly observed. This includes making inspections from a slow moving vehicle or, in busy urban areas, and particularly when inspecting footways, by walking

The frequencies of safety inspections are derived using the principles outlined in Part A Strategy and Hierarchy of this document (categorising the network into an appropriate hierarchy) and Part A Risk-based approach (covering risk based approach for inspections).

Where carriageway and footway hierarchies intersect, for example at pelican or zebra crossings, bollards, or other defined crossing points at junctions, the higher inspection frequency of those routes is applied in determining of inspection frequency, defect definition and responses. This principle is also applied to intersections between carriageways and cycle routes and between cycle routes and footways.

## Defect risk assessment

## Safety inspection of highway trees

Trees are important for amenity and nature conservation reasons and should be preserved but they can present risks to highway users and adjoining land users if they are allowed to become unstable, cause obstruction or create visibility issues.

In Wales the Highway Authority is also responsible for ensuring that trees outside the highway boundary, but within falling distance, are safe. Section 154 of the Highways Act 1980 empowers the authority to deal, by notice, with hedges, trees and shrubs growing on adjacent land which overhang the highway, and to recover costs.

Safety inspections incorporate highway trees, including those outside but within falling distance of the highway. For trees off highway limits inspections are only made so far as can be seen without trespassing.
Where there is concern over the condition of a third party tree the 'Owners' permission is obtained prior to entry onto the property for the purpose of making a more detailed inspection.

Details of any encroachment or visibility obstruction and any obvious damage, ill health or trip hazards are made during the inspection of trees

Where Inspectors have concerns over the condition of a tree specialist arboricultural advice is sought.

Specialist arboricultural advice on the most appropriate course of action to take, where extensive root growth from larger trees are causing significant damage to the surface of footways is sought, particularly in urban areas if possible to avoid harm to the tree.

In these circumstances, it is often for the authority to reconcile their responsibilities for surface regularity, with wider environmental considerations and a reduced level of regularity may be acceptable.

Overhanging branches can also present a risk to high vehicles and buildings adjoining the highway. In such circumstances, the necessary comprehensive consideration of respective risks and liabilities of the authority and landowner

will require specialist technical, arboricultural and legal advice to determine the most appropriate course of action.

## Competance

All staff undertaking the highway safety inspections have an appropriate level of practical experience in highway maintenance. All inspectors have been issued with a Safety Inspection Handbook and are briefed through regular meetings. Staff joining the team receive a formal induction into the role.

## Skidding resistance surveys

The maintenance of adequate levels of skidding resistance on carriageways, footways and cycle routes is a most important aspect of highway maintenance, and one that contributes significantly to network safety, particularly for cyclists, motorcyclists and equestrians. However, whilst the frequency of accidents is expected to increase as skidding resistance falls, the effect will be more pronounced for more 'difficult' sites and there is no skidding resistance boundary at which a surfacing passes from being 'safe' to 'dangerous'. Difficult sites are those where the geometry, for example, bends, junctions, roundabouts, steep gradients, pedestrian crossings and traffic signals increase the risks of skidding accidents.

Authorities should publish their Skid Resistance Strategy as part of their Asset Management Framework. The strategy, which should be informed by risk assessment, should define:

- the network to which it applies taking account of traffic flow and characteristics and accident risk;
- the test equipment to be used, i.e. SCRIM or Grip Tester. Authorities should state if they will use the Pendulum Skid Tester for detailed investigations;
- the method of survey to be used to provide an estimate of the summer skid resistance, referred to as the Characteristic SCRIM Coefficient (CSC). Authorities can choose between the Single Annual Survey Method, Mean Summer SCRIM Coefficient Method, or Annual Survey with Benchmark Method;
- quality assurance procedures for data collection;
- frequency of surveys;
- the approach to setting investigatory levels, including the range of investigatory levels which are to be used for different categories of site;

frequency of re-assessment of investigatory levels;

competence levels of staff authorised to set or approve investigatory levels;

the approach to be followed in site investigation, including prioritisation of investigations, and staff competent to undertake site investigations. Each site investigation should be undertaken or led by suitably competent personnel;

intervention criteria;
how remedial works will be prioritised in relation to available funding in the overall context of the Asset Management Framework;

whether they will follow existing highway design guidance (HD 28/15) or produce their own strategy for dealing with early life skid resistance;

a realistic/achievable timetable for each part of the strategy;

responsibilities for delivering each part of the strategy; and

the documentation to be retained to enable implementation of policy to be demonstrated (in court if necessary).

The decisions taken when setting investigatory levels should be recorded, dated and signed. Investigatory levels should be reassessed whenever a significant change to the network is made, for example the installation of traffic lights, a pedestrian crossing, or roundabout. The investigatory levels for each category of hierarchy of the network should be reviewed as a result of risk assessment.

Authorities need to decide whether to use SCRIM or Grip Tester for network testing and whether they will use Grip Tester or the Pendulum Skid Tester (recommended for localised investigations only). Research has been undertaken into the correlation between Grip Tester and SCRIM.

All sites where the skid resistance is at or below investigatory level should be identified as soon as is practicable.

The results of the investigations, including whether further action is required, should be documented and retained, together with the identity of the assessor and other parties consulted.

Where the skid resistance is considerably below the Investigatory Level (an appropriate figure should be determined locally), "Slippery Road" signs should be erected as a matter of urgency.

In other cases "Slippery Road" signs should be erected at locations where a site investigation has shown that there is a need for treatment to improve skid resistance.

"Slippery Road" signs should be removed as soon as they are no longer required. This should be after the remedial action has been taken and maintenance engineers are satisfied that skidding resistance levels have been returned to an appropriate level. In some cases this will not be immediately after treatment, for example at sites where surface binder has to be worn off before the skid resistance becomes adequate.

Where skidding resistance is determined as being substantially below the Investigatory Level (an appropriate figure should be determined locally) and there are clear indications that improving the condition of the surfacing is likely to significantly reduce the risk of accidents occurring, remedial treatment should be prioritised as a relatively urgent task.

Priority should then be given to the following sites:

where the skid resistance is below the investigatory level by a certain degree (an appropriate figure should be determined locally);

where low skid resistance is combined with low texture depth; and

where the accident history shows there to be a clearly increased risk of wet or skidding accidents.

Where investigations show that treatment is necessary, consideration should also be given to other planned maintenance works programmes to ensure that potential efficiencies are identified and actioned where possible. Surface treatment may not always be a necessary response and other measures to reduce the accident risk of the site may be both more cost effective and consistent with local transport policy.

## Service inspections - general

Within Monmouthshire most asset group Service inspections form part of the Safety Inspections with the exception of those relating to Structures.

The information gathered from those inspections is used by the Authority to determine programmes of work.

These inspections also include those undertaken for regulatory purposes, such as NRSWA, which are also primarily intended to maintain network availability and reliability.

## Service inspections for carriageways, footways and cycle routes

Service inspections for carriageways, footways and cycle routes are undertaken at the same frequency as the Safety Inspections.
These surveys are undertaken either by slow moving vehicle, on foot.

## Service inspection of highway drainage systems

In general Monmouthshire does not undertake service inspections of highway drainage systems.

It does however undertake ad hoc inspections of known problem areas where there have been problems with carriageway flooding previously.

Monmouthshire is intending to refine how those 'at risk' areas are prioritised in line with the Highway Maintenance Efficiency Programme (HMEP) Guidance on the management of highways drainage assets.

## Service inspections of embankments and cuttings

Monmouthshire has a history of problem with landslips, many of which have affected a number of its routes. These problems have largely occurred where either the geology of the landscape is naturally prone to slippage or the construction techniques used to construct these routes makes them vulnerable to slippage.

In recent years during periods of intense and prolonged rainfall further slips have affected the network.

Working with a consultant and the British Geological Survey (BGS) a number of those sites (subsequently repaired) have had telemetry installed in order to monitor ground movement at regular intervals in order to give an 'early warning' of further movements

Other areas which are potentially at risk of slippage are known and those areas are inspected following periods of heavy and prolonged rainfall

## Service inspection of fences and barriers

Service inspections of fences and barriers are undertaken concurrently with safety inspections.

Any defects identified are reported as part of the safety inspection and those details passed to the authority's operations group. The Operations team undertake the identified repairs and also review the whole installation

Steel and wire road restraint systems should be inspected at intervals determined through risk assessment in respect of mounting height, surface protective treatment and structural condition, to ensure that they remain fit for purpose. Tensioning bolts of tensioned safety fences should be checked

and reset to correct torque at intervals determined by risk assessment. Safety barriers adjacent to bridges should be inspected as part of the highway asset, as well as part of General and Principal Inspections for structures.

Inspection and testing of safety barriers with respect to mounting height and integrity should be undertaken at a frequency determined locally using a risk based approach.
Pedestrian safety fences, boundary fences and environmental barriers for which the authority is responsible, should be also inspected in respect of integrity, and where appropriate stock proof qualities, during the course of service inspections of carriageways, footways and cycle routes. A higher frequency may be necessary in some locations (e.g. in areas with known higher incidence of vandalism). Inspections of structural condition and protective treatment should be carried out at regular intervals. All inspection intervals should be determined using a risk based approach.

Vehicle restraint systems should be inspected in accordance with an authority's strategy based upon the UKRLG/DfT October 2011 document – Provision of Road Restraint Systems for Local Authorities.

*Safety barriers and fences adjacent to railway lines should be inspected by the Highway Authority irrespective of liability, with inspection intervals determined using a risk based approach. The DfT publication Managing the Accidental Obstruction of the Railway by Road Vehicles provides more guidance on this (see Section B.4.11 of this Code).*

The Road Restraints Risk Assessment Process (RRRAP) has been developed as an Excel based tool, which allows the need for a vehicle restraint to be established for individual sites/schemes and, if so, its performance requirements:

## Service inspection of traffic signs and bollards

Service inspections of traffic signs and bollards are undertaken concurrently with safety inspections. Defects in the condition of the asset are reported through to the operations team for attention.

The primary objective is to keep all traffic signs legible, visible and effective as far as possible at all times in relation to the road use and traffic speeds. The following defects in signs and bollards should be considered as factors in a local risk assessment. The speed of permanent repair will depend on the degree of danger but important warning and regulatory signs should be replaced as a matter of urgency:

- matters affecting the legality of important warning and regulatory signs;
- damage, deterioration, or vandalism to signs and bollards leaving either the sign or situation to which it applies in a dangerous condition; and

- missing traffic cylinders across gaps in central reserve fence at emergency crossing points.

Vegetation potentially obscuring road signs is recorded during safety inspections of carriageways, footways and cycle routes.

Inspection of "Stop and Give Way" signs at minor roads are included in the safety inspections

Redundant signing is either identified through safety inspections, pre project appraisals in advance of programmed works or user reports. Such signing is noted for removal as part of regular maintenance activities.

## Service inspection of road markings and studs

Inspections in respect of wear, spread, and colour are undertaken concurrently with safety inspections.

## Service inspections for network integrity

Operational efficiency through the integrity of the network is primarily a network management consideration but aspects of it are closely related to the maintenance function, for example:

- traffic signs or markings may be poorly sited or the legend may be either incorrect, confusing or not reflect current priorities;
- traffic signs or markings may be redundant;
- facilities for walking, cycling or public transport might be discontinuous or poorly defined. Opportunities for installation of dropped kerbs or textured paving should be taken

No specific inspections are made to confirm network integrity, however where deficiencies are identified through safety inspections or direct reports from service users these are acted upon through the Authorities regular maintenance activities. Route integrity for walking cycling or disabled routes are dealt with using specific reviews of those networks.

## Condition surveys - general

The most significant financial investments in highway maintenance will be in repairing, reconditioning and reconstructing carriageways, and to a lesser degree, footways and cycle routes. Condition surveys identify the current condition of the network and from this condition, both long-term and short-term maintenance funding decisions can be made. Repeatable condition

surveys allow trend analysis to be used to confirm the original decisions or allow for changes as a result of the changing network condition, and inform lifecycle planning.

Monmouthshire uses a number of types of survey, each providing information from a differing perspective, and which in combination can provide a comprehensive picture of the condition of the asset.

These surveys which can be classified as network level surveys include:

SCANNER (Surface Condition Assessment of the National Network of Roads);
Coarse Visual Inspections (CVI);
skidding resistance (SCRIM or Grip Tester);
Footway Network Surveys (FNS)

SCANNER surveys are traffic speed surveys that collect data on transverse and longitudinal profiles, texture and cracking of carriageways. These are fast surveys with real time processing of condition information, that were introduced with the aim of providing both reliable and repeatable information, for the assessment of carriageway condition. They can support national requirements for reporting where applicable.

CVI is normally carried out from a slow moving vehicle, it is a fast, cost-effective survey that enables the authority to cover large parts of their road network on a regular basis. Rather than recording detailed measurements of individual defects, the survey identifies and categorises lengths of features having generally consistent defectiveness.

Network surveys such as SCANNER and CVI provide regular whole network coverage and are used to target more detailed investigations of provisional treatments, using more detailed project level surveys.

Monmouthshire has undertaken a survey of its Footway Network. The survey is carried out by a single surveyor walking along the footway, the footway is split into 25m blocks and those blocks are assigned a condition category. This allows a reasonably detailed picture of the condition of the footway to be quickly built up.

## Inspections for regulatory purposes

A significant element of highway maintenance comprises regulation and enforcement of activities on or affecting the highway.

The most significant of these involves responsibilities under the New Roads and Street Works Act 1991 (NRSWA). In Wales most of these issues are now incorporated within the statutory duty for Network Management

imposed by the Traffic Management Act 2004, and are the responsibility of the authority's Traffic Manager.

Other regulatory activities include:

- ensuring 'expeditious movement of traffic';
- management of the Highway Register or equivalent;
- management of the Definitive Map for PROW;
- dealing with encroachment on the highway;
- dealing with obstruction on highways or PROW;
- dealing with illegal and unauthorised signs;
- issuing permits or permissions for utilities, skips, hoardings, temporary closures and other authorised occupation of the highway;
- construction of vehicle crossings;
- dealing with illegal parking on verges and footways
- adoption of new highways.

### Reliability of data

The need for data reliability is of particular importance as the captured data can be used to inform investment decisions, develop wider strategies or support the Authorities legal defence.

The competence of the Authorities staff engaged in inspections and surveys is therefore especially important where the quality and treatment of data could have significant legal and financial implications. All staff engaged in such duties are suitably experienced and receive training as required.

Where highways staff change role within an authority, their competence for the new position is reviewed and any required training or development is provided if necessary.

The Authorities SCANNER and SCRIM, surveys are carried out by accredited surveyors using accredited software.

### Recording of information

Information from all inspections and surveys, together with any immediate or programmed action, is accurately and promptly recorded

## Programming and Priorities Highways

### INTRODUCTION

The general principles to be applied to programming and priorities are outlined in Section A of this document, this section covers guidance relating to highways assets.

## Balancing priorities by type

The broad priorities for the respective types of highway maintenance will largely be determined by the outcome of safety inspections and condition surveys, assessed against local risks and policies specified by the authority in the light of the Code Well managed Highways. In general it will be important to establish priorities and programmes for each of the following:

emergency / reactive maintenance – attending to defects and other safety matters that require urgent action arising from inspections or user information
planned maintenance – attending to defects and other less urgent matters that may benefit from further planning leading to permanent repairs
programmed maintenance – providing lifecycle / road condition based work streams
routine maintenance – providing locally defined levels of service

regulatory functions – regulating occupation, interference or obstruction of the network

Winter Service – providing locally defined levels of service of salting and clearance of ice and snow.

## Priorities for emergency / reactive maintenance

Emergency / reactive maintenance involves attending to the rectification of defects and other safety matters that require urgent action arising from inspections or user information. The level of response is determined following a risk based assessment as set out in the section on safety inspections.

The option selected, together with relevant follow up, will largely be determined by operational practicalities and also whether the site is already part of a programme for more comprehensive treatment, in which case a temporary repair may be an appropriate course of action.

Examples of emergency / reactive maintenance are given below:

all assets – sign and make safe for safety purposes;
all assets – provide initial temporary repair for safety purposes; and
all assets – provide permanent repair for safety purposes.

Monmouthshire, in most cases, will elect to undertake a permanent repair as it first response.

## Priorities for planned maintenance

Planned maintenance involves attending to the rectification of defects and other less urgent matters that do not require immediate action and where further planning may lead to the opportunity for permanent repairs.

## Priorities for programmed maintenance

Programmed maintenance is undertaken primarily in the interests of providing for a sustainable outcome, seeking to minimise cost over time and to add community value to the network or to the environment. It can also be for safety purposes by, for example, improving skidding resistance or contributing to serviceability by, for example, improving ride quality.

It is necessary to develop priorities and programmes for the structure, surface and edge of carriageways, footways and cycle routes, using data such as age, condition, hierarchy and lifecycle planning.

Monmouthshire is part of the SCOTS/CSSW Roads Asset Management Project group and Monmouthshire uses the guidance and lifecycle planning tools are available to members via the RAM Knowledge Hub. Cost projection tools are also available for carriageways, footways, street furniture and other asset types. These tools enable the following models to be tested

- assessing the impact of different levels of funding on asset performance and asset maintenance needs;
- investigating current and future levels of funding required to sustain or improve the condition or performance of the asset;
- identifying the level of funding required to minimise whole life costs; and
- allocating resources to assets and treatments that provide the best whole life costs.

The goal is for programmed maintenance to be undertaken at the lowest whole life cost, therefore providing value for money.

## Priorities for routine maintenance

Routine maintenance programmes and priorities are determined largely, but not exclusively, from non-urgent defects identified during safety inspections and user requests.

Priorities and programmes are defined for all routine maintenance categories.

As Monmouthshire is largely rural in nature, it is most efficient to prepare a regular programme of visits to local council areas for the purpose of undertaking the widest possible range of routine maintenance activity where there is a good 'fit' of those operations.

Examples of routine maintenance are given below

- carriageways, footways and cycle routes – minor works and patching;
- drainage systems – cleansing and repair;
- embankments and cuttings – drainage and stability;
- landscaped areas and trees – management;
- verges – grass cutting;
- fences and barriers – tensioning and repair;
- traffic signs and bollards – cleansing and repair; and
- road markings and studs – replacement.

## Regulatory functions

Examples of regulatory functions are given below:

- maintenance of Highway Register and Definitive Map;
  co-ordination of road and street works (responsibility of Traffic Manager or equivalent);
- charging schemes and permits for highway occupation (responsibility of Traffic Manager or equivalent); and
- other regulatory functions – encroachment, illegal signs, parking.

## Value management

Value Management is a process that has not been adopted within Monmouthshire but it is seen as a process that offers a more enhanced tool for prioritising the competing needs of highway schemes, identified through condition and economic prioritisation.

It provides a structured, consistent and quality controlled approach for assessing the benefits of undertaking maintenance and the associated risks of not undertaking maintenance. The outcome should be a prioritised programme of schemes that will be entered into the Asset Management Framework.

Monmouthshire will therefore develop this approach by establishing a Value Management regime, where it will identify the frequency of review and the overall approach to be adopted.

This regime will take into consideration the corporate and transport priorities within the authority and the overall context of the Asset Management Framework. The regime will identify:

- Value Management frequency - it is possible that some activities would be performed on a continuous basis. However, it is anticipated that a Value Management review would be held annually in order to determine the programme of works to be included in the Asset Management Framework for the following years; and
- prioritisation criteria – the criteria considered under Value Management to be used to prioritise needs. It is important that the prioritised needs should align with the levels of service and the volumes of work identified in the Asset Management Framework.

The Value Management regime will consider each category (e.g. safety, socio-economic and environmental, value for money, risk) assigning a weighting to represent its importance in the delivery of the objectives of the authority and the context of the Asset Management Framework.

The Value Management process will be conducted in the form of workshops with the managers of the respective highway teams within the authority. The process involves the assessment of the performance of each of the programmed maintenance schemes under the various criteria. The outcome of the Value Management process will be an outline programme prioritised on scores obtained from the process. The work volumes and cost estimates should align with the work volumes and the funding estimates in the Asset Management Framework. The process should also highlight the risks related to the programme.

The overall aim of the Value Management process is to ensure that maintenance schemes are assembled into programmes of work that align with the objectives of the authority and deliver value for money. Value of these schemes will be maximised by co-ordination with other highway improvement programmes and integrated transport schemes on related parts of the network, thus minimising disruption to users and maximising benefits to the community.

## Value engineering

Value Engineering is a refinement of the Value Management process. It is a second stage process that is conducted on an individual scheme, to optimise both the design and construction phases. In principle, it reduces the risk associated with unforeseen issues at the time of scheme development. Value Engineering also provides the authority with a further chance to explore potential opportunities for innovation. Key individuals from works teams and specialists from each discipline should be present during this process.

## Materials, products and treatments

The importance of materials, products and treatments in meeting the core objectives of customer service, safety, serviceability, sustainability and the agreed levels of service is outlined in Section A of this document.

Where possible Monmouthshire will adopt innovative treatments that offer improved performance over traditional methods including service lives, surface

dressing, innovative patching products and systems, high friction surfacing, structural road recycling, crack sealing and slurry surfacing, geosynthetics and steel meshes, asphalt preservation systems, grouted macadam, retexturing and ironwork installation.

The Waste and Resources Action Programme (WRAP) is a major Government-funded programme established to promote resource efficiency and provide information resources such as The Quality Protocol for Recycled Aggregates.



# Winter Service

## Background

Winter Service deals with regular, frequent and reasonably predictable occurrences like low temperatures, ice and snow, as well as with exceptional events.
Policies and plans developed for Winter Service are likely to have relevance in emergency planning for dealing with extreme weather conditions including flooding, high winds and high temperature. The incidences of such events may be affected by climate change.

Winter Service is a significant aspect of network management both financially and in terms of its perceived importance to users. It can also have significant environmental effects. The organisation of the service is likely to have considerable implications for the overall procurement and management of other highway maintenance services.

## Objectives

Winter Service can contribute significantly to each of the core objectives set out in this Code as described below:

**Safety**

Safety is one of the prime considerations for the Winter Service

**Customer**
In the development of its Winter Service Plan the Authority has collaborated with the NHS to identify the needs of vulnerable individuals such as those on dialysis.

**Serviceability**

Maintaining availability and reliability of the highway network is a key objective for Winter Service

**Sustainability**

Low temperatures and the formation of ice can cause serious damage to the fabric of carriageways, footways and cycle routes with freeze/thaw action leading to accelerated damage of the network. An effective Winter Service can help to prevent freezing which can contribute reduce the whole life costs of those assets.

## Winter service policy

Monmouthshire County Council formally approved its current winter service plan in December 2017. In developing this plan the following matters were considered

- network resilience;
- treatment of facilities for public transport users;
- treatment of facilities for road users;
- treatment of facilities for walking
- treatment of transport interchanges;
- treatment of promoted facilities such as community or leisure centres;
- extent of priority for emergency services;
- extent of priority for key public services and critical infrastructure;
- resilience of Winter Service resources;

Within this exercise The Authority defined the Overall Winter Period, the Core Winter Period, the level of resilience and treatment networks.

## Resilient winter service

Precautionary salting is undertaken across Monmouthshire as defined within its winter service plan.

The primary network includes:

- All principal (class1)
- Non-principal class (2)
- Most rural class (3) routes
- Busy and strategically important streets in Monmouthshire's principal towns.

These routes are set out in the maps which form the Appendices to the above document.

The above routes comprise 525Km of highway or approximately 33% of Monmouthshire's total network.

When prolonged periods of snow and ice are expected or present salting is also undertaken on Monmouthshire's secondary network

The secondary network includes

- Housing estate roads,
- Footways and pedestrian areas in its town centres,
- Busy urban footways,
- Footways giving access to schools hospitals and homes for the elderly
- Footways incorporating steep gradients.

Snow clearance is also undertaken on the primary and secondary network defined above

In addition to the above routes snow clearance is also undertaken on

- Urgent medical and industrial routes
- Bus service routes
- Access to private dwellings where a need has been identified by the local NHS board
- Other class three and unclassified roads giving access to villages
- Roads serving isolated farms and houses

The network extents is reviewed annually.

## Minimum Winter Network

Monmouthshires minimum winter service network includes:

- All principal (class1)
- Non-principal class (2)
- Most rural class (3) routes
- Busy and strategically important streets in Monmouthshire's principal towns.

These routes are set out in the maps which form the Appendices to the above document.

The pre-salting service is agreed and signed off by The Head of Operations and the Cabinet Member for Highways, these details are then circulated to all those detailed on the circulation list of the Winter Maintenance Plan. Details of the actions taken are passed to all adjacent Authorities and the Emergency Services. The Well maintained highway matrix as amended in 2011 is used to determine the treatment to be deployed and the Meteorological Offices forecast is used to determine the trigger point for the action. The process is fully set out in the Winter Maintenance Service Plan.

## Winter Service Resilience Levels

The winter service period starts on the first Monday in October and ends on the nearest Sunday to the 1st of May.

Monmouthshire ensures that it has sufficient levels of salt present in its salt barns at the beginning of the winter service period and these levels are set at a minimum1.6 times the average salt usage over the previous six years.

This provides 56 precautionary treatment days based on two 20g/m2 treatments of the Primary route network

Barns are restocked when 50% of the salt stock has been depleted

Monmouthshire also has access to 200 tonnes of salt which is held for its specific use in the strategic salt stockpile just outside its borders.

Monmouthshire recognises that the delivery of the Winter Service relies all resources being available, including salt, fuel and trained staff and operatives.

The above resources are managed through a combination of rostering, regular contact and timely procurement of salt through its supply network, planned equipment procurement, regular maintenance of its salting fleet and fuel bunkering

The Authority provides regular updates to Welsh Government on salt usage on a monthly basis. Bi Annual meetings are held with all Authorities across Wales one at the beginning of the season and a further one at the end where experiences and examples of good practice can be shared.

## Co-ordination and collaboration

Monmouthshire has established collaborative arrangements with a number of its neighbouring Authorities where opportunities exist to streamline pre-salting services. In addition arrangements have also been made with Welsh Government to access salt stocks at its Ebbw Vale Emergency Salt reserve.

Neighbouring Authorities have collaborative arrangements in place for the sharing of weather station and forecast information and ongoing dialogue takes place between those Authorities on a regular basis throughout the Winter service period.

The Authorities Winter Service Plan is shared with Elected Members, Town and Community Councillors, Police, Fire, Ambulance, Meteorological Office, SEWTRA Emergency Planning Officer, and all neighbouring Authorities who have an opportunity to comment on the Plan.

## Winter service planning

Planning and preparation is fundamental to delivering a successful Winter Service. Careful planning in advance of the winter season will greatly assist in adequate resources and contingency arrangements being put in place by authorities to improve their overall resilience.

## Communication

Monmouthshire is aware that communication with stakeholders represents good practice, to this end it has set up effective lines of communication with the public, key public services, stakeholders and other Highway Authorities.

The Authority has produced the Corporate Communications Severe Weather Protocol document which sets out its approach to how communications are to be managed in advance of and during such events.

The protocol requires each front line service to have designated an officer to act as a communications lead for that service.

Within the Highways Department this role is undertaken by the out of hours duty Officer.

The Highway Service is responsible for updating its own web page which is dated and time stamped to ensure that viewers are confident about the currency of the information and information regarding gritting routes are posted on the severe weather dashboard.

In addition Service updates are posted on social media twitter and facebook.

## Setting Expectations

Information on likely road surface temperatures, and the routes to be salted is passed by the Group Engineer Highway Operations to the Authorities Communications prior to the deployment of the salting crews. This information is sent in both Welsh and English via a twitter feed to those residents signed up to receive it. This information is also posted on the Authorities web site.

Treatment regimes across Authority boundaries will generally be similar as the routes comprise mostly Primary routes, however some differences can be apparent as the decision to salt can be based on decisions based on information coming from different forecasters', however the intention will always be to provide the public with a safe route to travel.
All the forecasters use the same data from many weather stations. The MET Office (MCC's and Greater Gwent's Forecaster)would use nationwide weather station data to then model the forecast for MCC

Monmouthshire ensures that there is appropriate consultation and communication with other Highway Authorities, key public services and other stakeholders to ensure improved service for the public.
The Winter Service plan is shared directly with key stakeholders, including adjacent Highway Authorities, South East Wales Trunk Road Agency, all emergency services, Its own One Stop Shops, Meteorological Office Cardiff, Emergency Planning Officer, Town and Community Councillors, Monmouthshire's members and the Cabinet Member for Highways.

Liaison between adjacent Highway Authorities is routine throughout the winter season. Feed-back being given on relevant issues post salting runs when required.

Collaboration with other authorities takes place at the bi annual all Wales meetings where the respective Winter Service policies and plans and best practice is shared as well as the potential for mutual aid or joint training and exercising.

Regular liaison also takes place with the trunk road and motorway agency team.

## Contact Information

Staff contact details are confirmed before the start of the winter season, and those details circulated.

## Media Information

The Authorities communications team has produced the Corporate Communications Severe Weather Protocol document which sets out how information will be provided to the media in advance and during severe weather events.

The Authority has established effective working arrangements with local press and broadcast media. The above document providing contact details for both broadcast and print media.

Communication with the media is the responsibility of the Authorities Communication Team who will designate a Lead Communications Officer who will be responsible for providing and co-ordinating the information to the media.

A secure password system will be established by the communication team when a severe weather event is forecast, this password will be provided to the media partners so that they know when a genuine notification is being made.

Information regarding road conditions team deployments etc. are passed to the communications team from the Highway Operations team every few hours during a severe weather event.

## Information for the Public

Information Authorities should ensure effective communication of information for the public before and during both normal and severe winter conditions.

Monmouthshire provides users and the community a non-technical summary of the Winter Service Plan, including plans of the treated network which is available through the Authorities website

## Public Self Help

Monmouthshire assists the local community in areas not on priority routes or at known trouble spots, including gradients and sharp bends by the provision of public access salt bins. At the start of the Winter Season each salt bin is filled and the bins are refilled following each severe weather event or when required.

## Winter Service Plan

The Winter Service Plan is designed to be used by staff at all levels and that those that require it have ready access to the document. The document is issued to all Highway Engineers and Foreman engaged in the delivery of the Winter service and operatives are briefed on the plan.

Monmouthshire has formally approved, adopted, and published its plan, which is based on the principles of Well Managed Highways in consultation with users and key stakeholders

A briefing takes place at the start of the season to disseminate this information to staff involved in the delivery of the Winter Service. Staff are required to sign up to the delivery of the service confirming their availability and the status of their driving licence and personal insurances.

Any reported incidents or failure of the service is reviewed and any improvements identified

## Treatment Routes

Monmouthshire has defined its treatment route plans for carriageways and these are set out in its Winter Service Plan. The measures to be taken during snow events affecting footways are also set out.

Treatment routes for Winter Service are based on a hierarchy developed some time ago in collaboration with the Meteo Group and Nottingham University. The Hierarchy is to be reviewed with consideration being given to the following factors.

- wider transport network
- the Resilient Network;

- safe and reliable access to emergency facilities including Fire and Rescue, Police, Ambulance Services and hospitals; other public services access needs and critical infrastructure where the maintenance of access may be critical;
- public transport routes and access to stations, bus garages and depots;
- safe and reliable access to main industrial and business centres of key importance to the local and regional economy;
- any significant variation between summer and winter traffic;
- accessibility dependencies of remote communities
- the special needs of disabled people or older people particularly where these can be effectively targeted;
- known problems, including significant gradients, exposed areas and other topological factors;
- climatic and thermal capacity differences within the area; and
- co-ordination and co-operation with other authorities.

Risk assessments will also be undertaken to establish which routes should be included in a programme of treatment during winter.

## Contingency Planning

During exceptionally severe weather Town Centres, School access routes and footways adjacent to programmed refuse collection routes are cleared by operatives from the grounds maintenance teams who live in direct proximity to those towns as often operatives need to walk from their homes to the local depots in that area.

This activity is triggered by an instruction from the Group Engineer Highway Operations to the Grounds Maintenance Manager.

The scope of the work is set out at the beginning of each season and a formal instruction confirming the instruction sent out.

Monmouthshire is a Category 1 responder under the Civil Contingencies Act 2004, and has emergency plans in place.

Monmouthshire has direct access to reserve supplies of salt which clearly is a key resource. Reserve Operatives are available from the Authorities Grounds Maintenance Teams.

Monmouthshire has built strong relations with its neighbouring Authorities sharing forecasting information weather station sites and providing salt stock where necessary.

## Winter service delivery

### Decisions and Management Information

The decision support information will be used by the authority's Group Engineer Highways Operation, together with local experience, and against the background of a range of pre-determined scenarios, in deciding the action to be taken.

The Group Engineer maintains close consultation with others both within and adjoining the authority and also SEWTRA who deal with the Trunk and Motorway Networks.

### Information Recording and Monitoring

Monmouthshire collects comprehensive and accurate records of the all Winter Service activities. This includes the timing and nature of all decisions, the information on which they were based, and the nature and timing of all treatment. The time at the end of actual salting and the time of return to depot is recorded.

The Authorities gritting fleet is largely equipped with electronic vehicle location systems together with automatic recording of salt spreading. This simplifies the collection and accuracy of records as well as providing corroboration of service delivery in cases where failure to salt is alleged.

## Resources

The significant amount of resources required in the delivery of the Winter Service demands that the supplies of plant and large volumes of consumables such as salt for de-icing and fuel are properly planned and managed.

Monmouthshire dedicates a significant resource into the planning of this service to ensure that adequate salt stocks are in place at the beginning of the season, that the winter service fleet is fit for purpose and that robust maintenance regimes are in place for the maintenance of that fleet during the winter period. In addition all staff involved in the delivery of the service are briefed on the importance of their role and training is given as appropriate.

The Authority makes use of third party plant and personnel resources through a contractual management arrangement with a large agricultural contractor who co-ordinates the use of individual local farmers. This arrangement works particularly well especially during periods of severe weather.

In addition the Authorities refuse collection, street cleansing and grounds maintenance services provide support to the Winter Service, especially in times of prolonged ice and snow. These arrangements being made and documented well before the commencement of the season.

Detailed route planning has been undertaken to ensure economic, efficient and effective resource usage. The current routes are to be reviewed with close attention being paid to the following factors.

- spreading vehicle characteristics and capacity;
- depot and salt location;
- response times
- treatment times
- Risk assessment of target treatment times based on local circumstances that provide for the completion of pre-treatment before ice forming.
- turnaround times

Planning of staff resources covers the entire workforce involved in the Winter Service. Consideration is given to

- the need for staff to be available throughout defined risk periods. managed through a robust rota system;
- the need for the treatment operations to be co-ordinated and supervised which is managed through the duty officer.
- resources and equipment for treating carriageways, and footways. Managed through a robust system of maintenance and calibration;
- resources for dealing with vehicle breakdowns, problems with fuel supply and communications failure; Managed through a standby arrangement with plant fitters and a strong supply chain.

- resources for the storage, delivery and loading of salt. Managed through a robust supply chain and salt stock monitoring.

In planning resources, the following issues regarding personnel are also considered

- implications of Drivers' Hours Regulations;
- extent and nature of double manning and driver support;
- shift system arrangements; and
- provision for holidays and sickness.

The Authority has in place a contract with an agricultural contractor for the delivery of services during periods of prolonged snow and ice these arrangements are fully documented and the necessary insurances are in place.

# Part C Structures

# Part C Structures

## Introduction

This section relates specifically to the following highway structures.

- bridges including footbridges, cycle route bridges, bridleway bridges, accommodation bridges, occupation bridges, subways, underpasses and culverts;
- retaining walls;
- sign/signal gantries;
- cantilever road signs; and
- tunnels.

The following definitions are aligned with the Code of Practice on the Highways Network Asset definitions.

- bridge – a structure with a span of 1.5m or more spanning and providing passage over an obstacle, e.g. watercourse, railway, road, valley. This category also covers subways, footbridges and underpasses;
- cantilever road sign – a structure with a single support that projects over the highway in order to carry a traffic sign;
- cellar or vault – an underground room or chamber with a maximum plan dimension of 1.5m or more;
- culvert – a drainage structure with a span of less than 1.5m passing beneath a highway embankment that has a proportion of the embankment, rather than a bridge deck, between its uppermost point and the road running courses. Culverts are normally rectangular or circular in cross section;
- retaining wall – a wall associated with the highway where the dominant function is to act as a retaining structure, and with a minimum retained height of 1.35m;
- road tunnel – a tunnel with an enclosed length of 150 metres or more through which a road passes; and
- sign/signal gantry – a structure spanning the highway, the primary function of which is to support traffic signs and signalling equipment.

It should be noted that BD 2 (Technical Approval of Highway Structures) applies to all highway structures with a clear span or internal diameter greater than 0.9m, and to retaining walls of height greater than 1.5m.

# Legal Framework Structures

## Introduction

In Wales, reducing access to the means of suicide is one of the objectives of Talk to Me 2 – Suicide and Self Harm Prevention Action Plan for Wales 2015-2020.

Monmouthshire intends to undertake a suicide risk review of its structures where the potential exists for those structures to play a part in suicides and restricting access where necessary. (See **Part 3, Structures**)

## Structures specific legal and procedural requirements

The Highways Act 1980 sets out the main duties of Highway Authorities in England and Wales. In particular, Section 41 imposes a duty to maintain highways that are maintainable at public expense. Where a highway passes over a bridge, Section 328(2) vests the bridge as part of the highway and the normal duty to maintain under Section 41 of the 1980 Act applies under these circumstances. However this does not preclude bridges under highways being in private ownership and rightly the responsibility of the private owner. Issues regarding retaining walls are covered below.

## Bridges

Bridges built under an Act of Parliament for the construction of the canal and railway networks are not maintainable at public expense. In these instances where a bridge carries a road, (e.g. Network Rail), the maintenance obligations are clearly recognised by both the Highway Authority and the Bridge Owner. However it is proposed to formalise that situation through the production of an agreement which sets out the various maintenance responsibilities. (See **Part 3, Structures**)

Section 7 of the Trunk Roads Act 1946 and later Section 55 of the Highways Act 1980 led to the adoption by the strategic Highway Authority of all private bridges when a road was trunked. These bridges have generally been passed to the Local Highway Authority if the road was subsequently de-trunked in accordance with Section 2 of the Highways Act 1980 and in Monmouthshire we have one such structure which is located to the rear of no 10 Troy Gardens Monmouth

Between 1989 and 1999 as the result of a European Directive, authorities were required to assess the strength of bridges carrying the adopted road network and, where appropriate, with strengthening to ensure adequacy for the introduction of the 40 tonne European Standard. Currently 70% of the relevant bridge stock has been assessed and where necessary strengthening works put in place. The work is ongoing.

The British Railways Board, the London Board, and the British Waterways Board, now the Canal & River Trust (or their successors in title) are referred to as "the Boards" throughout the following section.

In the case of bridges owned by the Boards and their successors, an initial assessment was required to the new code BD21 The Assessment of Highway Bridges and Structures and its successive developments and, in the event of the assessment indicating inadequate strength, a further assessment generally to BE4, to determine whether or not the owner's load bearing obligation for the structure was met. Owners were only obliged to ensure that there structures met the BE4 requirements. Any shortfalls of strength identified could be addressed with cost sharing determined on the degree of shortfall, the form of strengthening and the desired loading requirements for the route. Schemes are progressed under national templates for works agreements prepared by the Boards and ADEPT Bridges Group. Further details are provided in Strengthening of Railtrack owned highway bridges, published jointly by CSS (now ADEPT) and Railtrack, March 1999.

BS EN 1991-2 defines models of traffic loads for the design of road bridges, footbridges and railway bridges.

## Retaining Walls

Most retaining walls, which directly support the highway or support land carrying the highway ("highway retaining walls") and are within the highway boundary, are maintainable at public expense. Occasionally such retaining walls have been built by adjoining landowners to create a more level site and so afford more useable space, e.g. for a mill, these are generally owned by, and should be maintained by, the landowner. Whilst this cannot be insisted upon by the Highway Authority unless covered by an agreement, the highway does have a right of support under Common Law and this can be used if the wall starts to collapse.

The responsibility for the maintenance of retaining walls which support property adjacent to the highway ("property retaining walls") is more difficult to determine. These walls may have been built as part of the highway and as such are maintainable at public expense unless built as accommodation works for the adjoining landowner with an agreement that the landowner would maintain them in the future. Some retaining walls may have been built by the adjoining landowner to create a more useable area and as such are maintainable by the landowner. In this case, if an existing wall is liable to endanger highway users, the Highway Authority can serve notice, under Section 167 of the Highways Act, on the owner or occupier requiring them to carry out repair work to remove the danger. This can be a protracted process and the authority needs to consider their general duty of care to the public. Serving of such a notice imposes a duty on the Highway Authority to act in default of action by the owner. Section 167 also states that no new retaining wall shall be built of height greater than 4 feet 6 inches (approximately 1.37m) within 4 yards (approximately 3.66m) of a street unless it is approved by the local council following consultation with the Highway Authority.

The ownership and maintenance of retaining walls can be a complex issue currently the County Surveyors Society Wales Bridge Working Group of which Monmouthshire is a member is reviewing this issue with a view to producing a guidance note to clarify retaining wall responsibilities.

## Railway and Canal Bridges

The Transport Act 1968 (Part VIII Bridges and level Crossings etc) sought to clarify responsibilities for maintaining the structures that carry highways over the railways of the British Railways Board or the London Board, and over waterways of the British Waterways Board, now the Canal & River Trust (or their successors in title).

Part VIII of that Act states that where, at that time, any of the above Boards were responsible for maintaining the highway on the bridge or giving access to the bridge, they remain responsible for all but the surfacing of the highway which from that time becomes the responsibility of the Highway Authority as highway maintainable at the public expense. The Act provides that the authority is not responsible for any defect in the surface that is attributable to the failure of the Boards to discharge their responsibility. There are similar obligations on the authority to afford access to the Boards to carry out their maintenance work and to seek the consent of the Boards to works which might affect the loading and/or parapet height on the bridge.

The Transport Act 1968 imposed upon the Boards the need to provide bridges with the required load-bearing capacity and to maintain or improve their bridges as appropriate. Except for special cases where standards are specified by a Minister, the capacity was defined as the weight of traffic which ordinarily uses or may be reasonably expected to use the highway carried by the bridge on or about the day on which the section of the Act came into force for existing bridges or, if the bridge is constructed subsequently, when it is opened to traffic. In the case of railway bridges this was further defined by The Railway Bridges (Load Bearing Standards) (England and Wales) Order 1972 (SI 1072 No. 1705) where five standards of loading are applied depending on the age of the bridge or when it was reconstructed (special provision is made for specific bridges listed in Schedules 2 and 3 to this order). The five standards of loading are:

- Technical Memorandum (Bridges) No. BE4 The Assessment of Highway Bridges for Construction and Use Vehicles;
- Type HA (equivalent lane loading) standard;
- HA and 37.5 units of HB (abnormal loading);
- HA and 45 units of HB; and
- for bridges that were or were about to be weight restricted, the load bearing obligation was limited to the weight restriction.

## Overbridges

The following overbridges are present within Monmouthshire.

- See **Part 3, Structures**

Where works are planned by the Highway Authority which could impact upon the interests of the respective boards responsible for those bridges the Authority consults with the owner.

Over-bridge strikes may have severe consequences, the Bridge Strike Prevention Group (BSPG), have developed a protocol for highway managers and bridge owners to minimise the risk of bridge strikes which Monmouthshire intends to adopt.
(See **Part 3, Structures**)

## Low, Narrow or Weak Bridges

The Traffic Signs Manual Chapter 4 contains guidance for the signing of low, narrow and weak bridges.

All bridges over highways with less than 5.0m headroom at any point over the carriageway are referred to as 'low bridges'.
Sections 1 and 2 of the Road Traffic Regulation Act 1984, as amended, are used to make a TRO (called a "Weight Restriction Order" although actually a TRO) prohibiting certain vehicles from using a bridge which has a load bearing capacity less than that required to safely carry all vehicles permitted under The Road Vehicles (Construction and Use) Regulations 1986 or The Road Vehicles (Authorised Weight) Regulations 1998. "Weak Bridge" warning signs are erected in accordance with Traffic Signs Manual Chapter 4 using guidance in BD 21 and BA 16 to determine the appropriate weight restriction with appropriate advance signing.

Where necessary Load Mitigation Interim Measures are imposed on weak structures in order to reduce the effects of the loading on the structure to an acceptable level. These measures can include weight restrictions, lane restrictions, propping, use of a temporary structure and closure.

## Culverts

Where the Authority intends to repair or provide a new culvert the hydraulic capacity of that culvert is assessed using the design methodology set out in the Flood Estimation Handbook FEH. The design is based around a 1:100 year storm return period with an additional allowance of 20% made for climate change.

As part of the design process consultation takes place with National Resources Wales (NRW) and the Authorities Flood Risk Manager

In some circumstances the NRW has required the Authority to maintain the existing capacity of a culvert which by current standards would be undersized in order to maintain habitats upstream.

The NRW (includes the former Internal Drainage Board (IDB)) and the Lead Local Flood Authority (LLFA) should be consulted when undertaking work on culverts/bridges that may interfere with the natural capacity of a watercourse.

## Other Highway Structures

Within the Structures database various other structural elements are recorded these are

- Reinforced earth structures
- Willow embankments
- Soil nailing systems
- Rock anchors
- Rock fencing and netting systems

## Cellars and Vaults

The majority of cellars and vaults associated with the highway are privately owned and their maintenance and management is largely outside the remit of the authority. The owner has a duty to maintain which is set out in the Highways Act 1980.

The Authority has no obligation to ensure that the Highway acts as an impermeable layer protecting the cellar or vault from water ingress or for ground water beneath the surface

Within Monmouthshire the collapse of a private cellar or vault collapses is a very rare occurrence.

Where such an event occurs the Authorities Bridge Manager will adopt the following protocol.

Following a collapse the authority liaises with the owner/occupier regarding the repair and agrees an action plan. This plan must address the following issues

- How the risk to the public will be minimised
- Agree the contractor (they must be approved to undertake works on the Highway) who will undertake the works
- Agree the length of time taken to return the highway to public use
- How the site will be secured, e.g. site safety, traffic management, initial inspection and structural analysis;
- identification of relevant parties, e.g. owner, occupier, highway and other authorities;
- investigation, e.g. nature of the cellar/vault, extent and cause of damage, scope and cost of works required and constraints
- repairs, e.g. establish who will carry out the repairs, identify work required to meet current standards and agree how costs will be shared between the parties.

In the event that an agreement cannot be reached or the owner fails to undertake these works then the Authority will take the necessary action to maintain the Highway.

## Improvements and Reconstruction

Sections 62 to 105 of the Highways Act 1980 give general powers to the authority to improve the highway be it widening, junction improvements or safety aspects. Improvements can include highway structures. Section 75(2) requires consent of the railway, canal, inland navigation, dock or harbour undertakers concerned, if affected.

Sections 91 and 92 of the 1980 Act respectively state that an authority can construct a bridge to carry the highway and that a bridge can be reconstructed either at the site or within 200 yards (approximately 183m) of the existing one. Section 93 of the Act permits the authority to apply to the Minister of State for an order to provide for reconstruction, improvement or maintenance of privately maintained bridges if they are considered dangerous or unsuitable for the requirements of road traffic.

The authority has the power under the 1980 Act, Section 110 to divert non-navigable watercourses if necessary or desirable as part of improvement or alterations.

Construction of bridges over, and of tunnels under, navigable waterways, requires an order from the Minister under Section 106 of the Highways Act 1980. If the waterway is also tidal, consent is required under the Coast Protection Act 1949 as amended by Section 36 of the Merchant Shipping Act 1988. If material is to be deposited in the tidal waterway, consent is also required in accordance with the Food and Environmental Protection Act 1985 Part II.

Each of these processes involves a statutory consultation process which includes the Environment Agency, Marine Management Organisation, navigation authorities, Trinity House, etc as necessary. For works required on highway structures within areas covered by a "Harbour Order" permission is required from the Harbour Authority.

## Structures Over or Adjacent to Watercourses or Flood Defences

If highway structure works are required in, over, under or near a watercourse or flood defences (including sea defences), Then the Authority will liaise with the appropriate body in order to gain consent to work in watercourses. Consents to cover both temporary and permanent work are normally required.

Consents are the means of meeting requirements that the works do not endanger life or property by increasing the risk of flooding or cause harm to the water environment. Consents are given by National Resources Wales (NRW) for main rivers and by Monmouthshire County Council as the lead local flood authority under the Land Drainage Act 1991 for works on or near 'Ordinary Watercourses'. Any potential conflict of interest is avoided by the Authority providing details of its 'in house' promoted schemes to the NRW. The former Internal Drainage Boards have now been subsumed into the NRW.

## Party Wall Act

The Party Wall Act 1996 requires the issue of statutory notices when work affects adjacent properties within 3 metres of any construction works or within 6 metres if affecting foundation support. The Act is only considered applicable if the land is owned by the authority rather than 'simply' highway land. However, the authority still has a duty to maintain support of the highway under Common Law. Condition surveys should be undertaken prior to any major works and in some instances the processes prescribed within the Party Wall Act may prove beneficial. The process may lead to an affected party appointing an Independent Party Wall Surveyor to act on their behalf and thus later disputes may be avoided. Further information may be obtained from the website of the Pyramus and Thisbe Club, which is the organisation for professionals specialising in party wall matters.

## Environmental requirements

Maintenance work and inspections on highway structures should be undertaken giving due consideration to the environment. Highway structures provide habitats for some species, such as reptiles, nesting birds, bats and plants especially lichens, mosses, and liverworts. They are often situated in and over key biodiversity corridors – i.e. rivers, streams and estuaries. Whilst they facilitate the passage of vehicles, cycles and pedestrians, over or under obstacles, bridges can also be a barrier to the migration of animals, which can result in conflict with traffic

## Sustainability requirements

### Guiding Legislation

The Climate Change Act 2008 empowered the government to set national targets for the year 2050 for the reduction of greenhouse gas emissions and to encourage energy users to meet the objectives of the act, such as reducing such emissions or removing greenhouse gas from the atmosphere.

## Conservation requirements

The Planning (Listed Building and Conservation Areas) Act 1990 requires each authority to compile a list of buildings of special interest, either historic or architectural. Listed building consent is required to demolish such a structure, or to alter or extend it in a manner affecting its architectural or historic interest. The Act also provides for the protection of conservation areas that have special historical interest. The status can influence the processes required for structure maintenance in such an area.

There are different grades of listing, depending on the historical or architectural importance of the structure, ranging from Grade 2 through Grade 2* to Grade 1, with a further level of Scheduled Ancient Monument, which is covered by The Ancient Monuments and Archaeological Areas Act 1979. CADW approval of proposals for work on a Scheduled Ancient Monument is required before any works

are carried out, except emergency works. The Ancient Monuments (Class Consents) Order 1994 gives consent in Class 5 for works which are urgently necessary in the interests of safety or health, provided that the works are limited to the minimum measures immediately necessary and notice in writing justifying in detail the need for the works is given to CADW as soon as reasonably practical. Proposals for works on structures recorded at the lower (listed) levels are usually approved by the planning department of the local authority. However, if the work will require complete or partial demolition, or if the work will alter or extend a Grade 1 or 2* structure in any manner which would change its character as a building of special architectural or historical interest, the planning department of the local authority has to consult CADW

Conservation of Bridges and BD 89 provide information regarding the Conservation of Highway Structures. Both these publications should be consulted before work is proposed on historic structures.

.

# Asset Management Information Structures

## Principles and considerations

A structures asset management system should provide/support the following list of functions.

- collection, storage and retrieval of inventory data and condition data;
- works management and prioritisation;
- asset valuation – both gross replacement and depreciated replacement cost to support Whole of Government Accounting requirements;
- production and reporting of national and local performance data;
- deterioration modelling and life cycle planning; and
- management and storage, in electronic format, of drawings, photographs and reports.

The County Surveyors Society Wales (CSS) in association with EXP Consulting have developed a methodology for Structures Asset Management Planning, referred to as the Structures Toolkit (6ST) Structures Cost Projection, which is used to produce the required figures for the Whole of Government Accounts.

## Management of asset information

The Authorities Asset data is held in the WDM Structures Management System (WDM SMS) which allows data to be easily entered, analysed and manipulated during the planning process. Data entry may be performed by administration staff or engineers. In the latter case data entry, especially for General Inspections, is combined with the identification of needs in order to produce a more time and cost efficient approach. The highway structures stock can be divided into groups and sub-groups that have similar deterioration characteristics and maintenance.

Consistency is vital to current and developing Bridge Management Techniques and to ensure that these are suitably supported, it is essential that element inventories are created and maintained in a consistent manner.

The extent of data held depends on the particular requirements of the authority but the following should be considered:

- **basic inventory data** – the basic information about each highway structure, including structure name/reference, structural type, location, route carried, obstacle crossed (where relevant) and key dimensions;
- **legal data** – details of contracts, licences, legal agreements, letters, etc. that define who is responsible for management, e.g. authority, other owner, third party, maintaining agent;
- **condition data** – an up-to-date General Inspection pro forma should be held for all structures as a minimum. Holding additional more historic condition data will assist in monitoring and developing trends;
- **structural assessment and review data** – the assessment rating, date of latest structural review, details of a planned assessment, or details of why the structure is excluded from the review/assessment programme.
- **Health and Safety** – H&S comments are recorded within the individual structures files.

## Inventory Data

The inventory holds the basic data and information on the stock of highway structures in terms of descriptive parameters such as structural type, form, construction material and geometry (dimensions, span, width, skew etc). Attributes held in the inventory should enable management to operate at a number of levels, e.g. stock, groups or individual structures.

The following fields for the highway structures inventory are listed below:

- structure type, e.g. bridge, culvert, retaining wall;
- owner and, where appropriate, management, maintenance and inspection responsibilities;
- structure identifier – reference, name, key number, etc;
- route carried, e.g. Principal A road, B road, footway;
- structure location, e.g. map reference (easting and northing), GPS, section of road, local position reference;

- year of construction/reconstruction, designer and design code;
- location of drawings, photographs, design details, etc;
- headroom envelopes, minimum headroom, navigation clearance;
- historic listing or scheduled ancient monument;
- special access requirements, including details of confined space working, permit to entry or work, maintenance access needs etc;
- details, including date, of major upgrades and/or modifications, e.g. widening or strengthening;
- presence of utility services (stats) – a field indicating 'yes' or 'no' may be sufficient rather than specific details. This is for information only and a live search should be carried out to confirm stats prior to any works;
- external considerations and/or constraints, e.g. social, geographical, environmental, conservation, etc;
- structure arrangement, e.g. number and location of widenings, number of spans/panels, skew;
- structural form, e.g. arch, beam and slab;
- general material of construction, e.g. masonry, steel, concrete;
- obstacle crossed, e.g. road, watercourse, railway;
- dimensions, e.g. length, width, height;
- list of components, e.g. primary deck element, joints, bearings. Monmouthshire County Council use the inspection pro forma developed by CSS Wales to record this information.
- materials of construction;
- year of construction/installation;
- manufacturer and unit specifications, e.g. for parapets, bearings and joints;
- presence of asbestos; and
- capacity rating/abnormal load rating.

## Inspection, Condition and Performance Data

General and Principal Inspections provide the majority of condition data. These are supplemented by Special Inspections, testing and monitoring, as appropriate, where the data sought is often focussed on a particular part of the structure or aspect of performance. Such data is often obtained on a "one-off" basis and may include measurements which cannot be conveniently entered into a paper based or electronic system. The database should indicate the location of the full report in such instances.

Condition data from previous inspections should be retained as the evolution of this data over time gives a clear indication of the rate of deterioration and residual service life.

## Performance measurement for highway structures

The following should be considered when identifying performance measures for use in asset management planning:

- performance measures for highway structures that are already in use, e.g. Condition Performance Indicator;
- performance measures that have been developed, or are under development, for highway structures, e.g. Availability and Reliability PI, see below; and
- additional performance measures that may be needed to reflect the levels of service for the overall network and for measuring the effectiveness and efficiency of the planning and delivery processes.

The Government paper on Choosing the Right Fabric: A Framework for Performance Measurement provides useful further guidance for the identification, development and use of performance measures.

Performance Measures for Highway Structures: Part A provides guidance on performance reporting. (See **Part 3, Structures**)

## Asset condition and investigatory levels – structures

### Introduction

All maintenance work should preferably be designed to current standards, although there may be situations where lesser standards are acceptable, e.g. repair of part of an element, repair of accident damage. Each case should be considered on its merits. Where lesser standards are accepted, the designer should check that the load carrying capacity of the structure at both serviceability and ultimate limit states and the durability of the repaired area are not less than that of the rest of the structure. Lesser standards may be unavoidable, e.g. maintenance of a listed bridge or scheduled monument. In this situation it is recommended that a safety audit or risk assessment is carried out. This documentation should be kept with the structure file for the structure in question. Where unacceptable risks or hazards are identified, the Bridge Manager should look for alternative mitigation measures. It is important that the implications for future maintenance are a prime consideration in the design and implementation of all maintenance schemes.

The Design Manual for Roads and Bridges (DMRB) and the Manual of Contract Documents for Highway Works (MCHW) are maintained by Highways England on behalf of all Overseeing Organisations (the national highway / roads authorities in England, Scotland, Wales and Northern Ireland).

The DMRB provides detailed guidance in the form of standards (BDs) and advice notes (BAs) for most aspects of highway structure design and assessment. The guidance includes criteria for structural loading, analysis, material properties, element design or assessment, in addition to geometrical requirements and best practice for design for durability. The MCHW provides model contract documents, specifications, notes for guidance and standard details. Care is required to remain fully aware of changes and additions to the DMRB and the MCHW.

The Overseeing Organisations also issue Interim Advice Notes (IAN), as interim guidance until full standards are available. Interim Advice Notes are available on the relevant national authority website. DfT publishes a Network Maintenance Manual (NMM) and Routine and Winter Service Code (RWSC) for the strategic road network in England.

## Technical Approval

All structural design and assessment should be subject to a formal Technical Approval procedure such as those used by the Overseeing Organisations [BD 2; Technical Approval of Highway Structure] or Network Rail [GC/RT5101 Technical Approval Requirements for Changes to the Infrastructure]. Authorities should have such a procedure in place and have formally appointed an appropriate organisation or individual to act as Technical Approval Authority (TAA).

Both Highways England and Network Rail have a range of documents applicable to maintenance and that refer to the relevant British Standards and Eurocodes. Departures from these standards should be carefully recorded to enable an audit trail for certification.

## National Variations

The DMRB is implemented by the Welsh Government with some specific variations appropriate for use in Wales.

## Implementation of the Eurocodes

The Eurocodes are a series of European Standards developed by the European Committee for Standardisation, to provide a common approach for the design of buildings and other civil engineering works and construction products. The Eurocodes are not to be used for assessment.

Ten Eurocodes have been developed and published. They are organised in 58 parts and each part is supplemented by a National Annex.

- EN 1990 Eurocode: Basis of structural design;
- EN 1991 Eurocode 1: Actions on structures;
- EN 1992 Eurocode 2: Design of concrete structures;
- EN 1993 Eurocode 3: Design of steel structures;
- EN 1994 Eurocode 4: Design of composite structures;
- EN 1995 Eurocode 5: Design of timber structures;
- EN 1996 Eurocode 6: Design of masonry structures;
- EN 1997 Eurocode 7: Geotechnical design;
- EN 1998 Eurocode 8: Design for earthquake resistance; and
- EN 1999 Eurocode 9: Design of aluminium structures.

On 31 March 2010, all British Standards that conflicted with the Eurocodes were withdrawn. The Eurocodes have therefore replaced national codes that were previously published by national standard bodies and have become mandatory for

European publicly funded works. As with other European standards, the Eurocodes will be used in public procurement.

## Predict future demand

The prediction of future demand on highway structures should align with the network demands and are likely to include changes in vehicle weight, height and width, and traffic volume. Future demands will be predicted using available data, historical trends, and local factors. The following will be considered when developing rules for predicting future demand on highway structures:

- **vehicle weight** – current highway bridge design and assessment standards [BS EN 1991-2, BD21] use a conservative loading model that may be able to cater for some future increases in Gross Vehicle Weights (GVW). However, increases in GVW may require associated changes to the Authorised Weight (AW) regulations, i.e. limits on axle weights, numbers and spacing. If the AW regulations change, the effect on bridges would be examined nationally and appropriate guidance provided by the DfT to Highway Authorities;
- **height and width** – it is unlikely that any change in specified vehicle dimension would force a national programme of bridge 'raising', road 'lowering' or road widening. It should be sufficient to assess the vertical and horizontal clearance requirements on specific structures or structures on a route, e.g. routes/structures that currently have height/width restrictions, routes that may be reclassified as a high load route. Height is not controlled by UK legislation, unlike width, length and weight; and
- **traffic volume** – increases in traffic volume may require highway structures to be widened or replaced as part of a larger highway widening/upgrade scheme. Also, increases in HGV movements (for example, due to a quarry or distribution centre opening) may have a significant impact on future management and maintenance. The Bridge Manager should seek to obtain advance warning of such schemes and use this in asset management planning.

## Risk management principles for highway structures

The principles of a risk based approach for highway infrastructure are dealt with in Part A of this document
Monmouthshire assigns its budgets using risk management principles to identify and prioritise the allocation of resources in the most appropriate location.

Risk can vary from structure to structure and is not necessarily linked to its size or the classification of the route it services. For instance a small structure/culvert on a critical network link may warrant more attention than a much larger structure on a remote unclassified road. Alternatively, a small structure on an unclassified road (with no local diversion routes possible) that provides the only local link between adjacent villages could be assessed as being more important than a much larger

structure on a more significant road (where simple diversions are possible). Monmouthshire therefore considers the hierarchy of its structures relative to the hierarchy of the road network, coupled with local factors and constraints to ensure that by applying an integrated asset approach, more efficient management strategies with a reduced impact for users can be realised.

This approach allows for funding to be prioritised in areas where the need is greatest. Which can help in managing the deterioration of the bridge stock in a more proactive integrated manner.

## Resilience requirements

Structural failures can result in network disruption with significant repair costs, damage to third party property, and more importantly the potential loss of human life. Bridges and other highway structures rarely experience complete collapse during non-extreme events, however when such collapses do occur, the results can be catastrophic.

Failure is defined as the inability of a structure, or one of its primary load-carrying components, to perform its intended function of being safe for use and fit for purpose. Failures can be caused by one, or a combination of the following (not exhaustive):

- errors in design, detailing and construction;
- effects of unanticipated stress concentrations;
- inadequate maintenance;
- use of improper materials or foundation types;
- unplanned extreme event;
- unknown deterioration and defects;
- hidden deterioration and defects;
- lack of appreciation of the significance of observed defects or of appropriate action;
- lack of inspection and monitoring;
- lack of funding for essential maintenance;
- pressure to keep structures in service; and
- effects of unanticipated or unforeseen change of use.

It has been shown through various studies that a bridge collapse is most likely to be caused by an extreme event, with the most prevalent type being flooding and scour. The County Surveyors Society Wales (CSS) in association with EXP Consulting have developed a methodology for scour assessment, referred to as the Structures Scour Assessment (6STS). Monmouthshire County is currently using this to undertake a scour risk assessment of the Counties bridge stock.

The frequency of occurrence of these events has been increasing. This rise in occurrences is considered to be due to the effects of climate change.

## Bridge Inspection and Maintenance

Regularly scheduled inspections enable bridge owners to record the general conditions of the bridge to help detect any potential problems that could lead to a failure. Regular inspections give the asset owner a data set to base their decision on. Consequently the inspection process is invaluable and the quality of this information will impact the effectiveness of any agreed maintenance strategies.

When developing maintenance strategies for bridges and highway structures a good maintenance programme will help to reduce the potential for deterioration that leads to a bridge failure. If bridge inspections are not routinely performed, deteriorated areas in need of repair will increase, resulting in the increased potential for a bridge failure. Monmouthshire has adopted the use of increased inspection intervals on certain structures in order to identify maintenance works early on and so prolong the life of the asset.

## Access

Maintenance work, including inspections, frequently requires access onto land in other ownership, either at the structure or gaining entry to it.

The Highway Authority or other owner does not necessarily own the land adjacent to a structure or under a bridge or have a right to access covered by a legal agreement.

Normally access is agreed quite informally for the purposes of inspection with formal notices being served in respect of works.

Records of all landowners are not routinely gathered but landowner details are retained within the bridge management system if they have been obtained through previous works activities.

If agreement cannot be reached it may be necessary for the Highway Authority to use the powers in the Highways Act 1980 (Sections 289 to 292)

Access to the structure is arranged where possible so as to minimise damage to the environment.

## Border Agreements

Section 3 of the Highways Act 1980 states that when a bridge straddles a boundary between authority areas an agreement has to be entered into between the two authorities whereby one of the authorities becomes the Highway Authority for the whole bridge and its approaches.

Within Monmouthshire the responsibility for the management of assets on those boundaries e.g river bridges is recorded but there is no formal documentation in place which sets out the detail of how those maintenance arrangements will be managed.

It is therefore proposed to set out a management agreement which will formalise arrangements in those areas. (See **Part 3, Structures**)

Maintenance on structures that straddle authority boundaries necessitates an especially high level of consultation, communication and joint planning of operations between the authorities. Work on strategic routes can also have a significant impact on the whole highway network of adjoining authorities and significant costs may result. Particular attention should be given to emergency planning for these types of structure as any major incident can have a significant effect on both authorities.

## Structures Owned by Other Bodies

Highways are frequently supported by or go under structures owned by parties other than the Highway Authority for that highway. Typically, local highways go under and over trunk roads, trunk motorways, live and disused railways, canals, and private accesses. The bridges may be owned by Welsh Ministers, Network Rail, Canal & River Trust, Natural Resources Wales which now incorporates the Internal Drainage Boards, other public authorities or private owners.

The Authority records these private structures within its Structures Management System along with the contact details of the owners who are contacted should any deficiencies in the structure be reported or identified..

There is a residual responsibility on the authority, in respect of the public using its roads, relating to bridges owned by other bodies. The authority has a responsibility to seek to ensure that other owners are exercising adequate stewardship over their structures. The Highways Act 1980 Section 56 allows proceedings for an order to enforce repair.

Section 130 of the Highways Act 1980 allows proceedings for the protection of public rights and can be used by authorities to enforce another owner to undertake maintenance.

## Structures Over or Adjacent to Operational Rail Lines

When required to undertake inspections or maintenance work on structures over or adjacent to operational railways, the Bridge Manager of the authority is required to adhere to Network Rail, procedures for outside parties. Early notice is necessary to enable the Outside Parties Manager of Network Rail to book track possessions and attendance to facilitate safe access to undertake the work.

## Structures Over or Adjacent to Canals or Navigable Waterways

Inspections or maintenance work on structures over or adjacent to canals or navigable waterways should be carried out in such a way as to ensure the safety of waterway users and the integrity of the waterway. The Canal & River Trust, or the relevant navigation authority may require the Bridge Manager of the Highway Authority to adhere to their procedures. These procedures may be covered in the agreement for the construction of the structure, but in the absence of an agreement or if the agreement is silent, Highway Authorities can use their powers under

Sections 289 and 291 of the Highways Act 1980 to gain entry with compensation being determined in accordance with Section 292. The Canal & River Trust do have a Code of Practise for works affecting the Canal & River Trust. However, there is currently legal advice being sought regarding the implications of this code in respect to Highway Authority structures and works.

The Canal & River Trust require all work which may cause a restriction or closure of the waterway, to be agreed before the 31 March of the current financial year for work to take place in the following financial year.

## Developer Promoted Structures

All proposals for new structures within or over an existing or proposed highway or works which affect existing highway structures will be subject to a formal Technical Approval (TA) process.

Highway managers and District Planning Authorities should inform developers at the outset of development proposals that they must obtain TA for their designs and inform Highway Authorities of the proposals immediately when they become known.

Structures being built as part of any development, irrespective of whether or not they will be maintainable by the Highway Authority, are included in the TA process if they:

- are adjacent to the highway and interfere with the support of the highway or access to it for inspection and maintenance;
- form part of any road that is to be adopted into the highway under a Section 38, Highways Act 1980, agreement; and
- form part of any road that is being built under a Section 278, Highways Act 1980, agreement.

.

## Utility Companies and NRSWA

The New Roads and Street Works Act 1991 (NRSWA) as amended by the TMA controls and co-ordinates work carried out in the street by utility companies (undertakers). The Act also requires the Highway Authority to take due regard of undertaker's apparatus when planning and carrying out highway and bridge works. It is essential that, before any work in the ground occurs, all statutory undertakers are consulted regarding the presence of apparatus and appropriate notice given.

Detailed interpretation of and guidance on the use of the Act has been published in the DfT New Roads and Street Works Act 1991 and Traffic Management Act 2004; Code of Practice on Co-ordination; Volume 2: Operations and Guidance; Section 5: Street Works near Highway Structures.

Section 50 of the Act contains provisions for issuing licences for apparatus to be installed in the highway by persons other than statutory undertakers, e.g. a private sewer. Advance notice to the undertakers is required to be given by the street authority when such a licence is to be issued and details of the installation are to be recorded by the street authority.

## Obligations of Undertakers

Before carrying out any work, undertakers are required to give notice to the authority (not always the Highway Authority). Designated notice periods are given in the Act or associated Code of Practice. These notification periods are intended to give the street authority an opportunity to consider and comment on the implication of works proposals for the highway infrastructure.

Section 88 of the Act imposes an additional obligation on an undertaker proposing works affecting the structure of a bridge. The undertaker is required to consult the bridge authority before giving the usual notice. The undertaker is required to comply with reasonable requirements for safeguarding the structure.

Section 63 of the Act permits a street authority to designate certain streets as "streets with special engineering difficulties". Under this section, an undertaker must submit plans and sections for approval by the authority before street works can be undertaken. This is the only time that drawing details are required. The authority has the power to require modifications if considered necessary.

Section 63 of the Act suggests that the designation of streets with special engineering difficulties may be appropriate at bridges where strength, stability, waterproofing and access for maintenance may be affected. The designation need only apply to the structure and the street directly adjacent and includes areas adjacent to retaining walls where stability may be an issue. Designating all structures under this section is recommended because it gives the greatest control over statutory undertakers working in the proximity of a highway structure, although some sub-sections of Section 88 would not apply in this case.

## Obligations of the Street Authority and the Structure Owner

The authority is required to keep a street works register under Section 53 of the Act and to include the streets with special engineering difficulties. All structures that are likely to be sensitive to undertaker's work should be recorded in the register. The resulting register provides the Bridge Manager with the earliest opportunity to advise undertakers on works likely to affect highway structures.

The Act defines the requirements when undertaking major highway and bridge works. The authority is required to serve notice of the proposed works under Section 58.

Where apparatus is to be diverted for major bridge works (i.e. replacement, reconstruction or substantial alteration of a bridge), the cost of any alterations to the apparatus will be shared providing advanced notice has been served under Section 85 of the Act and the authority pays in advance to the undertaker 75% of the

estimated charge to the authority. The Act and codes of practice make provision for the authority's costs to be reduced to allow for betterment. Also, where the length of apparatus diverted exceeds 100 metres and that apparatus is more than 7 years old a cost adjustment should be made for financial benefit conferred on undertakers by reason of the deferment of the time for renewal of the apparatus. Guidance on the calculation of these sums is also provided in the Act. No costs of diversionary works to apparatus should be borne by the authority when apparatus is placed in the bridge after advance notice has been given. Advance notice may be served up to 10 years in advance of works for the replacement of a bridge and 5 years in advance for all other works. In view of the cost of diverting apparatus, it is recommended that this procedure is followed.

In all cases, there is no obligation on the part of the authority to provide space for additional apparatus in the future. Such an approach may be prudent when reconstructing a structure or carrying out major works in order to minimise problems in the future with inappropriately placed apparatus. Any costs incurred in making provision for additional apparatus requested by undertakers may be charged to them although it is advisable not to allocate spare ducts to undertakers until they need to lay apparatus across the structure.

## Inspection, assessment and recording – structures

### Introduction

Inspection, testing and monitoring should be used to:

- provide data on the current condition, performance and environment of a structure, e.g. severity and extent of defects, material strength and loading. The data enables the Bridge Manager to assess if a highway structure is currently safe for use and fit for purpose, and provides sufficient data for actions to be planned where structures do not meet these requirements;
- inform analyses, assessments and processes, e.g. change in condition, cause of deterioration, rate of deterioration, maintenance requirements, effectiveness of maintenance and structural capacity. The outputs inform asset management planning and enable cost effective plans, which deliver the agreed levels of service, to be developed; and
- compile, verify and maintain inventory data, e.g. structure type, dimensions and location, for all the highway structures the authority is responsible for.

The extent of inspection, testing and monitoring of structures should be determined using a risk based approach. This should consider the position of the structure on the highway network hierarchy and hence, its importance to the overall transport infrastructure, and also the characteristics of the structure itself in terms of its type, material, condition, vulnerability to closure or restriction due to component failure, flooding, impact etc.

Reducing the level of inspection, or increasing the interval between inspections increases the level of risk to the manager/owner of the asset. These changes are only made if it can be evidenced through asset management techniques, such as deterioration modelling that they are justified. The County Surveyors Society Wales (CSS) in association with EXP Consulting have developed a methodology for risk based assessment, referred to as the Risk Based Structures Inspection (6STR). Monmouthshire County is currently using this to undertake an inspection interval risk assessment of the Counties bridge stock.

The Inspection Manual for Highway Structures (Volumes 1 and 2) was commissioned by Highways England and published in May 2007.

The manual contains detailed guidance which covers the following areas:

- The inspection process;
  - scheduling inspections;
  - planning and preparing for inspections;
  - performing inspections;
  - recording inspection findings; and
  - input to maintenance planning process.

- Defects, descriptions and causes;
  - Principal causes of defects;
  - Concrete defects;
  - Steel defects;
  - Masonry defects; and
  - Defects in miscellaneous materials.

- Investigation and testing;
  - The testing process;
  - Summary of testing techniques;
  - General testing techniques;
  - Tests on concrete;
  - Tests on metal;
  - Tests on masonry;
  - Tests on timber; and
  - Tests on advanced composites.

## Inspection regime

An inspection, testing and monitoring regime should minimise risks to public safety, provide sufficient data for management and make effective use of resources. The mix of techniques used in the regime, and frequencies at which they are applied, should be determined by considering appropriate criteria in an objective manner, e.g. through a formal risk assessment. The criteria should include, but not be restricted to, public safety, the characteristics of the assets, the consequence of failure, the environment the assets operate in, the services provided, typical rates of deterioration and susceptibility to damage.

The inspection, testing and monitoring techniques should be sufficient to:

- identify condition, defects and signs of deterioration that are significant to highway structure safety and management;
- identify any significant changes in condition, loading or environment that have occurred since the last observation;
- assess or provide information for the assessment of stability and serviceability;
- determine or assist the determination of the cause, extent and rate of deterioration; and
- provide information that can be used to support highway structures management, i.e. the identification of needs and associated maintenance works.

The inspection regime should enable 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 (including Inspections for Assessment), as necessary, concentrating on known or suspected areas of deterioration or inadequacy. Guidance on inspections for highway structures is included in BD 63 Inspection of Highway Structures.

All inspections should result in a report, in a format commensurate with the inspection type, which gives a clear and accurate description of the structure's condition.

A procedure should be implemented whereby the inspector has a clearly defined duty to inform the Bridge Manager, at the earliest possible opportunity, of any defects that may represent an immediate risk to public safety.

## Routine Surveillance

All structures should be subjected to Routine Surveillance as part of regular Highway Safety Inspections carried out by highway maintenance staff. Routine Surveillance is normally undertaken from a slow moving vehicle. Inspectors should immediately report to the Bridge Manager any obvious defects that are apparent from the vehicle which need urgent attention, such as damage to the superstructure and bridge supports of overbridges, damage to parapets, flood damage, insecure expansion joint plates, etc. The Bridge Manager should be satisfied that the frequency of Highway Safety Inspections is suitable for the Routine Surveillance of highway structures and, if unsuitable, decide how to deal with the need for additional surveillance.

All highway structure management and maintenance staff should be encouraged to be vigilant at all times when moving around the network and to report anything that might need urgent attention. The general public should also be informed of the need to report any highway structure defects they feel may pose a risk to public safety.

This is normally best achieved by providing appropriate contact details (e-mail and/or telephone) on the authority's website.

Within Monmouthshire County Council all staff are encouraged to report defects observed through their regular Highway Maintenance Duties to the Bridge Manager

## General Inspection

General Inspections comprise a visual inspection of all parts of the structure (that can be inspected without the need for special access or traffic management arrangements) and, where relevant to the behaviour or stability of the structure will include an inspection of the adjacent earthworks or waterways. Riverbanks, for example, in the vicinity of a bridge should be examined for evidence of scour or flooding or for conditions, such as the deposition of debris or blockages to the waterway, which could lead to scour of bridge supports or flooding. Guidance on General Inspections for highway structures is include in CSS Bridge Condition Indicators Volume 2: Guidance Note on Bridge Inspection Reporting and Addendum to CSS Bridge Condition Indicator Volume 2.

## Principal Inspection

Principal Inspections comprise a close examination, within touching distance, of all accessible parts of a structure, including, where relevant, underwater parts and adjacent earthworks and waterways, utilising suitable access and/or traffic management works as necessary. Closed circuit television, high resolution digital photography/video or drones may be used for areas of difficult or dangerous access, e.g. obscured parts of a structure, confined spaces and underwater inspections.

A Principal Inspection may include a modest programme of tests, when considered necessary, e.g. hammer tapping to detect loose concrete cover or half-cell and chloride measurements to enable risk of reinforcement corrosion to be assessed, tests for cement content and measurements of concrete cover and electrical resistivity of concrete (see Section 7.3 of BA 35).

A Principal Inspection should be of sufficient scope and quality to determine:

- the condition of all parts of the structure;
- the extent of any significant change or deterioration since the last Principal Inspection; and
- any information relevant to the stability of the structure and/or continued use in service and safety.

A Principal Inspection should establish:

- the scope and urgency of any remedial or other actions required before the next inspection;
- the need for a Special Inspection and/or additional investigations; and
- the accuracy of the main information on the structure held in the inventory.

## Special Inspection

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 that have to carry an abnormally heavy load - inspections may be done before, during and after the passage of the load;
- following a bridge strike;
- following a flood or high river flow 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; and
- where a post tensioned bridge has a regime of Special Inspections implemented as a result of an earlier investigation or a Special Inspection is required in accordance with BA 50 Management of Post-Tension Concrete Bridges, organisation and methods for carrying out Special Inspections.

The Bridge Manager determines when it is appropriate to carry out a Special Inspection. Further guidance on Special Inspections is provided in BD 63 Inspection of Highway Structures.

## Inspection for Assessment

This is another type of inspection, which is carried out before a structural assessment. BD 21 provides guidance on undertaking an Inspection for Assessment.

## Safety Inspection

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 undertaken in the longer-term.

Extreme unplanned events such as storms, high winds and flooding have a significant impact on infrastructure.
All main river bridges are inspected following extreme events such as flooding to check on their integrity.

## Acceptance Inspection

The need for an Acceptance Inspection should be considered when there is a changeover of responsibility for the operation, maintenance and safety of a structure from one party to another. The purpose of an Acceptance Inspection is to provide the party taking over responsibility for the structure with a formal mechanism for documenting and agreeing the current status of, and outstanding work on, a structure prior to handover. The scope of an Acceptance Inspection depends on the circumstances, e.g. handover of a new structure, transfer of an existing structure, handback of a structure after a concession period. Acceptance responsibilities and activities depend upon the form of contract, but the Acceptance Inspection is normally carried out by the party taking over responsibility but who may be accompanied by the other party to facilitate agreement. The Acceptance Inspection should include:

- the identification of any permanent access provisions and features affecting the safety and security of the structure. These should be discussed in detail and agreement reached before handover;
- the identification and handover of all the necessary records, maintenance and operating manuals which have an impact on the future management of the structure; and
- agreement of the date on which the authority takes over responsibility for the structure. The agreement should be recorded in the Structure File.
-

Acceptance Inspections on new, existing and concession structures should also include the following, as appropriate.

- Handover of a new structure:
  - An Acceptance Inspection should be undertaken for new structures about one month before the issue of the completion documentation or opening to traffic. A Principal Inspection should be used for this purpose. The inspection should identify and record any defects, developing problems and work outstanding under the contract and secure agreement on any works to be completed before handover. This should act as the benchmark for the inspection carried out at the end of the Defects Correction Period and for subsequent inspections.
  - A construction contract normally includes a Defects Correction Period (also referred to as the Period of Maintenance or Defects Liability Period) during which the contractor is responsible for making

good defects that appear. The length of the Defects Correction Period should be specified in the contract.
    - An inspection should be undertaken prior to the end of the Defects Correction Period to identify all defects before the expiry of the contractual obligations. The timing of the inspection should be sufficient to allow agreement of the work to be undertaken by the contractor and, if necessary, enforcement of contractual obligations. The inspection may be a General or Principal Inspection depending upon the type and form of the structure and the length of time since handover or the last inspection.
    - Prior to adoption of a new structure, asset information should be obtained, in the appropriate format, and at the appropriate BIM level, for the authority taking over responsibility for a new structure.
    - The ADEPT Bridges Group has published guidance for the calculation of commuted maintenance sums for structures to be adopted or transferred.
    - Authorities may also wish to use the above, or a similar, procedure for accepting major maintenance work.

- Transfer of an existing structure:

    - An Acceptance Inspection should be undertaken prior to an authority taking over responsibility of an existing structure. A Principal Inspection should be carried out as part of the Acceptance Inspection unless the results of a recent Principal Inspection are deemed to be relevant and sufficient. Should there be areas of concern highlighted in the PI such as defects that could impact on the long term durability of the structure then a Special Inspection should be carried out to ascertain the extent and implications of the defect(s) with respect to the structures future lifecycle costs and commuted maintenance sums.

- Handback after a concession period:
    - An Acceptance Inspection should be undertaken before handback at the end of a concession period, e.g. a PFI or PPP type contract. The inspection should compare the current condition and performance of the structure against the measures specified in the contract. This should include a Principal Inspection unless the results of a recent Principal Inspection are deemed to be relevant and sufficient. This information should be used to identify and agree items of outstanding work to be completed, in order to satisfy the contract measures, before handback. The timing of the Acceptance Inspection should be sufficient to allow agreement of the outstanding work to be undertaken by the contractor and, if necessary, enforcement of contractual obligations.

## Inspection Requirements of Other Owners

Where other owners have structures within the footprint of the highway, they are responsible for ensuring the safety, integrity and adequacy of those structures for

use by the public. Any defects that are observed by the Authority or reported to it on these structures are referred to the relevant body which is either the Canal and Rivers Trust or Network Rail

The Highway Authority only has the power to act to ensure safety in default of action by the other owner when the structure becomes dangerous.

## Frequency of Inspections

The Authority determines the frequency of General or Principal Inspections using the Risk Based Structures Inspection tool (6STR) developed in collaboration with the County Surveyors Society (CSS) Wales and the consultancy EXP. This tool also allows the Safety Inspections intervals to be assessed.

The revised inspection regime and the reasons for more frequent inspections are recorded in the Structure File. The more frequent inspection regime may be limited to a specific element or feature.

It is intended to develop a management plan for those structures that are deteriorating slowly towards the point where they become no longer serviceable. This plan will detail frequencies of inspection, intervention levels, established by risk assessment with the plan being lodged in the Structure File.

Highway structures are long life assets and their constituent components deteriorate at different rates due to a wide range of factors, e.g. material type, construction form, usage, exposure and maintenance. Inspection intervals are assessed and justified using the EXP Structures 6ST Cost Projection Tool Kit

Consideration is given to the type, quality, extent and results of previous inspections, testing, monitoring, structural assessment, etc.

Where accessibility to all parts of a structure is good then it may only be necessary to undertake a general inspection as there would be little difference between the General and Principal Inspection.

A Principal (or Special) Inspection may only be required when the need has been identified by a General Inspection or the inspector cannot get close to all parts of the structure during a General Inspection.

Examples of where a general inspection may need to be supported by Special inspections are in identifying scour problems where water levels preclude an adequate inspection to be made and the assistance of divers is required or in those structures requiring confined space entry.

In the main General Inspections are undertaken bi-annually.

## Risk Assessment

Risk assessments are to be undertaken for groups of similar structures such as masonry or steel. The assessment method will determine the following.

- the likelihood of rapid deterioration or other incidents; and
- the consequence of unchecked deterioration/incidents.

Assessment of the likelihood of rapid deterioration or other incidents should include, but not be limited to, the following criteria where relevant:

- exposure severity, e.g. mild, moderate or severe, and external influences which may cause rapid deterioration or failure, e.g. significant change in use (above, adjacent or beneath), loading that exceeds existing restrictions, stray current/electrical corrosion;
- current condition and level of contamination, e.g. chlorides or carbonation, and how these conditions may influence the rate of deterioration. The age of the structure may also be considered;
- material type and the typical rate of deterioration for the observed deterioration mechanism. Many defects are known to take many years to develop to the point where they require maintenance or present a risk to structural integrity or public safety. The maintenance/repair history of the structure should be taken into consideration and structure specific characteristics such as fatigue-prone details and susceptibility to scour damage, should be considered;
- severity and extent of damage due to incidents, such as vehicle impact, scour and vandalism, and whether this is likely to lead to further deterioration before it is repaired;
- potential mode of failure, e.g. brittle or ductile failure;
- extent of failure, e.g. local or global failure;
- structural form and age; and
- visibility / access to critical elements.

Assessment of the consequence of unchecked deterioration and other incidents should include, but not be limited to, the following criteria where relevant:

- consequence of failure of the structure or its elements, e.g.
    - the likely number of fatalities and casualties based on the size of the structure and traffic volume on the route crossed and obstacle crossed;
    - traffic delay costs incurred through diversions/congestion based on the route type and availability of diversion routes;
    - socio-economic impact based on the location of the structure and the community served, e.g. industrial, business or residential;

- increased costs due to unchecked deterioration/incidents resulting in more expensive maintenance work at a later date; and
- to determine in so far as is reasonably practicable based upon the available information and interpretation, when to intervene to close the structure or the road to ensure public safety.

The risk assessment should be recorded in the Structure File and agreed by the Bridge Manager before the frequency of inspections is changed. The validity of the

risk assessment should be re-confirmed and recorded by the Bridge Manager after each Principal Inspection or when any other significant change in the condition of the structure becomes apparent.

## Tunnels

The authority is responsible for two tunnels within Monmouthshire one is located in the garden of a private residence and is sealed off and another which can only be accessed from within a council depot is used by a third party group licenced to use the facility. Neither of the structures form part of the Highway Infrastructure and cannot be routinely accessed by the general public.

## Inspection of Mechanical and Electrical Equipment

Mechanical and Electrical (M&E) equipment associated with highway structures includes, but is not limited to, lighting and ventilation in road tunnels, lighting in pedestrian underpasses and hydraulic rams on moveable bridges. The stewardship of this equipment may be the responsibility of the Bridge Manager.

An appropriate regime of inspection (and testing) of M&E equipment should be established. The inspection regime should be commensurate with the manufacturer's recommendations.

Useful guidance on the inspection and testing of M&E equipment associated with highway structures is provided in Series 7000 Mechanical and Electrical Installations in Road Tunnels, Moveable Bridges and Bridge Access Gantries MCHW.

## Monitoring

Monitoring is the periodic, or continuous, measurement of structural behaviour by visual / electronic means, or other means to record data on deterioration and performance, e.g. deflections, strains and crack sizes. There are many instances where measurements can usefully be repeated periodically, or in rare circumstances taken continuously, so that condition and performance can be monitored over time.

## Need for Monitoring

Key reasons for undertaking monitoring include:

- during construction to check behaviour;
- after construction as an aid to the future maintenance management;
- where deterioration or damage has occurred and it is necessary to check for further loss of strength, condition or performance;
- on structures that, when assessed to modern codes, have a load-carrying capacity that is below current standards but do not appear to be suffering distress; and

- to determine safety to remain in use.

## Selection of Monitoring Techniques/Design of Monitoring Systems

Monitoring covers a wide range of applications, from determining the ingress of chlorides into concrete over a period of years to the transient behaviour of a structure as a heavy vehicle passes over it. Typically, monitoring systems may be put in place to determine long-term movements, crack growth, changes in strain (either long-term or short-term) or the corrosivity of the environment.

The techniques used depend on the reasons for monitoring, which should be clearly defined at the outset. The aim should be to install the simplest monitoring system that meets the objectives, providing it is sufficiently robust for the specific location. The following issues should be considered when selecting a monitoring system.

- External factors
  - When devising a monitoring system consideration should be given to monitoring the external factors that may influence the property being measured. Temperature, for example, has a major influence on both structural behaviour and the various deterioration mechanisms that occur in highway structures.

- Data collection frequency
  - Where access is difficult or more frequent measurements are required, e.g. to monitor changes due to temperature, it may be necessary to install sensors that can be connected to a data logging system. This is particularly advantageous in those cases where access causes traffic disruption. It is important to consider how the data will be collected, e.g., it could be downloaded locally by visiting the site, or remotely through telephone lines.
  - The interval between readings depends on what is being monitored and the rate at which it is likely to change, e.g., it might be appropriate to repeat certain types of measurement, such as the determination of chloride concentration, every time a Principal Inspection is carried out. Other types of measurement might need to be repeated more frequently, e.g. monitoring crack widths might require weekly or monthly measurements. Monitoring temperatures or strains might require measurements every hour and recording transient strains might require measurements to be taken several times a second.
  - Most monitoring systems can collect data at regular intervals for the period of the monitoring but in other cases data is collected only when an event triggers the monitoring system. An example is the detection of wire fractures in post-tensioned structures using acoustic monitoring. The structure is monitored continuously but data is recorded only after an acoustic event is detected that has the characteristics of a wire break. Another example is the measurement of stresses under traffic loading where the monitoring system is triggered by heavy vehicles and data is collected only during their passage over the structure.

- Monitoring systems can also be designed to process data as it is being collected from the instrumentation. With this setup, if the system is connected by telephone or other transmission system, it can be designed to act as an early warning device, automatically issuing an alarm when pre-defined limits of the parameters are reached. This type of system can be used effectively as part of a risk management strategy.

- Scour
  - BD97 outlines requirements for the assessment of scour and other hydraulic actions at highway structures crossing or adjacent to waterways. It provides processes to determine the level of risk associated with scour effects. It also includes processes to assess the robustness of structures in a flood, and references to measures for reducing risk.
  - Advice on the monitoring of highway structures for scour is given in Manual on scour at bridges and other hydraulic structures.
  - Scour monitoring and inspection is not straightforward because scour is not normally visible during a flood and scour holes often fill in during the falling stages of a flood. As a result it can be difficult to assess in flood conditions the magnitude of scour holes and determine whether the structure is safe.

- Retaining walls
  - Monitoring the performance of retaining walls can be carried out by measuring movements directly, but sometimes it is more appropriate to use inclinometers, or electro-levels. Loads and moments in walls can be measured using pressure cells and strain gauges. Associated behaviour of the nearby ground can be monitored using inclinometers, pressure cells and piezometers. Installation and monitoring of these devices is a skilled operation and recourse should be made to a specialist.

- Installation
  - Key issues that need to be addressed when considering the installation of a monitoring system include:

- Environment of installation;
- Maintenance and power supply;
- Data logging capacity; and
- Protection against vandalism.

Details of the monitoring system should be included in the Structure File and Health and Safety File, if appropriate, so that others working on the structure are aware of its presence.

## Monitoring of Sub-standard Structures

Advice on the monitoring of structures that fail a strength assessment is given in BD 79 Management of sub-standard structures. Monitoring interim measures can avoid the disruptive effect of applying load mitigation interim measures.

### Evaluation of Monitoring Results

Within Monmouthshire certain structures such as Chainbridge are monitored with reference to deterioration levels based around a traffic light system of Red Amber and Green. Any elements moving from Amber into Red, trigger implementation of remedial works.

### Recording and Reporting of Monitoring Results

A detailed record is kept of the monitoring system. The record includes objectives of the monitoring, the equipment used, the location and position of sensors and data logging system (where appropriate), procedures for maintaining the system and collection of data, where the data is stored and how it is analysed.

Where necessary, sensors are calibrated before use and the calibration records maintained in the Structure File for future reference.

Action plans are developed as part of a Monmouthshire's management approach to highlight the required interventions when trigger levels are breached.

## Competence and training

Highway structures management is carried out by suitably qualified and experienced civil engineers and on-site work (including inspections, testing and maintenance) is carried out by appropriately qualified, trained and experienced personnel.

Continuing Professional Development (CPD) and training for Bridge Managers, engineers, inspectors and other staff is actively promoted and encouraged.

Contractors are also required to demonstrate that their personnel are adequately trained and competent for the work they undertake in relation to highway structures.

### Bridge Inspection Competence

Monmouthshire recognises that a bridge inspector should have the following competences and is active within the CSS Wales Bridge Group in developing a course for Welsh Bridge Inspectors which will support this knowledge base.

- structures types and elements / behaviour of structures;
- inspection process;
- defects descriptions and causes;
- investigation and testing; and
- repair techniques.

## Assessment of structures

The purpose of the assessment of a highway structure is to determine the ability or capacity of the structure to carry the loads which 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.

Apart from structures under a BD79 review which are reviewed every two years an ad-hoc approach is adopted to the review of those structures to establish the need to assess, or update the assessment of, all structures which have not been designed or previously assessed to current standards.
The results of assessments and structural reviews are recorded, together with relevant data and assumptions within the Bridge Management System.

### Structural Review

A review of an individual structure or group of structures, within the structures stock, to establish or confirm the validity of its latest assessment (or its original design if there has been no subsequent assessment) is termed a 'structural review'. A structural review should consider all available current information, taking account of the known condition of the relevant structures, their inherent strengths and weaknesses and anticipated effects of any changes, including changes to assessment standards. A structural review should not normally require detailed analysis of particular structures.
Assessment and structural review are key elements of the management process for highway structures to check their safety and serviceability. All structures are therefore assessed or reviewed against current national standards.

### Assessments

Since detailed assessments require considerable effort, an assessment should only be undertaken when a structural review has identified the need for assessment.

The assessment should take account of all available information about the structure including its service performance. In addition, an 'Inspection for Assessment' should be performed to establish the current condition of key structural elements as accurately as is practicable.

The scope of assessment and method of analysis used should be commensurate with the form of the structure, information available and the consequences of a potential shortfall in the assessed load bearing capacity. Assessment of simple structures not showing signs of distress, particularly if details of the hidden parts of the structure are unknown, may be based solely on inspection as permitted by current standards.

This would include mass concrete or masonry retaining walls that did not show signs of bulging, cracking, deformation, tilting etc.

Assessment should generally be carried out initially using simple but conservative analytical methods. Where the adequacy of a structure cannot be confirmed, or falls short of requirements using simple methods, progressively more precise and advanced methods should be employed where it is judged that a desired increase in assessed load bearing capacity might reasonably be achieved.

## Structural review and assessment regime

BD101 provides a system for Structural Review and Assessment of structures, which links the assessment and inspection processes.

The future management of highway structures should include a regime of ongoing structural reviews to ascertain their adequacy to support imposed loads. Such reviews should be undertaken when significant events occur that could increase the imposed loads above those previously assessed for and/or reduce the load bearing capacity of structures. A structural review should be undertaken, for example, when one or more of the following conditions or events occur:

- the structures are known or suspected to have load bearing capacities below those deemed to be appropriate for the class of highway supported;
- there is a significant change in the regulations governing the configurations and weight limits of vehicles which may use the relevant highway. The impact of such changes would generally have been assessed by Welsh Government and guidelines issued to authorities on the actions to be taken;
- the hierarchy of the road carried by the structure has changed or is proposed to be changed. The change may modify the density and type of traffic carried resulting in a change to the 'loading class' defined in BD21 The Assessment of Highway Bridges and Structures;
- records of the original design or subsequent assessment do not exist or have become discredited;
- the structure has been modified or is proposed to be modified;
- the structure is on a route proposed for an abnormal load movement, either a Special Order vehicle or an un-common STGO vehicle, for which the structure has not been previously assessed;
- significant deterioration or damage has been identified by an inspection. Conditions considered would include those found in structures such as arches which may be susceptible to changing condition factors; and
- structural reviews are recommended to follow alternate Principal Inspections when these are done at the frequency included in the Inspection Manual for Highway Structures. Where Principal Inspection intervals have been changed, the interval for structural review should also be determined and noted on the Structure Files.

Many highway structures have already been assessed. MCC intend to develop a prioritised programme of structural review to establish the validity of existing assessments, the appropriate periods of review and the need for new assessments for structures that have not been assessed to current standards. The following priorities are suggested in the absence of any other information:

- structures with suspected load bearing capacities below those deemed to be appropriate for the class of highway supported;
- structures built prior to and including 1975, unless known to have been designed to Technical Memorandum (Bridges) BE 1/73 Reinforced Concrete for Highway Structures where appropriate. 1975 broadly corresponds to the cut off for Stage 2 of the Overseeing Organisations' assessment programme in the 1990's, which picked up bridges not designed to the reinforced concrete shear design rules in BE 1/73;
- reassessment of structures that have passed the 40 tonne Assessment Live Load requirement, to determine their capacity to carry abnormal loads. BD 86/11 The Assessment of Highway Bridges and Structures for the Effects of Special Types General Order (STGO) and Special Order (SO) Vehicles is a relevant consideration when assessing bridges for abnormal loads;
- structures built between 1975 and 1985. This period saw significant increases in the HA (normal traffic) loading associated with HB (abnormal) loading and the implementation of BS 5400; Steel, concrete and composite bridges; and
- structures built after 1985, if deterioration or other factors indicate the structure may not meet the required operational load bearing capacity and structural integrity may be compromised. Current highway design loading has remained effectively unchanged since BD 37 Loads for Highway Bridges was first published in 1988. However, during the previous two to three years various interim design standards were in place such that 1985 is believed to represent a reasonable date to assume for the introduction of the current design loading criteria.

The ADEPT Guidance Document on the Implementation of Structural Eurocodes was published in December 2010. This document is a relevant consideration when undertaking structural assessments and/or strengthening.

## Assessment process

### Initial Appraisal

Most assessments require an initial appraisal to establish what level of assessment is required and whether any additional information in the form of further inspections or testing is needed. The form of this appraisal may vary, but may include a Level 1 analysis.

When sufficient information has been obtained, the appropriate scope of the assessment should be formally agreed between the overseeing manager and the assessor and be subject to a Technical Approval process. The appropriate scope of assessment may range from a judgement based simply on the Inspection for Assessment, as allowed by BD 21 The Assessment of Highway Bridges and Structures, to a detailed structural analysis of all parts of a structure based on information from records, inspections and investigations.

Structures that have not previously been assessed generally require an assessment of all load bearing elements. Assessments arising out of identified local damage and/or deterioration may only require assessment of a limited number of elements that lead towards the design of a suitable repair. Depending on the circumstances, there may be variations in traffic loads that may need to be considered.

### Inspection and Testing for Assessment

The report on the Inspection for Assessment should include the observations made and comment on the condition of the structure, giving the condition factors required by BD 21 The Assessment of Highway Bridges and Structures. If the condition has deteriorated since the previous inspection, a statement should be included on its importance and, if appropriate, how the deterioration should be taken into account in the assessment calculations. For example, a condition factor might be used or the assessment might be based on a deteriorated (smaller) section of structural elements.

### Technical Approval

Technical Approval is the formal arrangement by which the Technical Approval Authority (TAA) agrees the basis on which a structural design or assessment is to be carried out. It confirms the scope and level of the assessment together with the standards to be used and the forms of analysis models that are to be used. Technical Approval extends to formal acknowledgement of completion by the acceptance of appropriate certification. Guidance on the Technical Approval process is given in BD 2 Technical Approval of Highway Structures.

Currently an ad-hoc approach is adopted in respect of Technical Approvals, however a more formalised approach is being developed which will see a specific organisation being formally appointed to act as the TAA.

The authority and the TAA should jointly maintain an up-to-date list of current design and assessment standards similar to those listed in Annex B of BD 2.

### Formal Assessment Analysis

The analysis of a structure to determine its load bearing capacity should employ an approach that is appropriate for the structural form and materials as recommended by national standards.

The three Levels of Assessment as defined in BD79 The Management of Sub-standard Highway Structures should be considered, and are summarised in Table 8 below.

Table 8

| Level | Requirement |
|---|---|
| 1 | Use of simple analysis methods and full partial safety factors from appropriate assessment standards to produce a conservative assessment |
| 2 | Use of a more refined analysis model such as grillage or finite element models.<br>Also allows the determination of actual characteristic strengths based on existing test data deemed to be relevant to the particular structure. |
| 3 | Allows the use of Bridge Specific Assessment Live Loading (BSALL).<br>Also allows the use of characteristic strengths or worst credible strengths based on testing of samples of materials from the structure. |

The level of analysis should be appropriate to the circumstances. Where initial assessment does not provide the required confidence in the structure, progressively more advanced methods should be employed, taking into account the cost of more advanced analysis and the benefits that might reasonably be gained.

Level 1 may be used for initial assessments, leading to subsequent Level 2 or 3 assessments. Level 1 should only be relied upon as a definitive assessment if it clearly demonstrates the required load bearing capacity of the structure.

Levels 2 or 3 generally provide the degree of confidence required to establish the load bearing capacities of most structures. The additional testing associated with Level 3 should be dependent on whether or not such evidence might reasonably increase the assessed load bearing capacity to a level which is considered appropriate or desirable for the particular structure.

Where practicable, assessment should include an estimate of any reserve load bearing capacity of the structure. Where there is likely to be ongoing deterioration of a structure, assessment should include the determination of critical condition factors.

Where the assessment indicates that a structure is substandard in relation to the requirements of current standards, remedial options should be considered, appraised and a final action recommended. Interim measures (including those necessary to protect the structure and the public) to be taken prior to the implementation of the recommended remedial action, including restriction of use or monitoring if appropriate, should be recommended. All decisions taken need to be appropriately documented.

## Assessments for abnormal loads

The principles of managing abnormal loads are dealt with in Section A.4 of this Code. This section contains information specifically related to structural assessments.

Assessment for the effects of abnormal loads on bridges and other highway structures should be carried out in accordance with BD 86. This standard is based upon a series of "SV" loading models which more closely model the behaviour of real heavy vehicles than the old HB model, and defines how a Reserve Factor should be calculated for each acceptable vehicle.

BD 86 also provides guidance for converting existing HB ratings to equivalent SV ratings to aid correlation of such ratings with the effects of real vehicles. However, this is necessarily conservative and reassessment to BD 86 should be considered for critical bridges.

For Special Order movements (greater than 150 tonne) and, in some special cases, for General Order movements, detailed assessments may be required for particular structures where no alternative route is readily available.

In such cases, for bridges, consideration may be given to limiting Dynamic Amplification Factors and the effects of normal traffic, which might be on a bridge at the same time as the abnormal load. Guidance for such assessments is provided in Annex D of BD 86.

Where an initial assessment shows that the load effects induced by an abnormal load marginally exceed the capacity of a bridge on the route, it may be possible for the abnormal load to safely cross the bridge provided the speed of the vehicle is restricted and other normal traffic is kept clear of the bridge when the abnormal load crosses it. Checks for such situations can be made in accordance with the procedures given in Annex D of BD 86.

An engineer with good experience of Highway Structure Assessments shall undertake the role of Structures Advisor, to whom the Abnormal Loads Officer should refer decisions relating to vehicle movements which fall outside the agreed guidelines which otherwise determine whether or not particular vehicle movements should be accepted.

## Recording of assessment results

### Assessment Report

Structural assessment results should be fully detailed in a formal report which should consider providing the following information:

- the name, location and any formal identification number of the structure;
- for bridges, details of obstacles crossed and roads carried;
- the date and reason for the assessment;
- an overview of the method of analysis including a description and diagram of any computer model used;
- any appropriate geological assumptions and parameters;

- loading details;
- level of assessment;
- overall assessed load bearing capacity;
- identification of any critical elements of the structure;
- all condition factors used and if relevant, the pavement condition or other variable factors which formed part of the assessment;
- recommendations in respect of any elements having an assessed load bearing capacity below that required or considered desirable;
- guidance on timescale for which the assessment results are expected to be valid and the date or specific circumstances for undertaking a subsequent structural review; and
- the signed AIP and accepted certification should be included in an appendix together with the assessment calculations or reference to other documents containing the calculations.

**Basic Records for the Bridge Management System**

The basic results of an assessment should be recorded in a standard format common to all of the structures for which the authority is responsible. Ideally the record would take the form of an electronic database.

The level of detail transcribed from the assessment report into the database should be defined by the Bridge Management System adopted by the authority. This could include basic details of each structure including location, form of structure, details of road(s) carried, span arrangements, and designed or assessed load bearing capacity.

Where the results of the assessment are dependent on variable factors such as pavement condition, as allowed by BD 21, there should be a clear feedback to the Highway Authority to ensure that the ongoing requirements form part of the planning process for periodic maintenance. In such cases, committing to a protocol that ensures good stewardship of the surface quality can lead to the benefit of an increased load bearing capacity rating for the bridge. However, poor condition should generally be assumed if that commitment cannot be assured.

Information on reserves in load bearing capacity is used to inform decisions on structures management as required but no formal schedule is available.

**Additional Records for Critical Structures**

A structure that has a load bearing capacity below those of others on a particular section of road is termed a ‘critical structure’. This is a technical term unrelated to the HIAMG definition of ‘critical infrastructure’. If the load bearing capacity of a critical structure is below that required for unrestricted normal traffic (typically the 40 tonne Assessment Loading defined in BD 21), it will effectively restrict the whole section of the road to this weight limit. Alternatively, a structure may be critical with respect to the movement of abnormal loads. In either case, it is useful to record additional information from the assessment to aid consideration of what vehicles should or should not be allowed to use the road.

## Interim measures and management of substandard structures

A structure which does not meet the requirements of standards used in its assessment is termed a 'substandard structure'. The assessment of a substandard structure should identify the appropriate remedial action required to maintain its safety.

Prior to strengthening or replacement, all substandard structures should be considered as representing a risk to the public. Where such works have to be deferred, detailed risk assessments should be undertaken and where appropriate interim measures should be implemented as soon as possible.

If there is deemed to be an immediate risk to public safety, BD 21 and BD 79 require that formal interim measures which would effectively mitigate the risk, be put in place until the identified remedial action is implemented. These measures may include:

- weight or width restrictions plus monitoring;
- propping or temporary bridge plus monitoring;
- closure and diversion of traffic; and
- deterring vehicles over-running substandard areas of structures.

BD 79 also provides guidance on the short to medium term management of structures where the immediate application of any of the above measures may not be practicable.

In particular BD 79 provides guidance on the use of weight restrictions and/or the application of monitoring to appropriate structures, and provides a Technical Approval framework for agreeing such measures.

BD 79 indicates that structures that satisfy **all** the criteria in 1, 2 and 3 below and additionally small span bridges as described in 4, may be considered to be appropriate for monitoring subject to Technical Approval.

1. Structures with no significant signs of distress, or structures where distress is observed which does not appear to be recent or significant and detrimental to the safety of the structure.
2. Structures where failure is likely to be gradual over time, progressing from local signs of distress to more extensive failure before reaching the point where total collapse is precipitated. It must also be possible to predict the mode(s) of failure under traffic load with reasonable certainty.
3. Structures and situations where monitoring would be meaningful and effective.
4. Bridges of spans less than 5 metres where the consequences of failure are low.

## Programming and priorities – structures

### Introduction

The general principles to be applied to programming and priorities are outlined in Part A of this Code, with this section covering guidance relating to structures.

Highway structures are exposed to a wide range of naturally-occurring and man-made factors that lead to, or directly cause, deterioration. In addition, the highway network is a dynamic system with changing user demands, some of which may be reflected in changes to codes and standards. The purpose of maintenance is to repair damage caused by deterioration, vehicle impact or vandalism, slow down or prevent the deterioration process and, where appropriate, meet the changing demands of users.

The purpose of maintenance planning and management is to enable the Bridge Manager to develop and implement cost effective and sustainable maintenance plans for highway structures that support the safe operation of the network while delivering the required asset performance and levels of service. The maintenance planning and management process enables the Bridge Manager to deliver the authority's long term goals and objectives by developing maintenance plans that align with and provide detail to the work volumes and phasing identified in the Asset Management Framework.

Maintenance planning should adequately support the safe operation of highway structures. Performance levels should be identified at which a structure or component is considered to be sub-standard and which, if left unmanaged, may result in the structure becoming unsafe. Identifying minimum safety and performance levels assists the prioritisation of needs and development of maintenance plans.

Authorities should be suitably prepared for urgent safety and stability concerns and emergencies and deal with them effectively when they occur. An emergency response procedure should be developed for this purpose and documented, and an associated emergency budget determined.

### Classification of work types

An important feature of maintenance planning is the appropriate classification of all items of maintenance work. Classification provides a beneficial tool for analysing the workbank and removing appropriate work types from the Value Management and Value Engineering phases, i.e. regular and reactive maintenance. Eleven work type definitions grouped under three headings are given below that cover the majority of operational activities. These work types and the terminology should be used to provide clarity to work volumes identified in plans, i.e. Asset Management Framework, Forward Work Plan and Annual Work Plan.

1. Regular Maintenance
    - a. Inspections – covers all inspection types, i.e. Safety, General, Principal and Special. Inspections include confined space inspections, boat inspections,

underwater inspections and special follow-up investigations identified from the inspections;

- b. Structural Reviews and Assessments – structural reviews should ascertain the adequacy of structures to carry the specified loads when there are significant changes to usage, loading, condition or the assessment standards. A review should identify structures which need a structural assessment. An assessment quantifies the load bearing capacity of the structure in accordance with the appropriate current standards;
- c. Routine Maintenance – minor work carried out on a regular or cyclic basis that helps to maintain the condition and functionality of the structure and reduce the need for other, normally more expensive, maintenance works. Examples of routine maintenance common to highway structures include cleaning out expansion joints and drainage systems, greasing of metal bearings, removal of vegetation, removal of blockages in watercourses including removal of silt; and
- d. Management of Substandard Structures – normally constitutes implementing interim measures to protect users of substandard structures and may include monitoring. Guidance is given in BD79 The Management of Sub-Standard Highway Structures.

2. Programmed Maintenance

- a. Preventative Maintenance – work carried out to maintain the condition of the structure by protecting it from deterioration or slowing down the rate of deterioration. Preventative maintenance is justified on economic grounds because it provides minimum whole life cost maintenance. By timely intervention preventative maintenance reduces the need for essential work and/or the likelihood of essential work arising prematurely in the future. Examples of preventative maintenance include re-pointing, repainting, minor defect repairs, silane impregnation, cathodic protection and re-waterproofing. Re-surfacing is not included because it is considered to be a road maintenance activity;
- b. Component Renewal – renewal of components that have a finite service life, e.g. bearings and expansion joints;
- c. Upgrading - work that brings an existing structure up to the appropriate current standard, e.g. strengthening, upgrading parapets, waterproofing. The work may have resulted from a change to standards or a change in requirements for the structure, e.g. enhanced network levels of service;
- d. Widening and Headroom Improvements – increasing the width or headroom of the existing structure. These improvements are generally considered to be network issues unless arising due to structural maintenance requirements; and
- e. Replacement – a structure/component is replaced when it reaches the end of its useable life, excluding cyclic Component Renewal item (2b) above. The replacement structure/component restores the full design performance of the structure/component it replaces (if the performance is enhanced it is classified as an upgrade – item (2c) above).

3. Reactive Maintenance

- a. Emergency – work that must be dealt with immediately due to the high risk the situation poses to public safety, e.g. caused by accidents such as bridge strikes; and
- b. Essential Maintenance – major structural repair work and especially that undertaken when part or all of a structure is considered to be, or about to become, structurally inadequate or unsafe, or unpredictable in its deterioration. Examples of essential maintenance include major concrete, masonry and steelwork repairs, and scour repairs.

## Inputs to the planning process

Maintenance planning and management is an on-going activity and as such, requires up-to-date and relevant information on structural condition and performance, to ensure the correct work is being planned and to assess the effectiveness of previous work. Relevant condition and performance inputs to the maintenance planning and management process include, but are not restricted to:

- **Inspection, testing and monitoring** – inspections, primarily General and Principal Inspections, generally provide the most up-to-date and comprehensive data on the condition of highway structures, and as such are a key input for maintenance planning. Inspections are sometimes supplemented by testing and monitoring**;**
- **Assessment of structures** – structural reviews identify structures that require a structural assessment, while structural assessments identify sub-standard structures. Resources are required for the structural reviews and assessments and for dealing with sub-standard structures. These should be taken into account in the planning process; and
- **Other** – may include incidents, emergencies and reports from the police or public, e.g. bridge strikes, scour damage from a flood, loose bricks.

The above data enables a response to any urgent needs or emergencies and to plan work based on the actual current condition and performance. It also allows the maintenance planning process to provide the essential detail to the generic work volumes and phasing produced by the long term asset management planning process.

## Determine current performance

The asset inventory, condition and performance data help to determine the current performance of the highway structures. Much of the information is in a format that can be readily used for identifying needs.

The current performance is determined for individual elements and/or structures using absolute measures, e.g. severity and extent of a defect or assessed capacity of a structure.

## Identification of needs

The purpose of this task is to identify and document all maintenance required on highway structures and the associated cost estimates. The documented maintenance needs and costs are referred to as the structures workbank. The structures workbank forms the basis of the subsequent Value Management and Value Engineering processes.
A formal approach to the identification of needs should be developed but the Bridge Manager should be aware that maintenance needs can arise due to a wide range of factors, some of which may not be covered by a formal approach. Common criteria that should inform the identification of needs are:

- assessment of condition and performance data by a suitably qualified and experienced engineer to identify needs;
- development of lifecycle plans to identify maintenance cycles and intervention thresholds; and
- identification of regular maintenance needs (e.g. inspections, structural reviews and assessments and routine maintenance) and planned improvement/development schemes.

The following sections describe the above criteria in more detail.

## Condition and performance data

The condition and performance data is reviewed periodically by a suitably qualified and experienced engineer to identify maintenance needs. General Inspection pro forma are reviewed and are to be proposed to be signed off within four months of the inspection.

## Lifecycle plans

MCC is developing its Lifecycle plans which will be used to identify needs on specific structures and elements. The cyclic/intervention rules established in the lifecycle plans are compared against the current condition and performance of a structure/element and the specific characteristics of the structure are assessed to determine if the lifecycle plan activity is appropriate, i.e. the lifecycle plans should be used as general guidance when identifying specific maintenance needs.

Where appropriate, lifecycle plans should be amended through the maintenance planning process because the bridge engineer is undertaking a more detailed review of needs compared to asset management planning. Such amendments should then be passed back to asset management planning to improve long term work predictions.
A lifecycle plan should be developed for each structure group/sub-group. Refinement of the groups and sub-groups may prove beneficial as it allows greater management planning control through more targeted lifecycle plans, but more knowledge of deterioration rates and mechanisms is required.

Lifecycle plans should be developed using whole life costing, if appropriate, in order to establish the most cost-effective approach. Whole life costs should not be the sole consideration and other issues such as asset performance and network safety should also be considered where relevant.

In Wales, guidance and lifecycle planning tools are available to members of the SCOTS/CSSW Roads Asset Management Project group via the RAM Knowledge Hub. Cost projection tools are available for structures and other asset types.

## Structures Workbank

The structures workbank is a database of all work that is currently outstanding on the network, including estimated costs for doing the work. It includes a volume of work to cover re-active maintenance which is based on past experience and engineering judgement. The workbank is developed from information gathered from the Authorities 6ST Structures Cost Projection Toolkit.

The workbank aims to provide a full list of all maintenance required on the structures stock and provides the following information for each item of work:

- name and number/reference of the structure;
- element where work is required;
- defect, including severity and extent (if appropriate);
- required work;
- work type;
- recommendation for when the work should be undertaken, i.e. which year; and
- estimated cost.

The full list of information is taken forward to the Value Management and Value Engineering phases. Once work has been undertaken it should be identified as completed and removed from the workbank.

## Value management

Value Management needs to be further developed within Monmouthshire in order to better prioritise the identified needs compiled in the structures workbank.

This process is the planning (including value engineering if appropriate), scheduling and implementation of non-value managed work. The workbank identifies all work, not only value-managed work, and all the work needs to be appropriately managed.

Value Management should be used because it provides a formalised approach for assessing the benefits of undertaking maintenance and the associated risks of not undertaking maintenance. The risks and benefits should cover hard issues, e.g. condition and assessed capacity, that can be assessed objectively and soft issues such as local importance, customer feedback and synergies with other work that may need to be assessed subjectively.

The outcome of the Value Management process should be a prioritised list of actions in the structures workbank that is taken forward to the Value Engineering process. It should also identify where there will need to be an option appraisal in the Value Engineering process.

Value Management should not be a complex and overly involved process. It should cover the appropriate criteria in a manner that enables engineers readily to compare and identify a priority score.

The full Value Management process is only appropriate for major schemes. A simplified process should be used to deal with common types of moderate and minor maintenance and this is one tasks which will be reviewed .

## Value Management Regime

MCC will develop a Value Management regime identifing the frequency of review and the approach to be taken. The regime will identify:

- **Value Management frequency** – The review frequency will be
- **Prioritisation criteria** – the criteria considered during the Value Management process to prioritise needs. They may be objective or subjective in nature; and
- **Value Management review** – the review will be undertaken by the Bridge Manager and the Assistant Engineer Structures.

## Prioritisation Criteria

Prioritisation will be undertaken using the CSS Wales 6ST Structures Toolkit.

The Value Management process should include a range of prioritisation criteria that are appropriate to the characteristics of the highway structures stock and network. As a minimum, prioritisation criteria should be considered that relate to the following three categories:

- **Safety and functionality** – criteria in this category should seek to use information from the asset inventory and database to rank the importance of the need. Examples of criteria that could be considered are structure type, structure location, route carried, obstacle crossed, element condition, assessed capacity, height restriction and traffic flow restrictions. The criteria considered should influence the prioritisation score in an appropriate manner, e.g. as condition deteriorates the prioritisation score increases, as route classification increases the prioritisation score increases;
- **Benefits and dis-benefits** – criteria in this category should seek to quantify in a simplified manner, the benefits and dis-benefits produced by addressing and not addressing a need. It may be more appropriate to use engineering judgement rather than an automated procedure. If the former approach is used it should be guided by a simple classification procedure, e.g. High, Medium or Low benefit/dis-benefit. Examples of benefits/dis-benefits that

should be considered include lower or higher whole life costs, reduced or increased journey times, minimisation of network disruption, and integrating work items to achieve cost savings; and

- **Socio-economic and environmental** – criteria in this category should cover the softer issues that cannot be readily quantified by an automated prioritisation process, e.g. local policies, user/customer perception, impact on local communities and businesses, environmental impact and sustainability considerations. A formalised approach should be developed that allows the reviewer, or workshop attendees, to quantify criteria easily, e.g. High, Medium or Low impact.

Many of the above criteria can be assessed through a formalised risk analysis and risk assessment approach.

During the development of the Value Management process, careful consideration should be given to the weighting of each criterion. While it is recognised that safety will be a motivating factor other issues should be addressed to ensure a balanced work programme, e.g. priorities of the Asset Management Framework. Otherwise the process may focus solely on more apparent maintenance needs and fail to address preventative maintenance requirements. The system should also provide robust and justifiable prioritisation scores.

## Value Management Review

The prioritisation criteria will be reviewed, the review will be undertaken by the Bridge Manager and the Assistant Engineer Structures.
The review will assess each need in turn and give it a final prioritised score. The starting point for the review/workshop may be:

- **Un-prioritised workbank** – in this case the review/workshop must address all the prioritisation criteria. It is advisable to use a small number of important criteria in order to avoid the review becoming overly complex; and
- **Semi-prioritised workbank** – in this case an automated prioritisation would have already been performed based on the asset inventory and database information (primarily using the safety and functionality criteria). The review or workshop should therefore concentrate on the softer prioritisation issues that may not be appropriate for automation, e.g. **socio-economic and environmental**.

The cost estimates for the prioritised needs are compared against the 1 to 3 year funding plan. Starting at the top of the prioritised list, i.e. taking the most critical need first, the cost estimates are added together until they equal the 1 to 3 year budget.

## Value engineering

Value Engineering is the process of developing an optimal solution to a maintenance need and reducing waste and inefficient aspects of design, construction and maintenance

Value Engineering takes the prioritised needs from the Value Management exercise and creates cost effective schemes that can be planned, scheduled and implemented.

The two key components of Value Engineering are option appraisal and scheme development. Important criteria that feed into these components include maintenance options and standards, Whole Life Costing and synergies with other schemes. Option appraisal, scheme development and Whole Life Costing are described below.

The full Value Engineering process will be applied to those schemes in excess of one million pounds but a simplified process should be used to deal with moderate and minor works, where minor works should be grouped into those of a similar type to streamline the process.

## Option Appraisal

Option appraisal is necessary to identify the appropriate maintenance solution when there is more than one practical alternative for addressing the maintenance need. There may be only one practical maintenance option for many of the identified needs and it may have already been determined from the Identification of Needs and Value Management exercises. When there is only one practical maintenance solution, option appraisal is not required and the work item can be passed through to the scheme development process.

The Value Management phase should have flagged up needs that are suitable for option appraisal. These needs should now be assessed by suitable personnel in order to identify the practical maintenance options. Personnel suitable for assessing options may include:

- Bridge Manager/engineer and other suitably qualified and experienced staff within the authority; and
- external consultant and contractor staff with suitable experience and preferably a sound knowledge of the structures and network.

It is beneficial to involve the aforementioned personnel as early as possible in the exercise as this may lead to alternative proposals that benefit the network and lead to long-term savings. Early contractor involvement may enable the cost of work to be more robustly informed and effectively assessed. This process increases confidence levels and makes achievement of the planned work regime more likely.

The options should be analysed using Whole Life Costing to identify the most cost effective solution. Larger maintenance or improvement needs may merit the use of more sophisticated analysis techniques that account for a wider range of socio-economic issues, e.g. Multi Criteria Decision analysis. Expert advice should be sought regarding the suitability of applying more sophisticated techniques.

Large upgrade or improvement schemes may require a formal public consultation exercise. In such cases, authorities should identify appropriate parties to include in the consultation, e.g. local residents and businesses, and give them a suitable opportunity to comment on the options proposed.

## Scheme Development

The scheme development process should focus on the minimisation of network disruption and minimisation of whole life costs without compromising other important aspects such as appearance, access arrangements, environmental and sustainability issues, etc. It should be recognised that it may not be possible to minimise both network disruption and whole life costs and a compromise may have to be accepted. When developing schemes a number of alternative techniques are available for combining work items, each having different outcomes. Commonly used techniques include:

1. **Combine different work items on one structure** - addresses all actions on one structure thereby creating one period of longer network disruption compared to several interventions of shorter individual disruption but possibly longer total disruption. This technique may have relatively high scheme costs because the contractor has to mobilise for a range of activities and possibly more than one contractor is required;

2. **Combine similar work types** – a scheme of works that concentrate on one specific work type or similar work types. This technique should achieve cost savings by procuring the work in bulk because mobilisation fees are reduced and the contractor is provided with a steady work stream. A disadvantage is increased network disruptions at a particular location because different contractors may visit one structure in order to carry out their specific activities; and

4. **Combine schemes based on route or area** – this technique is similar to technique 1 above except that it is extended to cover a series of schemes on a route. It should achieve cost savings by procuring the work in bulk because contractor mobilisation fees are reduced and they are provided with a steady work stream. A disadvantage is that a number of contractors are likely to be required, leading to the possibility of programme extensions, site conflicts and continued network disruption over a short period.

The developed schemes are used to prepare the Forward Work Plan.

## Prepare forward work plan

The Forward Work Plan is a detailed 1 to 3 year programme of work. This provides details of the schemes to be carried out in the 1 to 3 year period and their approximate annual phasing.

The Forward Work Plan should draw together all the work that has passed thorough the Value Management and Value Engineering phases, i.e. developed schemes, and non-value managed work, e.g. inspections, structural assessments, routine maintenance and management of substandard structures.

## Monitoring, review and feedback

The Annual and Forward Work Plan should be regularly monitored and reviewed to assess work delivery, i.e. planned programme and costs vs actual. Changes may be required to the planned schedule of works if it has deviated significantly from the original plan. Feedback loops should also be implemented to assess and record out-turn costs and the quality of the final solution (this data may also inform improvements).

The workbank should be continually reviewed to check that maintenance needs are being properly addressed and removed from the workbank once acted upon. It is helpful to record the dates when the scheme is included and removed from the workbank so the turnaround can be monitored.

## Identify improvements

The Bridge Manager should continually seek to improve the efficiency and effectiveness of the maintenance planning and management process. Improvements to the maintenance planning and management process may align with improvements to the long term asset management planning process, and the Bridge Manager should seek to combine the work required on these improvements where appropriate.

Feedback from inspections and maintenance work should be used to improve the accuracy and development of lifecycle plans and maintenance strategies. Out-turn costs should be used to improve workbank cost estimates, whole life costing and asset management planning.

## Strengthening prioritisation based on BD 79

*BD 79 The Management of Sub-Standard Highway Structures* lists the factors which should be taken into account in any prioritisation of strengthening work. These include:

- risk of structure collapsing;
- traffic delay costs caused by interim measures;
- other social, environmental and economic consequences caused by interim measures;
- the negotiability of alternative routes;
- the cost-effectiveness of the strengthening (ratio of costs and benefits); and
- other benefits from scheme.

A Good Practice Guide on Maintenance Prioritisation for Highway Structures: Phase 1 has been published by London Bridges Engineering Group (LoBEG).

# Part D Lighting

# Part D Lighting

Introduction

introduction
further guidance

Legal Framework Lighting

lighting legal considerations
conservation areas

Asset Management Information Lighting

introduction
principles and considerations
central management systems (cms)

Asset Condition and Investigatory Levels Lighting

introduction
monitoring for inoperative lighting
response times
emergency service

Inspection Assessment and Recording Lighting

introduction
defect risk assessment
electrical inspection and testing
lighting columns and illuminated traffic sign posts
light measurement
trees
reliability of data
competence
recording of information
developments in survey technology

Programming and Priorities Lighting

introduction
principles
management of maintenance
design for maintenance
recycling and waste disposal
commuted sums
traffic sign and bollard maintenance
lamp replacement
compatibility of components

Service Agreements

introduction
service agreement
procedures for new installations
procedures for repairs
cut-outs
electricity settlement inventory
trading arrangements

# Introduction

## Introduction

Part D of this document covers specific issues and themes regarding lighting, and includes the following asset types:

- lighting columns;
- lighting units attached to walls/wooden poles;
- heritage columns;
- illuminated bollards;
- illuminated traffic signs;
- columns and foundations;
- brackets;
- luminaires;
- control equipment, cables; and

- control gear, switching, internal wiring cabling (within ownership).
- Rising traffic control bollards
- Vehicle Actuated signs
- Illuminated pedestrian crossings

The objectives of this part of the document are as follows:

- to encourage delivery of the right quality and amount of light in the right place and at the right time;
- to support a risk based approach for lighting management that is suitably recorded and documented;
- to deliver value for money through the adoption of appropriate technology;
- to encourage the development, adoption and regular review of policies for lighting operation and maintenance, consistent with the wider principles of integrated transport, crime reduction, sustainability and best value;
- to encourage harmonisation of lighting maintenance practice, where this is consistent with user expectations, whilst retaining reasonable diversity to accommodate local requirements; and
- to encourage the adoption of an efficient and robust approach in the collection, processing and recording of lighting asset inventory and condition data for the purpose of local and national needs assessment, including:
    - scenario planning and investment modelling;
    - management;
    - performance monitoring; and
    - electricity purchase.

## Reduced Lighting

Within Monmouthshire Reduced Lighting techniques have been adopted. This has largely been in response to increases in electrical energy charges that have placed a significant additional burden Monmouthshire's street lighting budget. The techniques include the switching off of columns in selected residential streets between the hours of 24:00hrs and 5:00hrs and reducing the light outputs of columns. Columns which have been identified in Mayrise have had their light output dimmed to 40% of their maximum output. No adverse Customer comments have been received following the utilisation of these techniques

The removal of street lighting columns or their disconnection has not been employed in Monmouthshire.

## lighting legal considerations

There is no statutory requirement on local authorities in the United Kingdom to provide public lighting. The following statutes empower local authorities to light roads but do not impose a duty.

In England and Wales, the Highways Act 1980 empowers a Highway Authority to provide lighting for any highway or proposed highway for which they are, or will be, the Highway Authority.

Highway Authorities have a duty of care to the road user. Any loss to an individual as a consequence of the inappropriate use of these powers may result in action being taken to recover the loss. Such action could be taken on several grounds:

- negligent exercise of power (including failure to use that power). There is no blanket immunity;
- action for misfeasance of public office; and
- breach of the common law duty of care (if it can be established).

NOTE: This duty of care does not imply any duty on the Highway Authority to keep the public lighting lit. However, an authority responsible for the maintenance of public lighting should be able to demonstrate that they have systems in place to maintain the public lighting equipment in a safe condition, including the detection of dangerous equipment.

### New Roads and Street Works

The New Roads and Street Works Act 1991 (NRSWA) is an enabling act setting out the duties of Street Authorities to coordinate and regulate works carried out in the highway.

### Statutory Nuisance: Lighting

In England and Wales street lighting is not specifically exempt from the legislation, but it is unlikely to qualify as a statutory nuisance as generally speaking it is not considered to be within the definition of 'premises'.
In England and Wales the Clean Neighbourhoods and Environment Act 2005 applies and Section 102 of the legislation makes artificial light a potential statutory nuisance.

### Natural Habitats

Local Authorities should be aware that under the Conservation (Natural Habitats, &c) Regulations 1994 and as amended in 2007 European Protected Species of plants and animals receive protection.

One such protected species on which artificial light can have adverse effects is bats and so care needs to be taken not to disturb the animals themselves or their roosts and habitats. Where the replacement of street lighting columns is to be made on a like for like basis no special measures are put in place. On new developments where street lighting networks are planned the planning conditions relating to ecological matters in association with those networks will be followed in the design. Guidance is available from the Bat Conservation Trust and the Institution of Lighting Professionals.

### Traffic Management

The general duties relating to network management including enforcement of network management duties the maintenance of records and information (e.g. including records and locations of apparatus) and the duty to inspect records etc. can be found in the Traffic Management Act 2004 document. Within Monmouthshire no records are maintained for the location of cable runs but the location of all columns are plotted within the street lighting management system.

### Climate Change

The Climate Change Act 2008 empowered the government to set national targets for the year 2050 for the reduction of greenhouse gas emissions and to encourage energy users to meet the objectives of the Act, such as reducing such emissions or removing greenhouse gas from the atmosphere.

The Act also introduces legally binding carbon budgets, which set a ceiling on the levels of greenhouse gases that can be emitted into the atmosphere. The ensuing CRC Energy Efficiency Scheme does not however apply to Street lighting operated by local authorities..

### Crime and Disorder

Section 17 of the Crime and Disorder Act 1998 states the duty to consider crime and disorder implications.

### Traffic Signs

The Traffic Signs Regulations and General Directions 2016 prescribes the design and conditions of use of traffic signs on or near roads in England, Scotland and Wales.

## Conservation areas

The introduction of the Civic Amenities Act 1967 gave legislative control to the protection of conservation areas which are defined as - ‘an area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance.’

Conservation Areas are designated more on local criteria than on national criteria and their designation is derived by a local authority with support and advice from Cadw, the Welsh Government's historic environment service. Consideration is given to the history, building style, important views and different activities performed in the area as well as other factors of which the exterior lighting may be one.

Within the village conservation areas of Grosmont, Tintern, Llandogo and Trellech an appropriate lighting column specification is used. In other conservation areas advice would be sought from the Authorities Conservation officers in order to agree the specification for the proposed columns.

Where the maintenance and/or replacement of heritage equipment in conservation areas is required then consideration will be given to the use of equipment which gives the same 'feel' to the conservation area. This may be due to availability or cost considerations.

## Asset Management Information Lighting

### Principles and considerations

Monmouthshires Lighting Asset Management System Mayrise provides and supports the following list of functions:

- storage and retrieval of inventory data including street lighting columns, illuminated signs, illuminated bollards and luminaire details.
- Issue of works orders;
- production and reporting of national and local performance data;

Drawings photographs and reports are not held electronically but it is planned to convert these to an electronic format in the next two years.

The asset management system is kept up to date to ensure the currency of the data held.

The Asset data available within Mayrise and associated systems allows the calculation of Gross Replacement Cost and Depreciated Replacement Cost for lighting associated with highway infrastructure, as required for Whole of Government Accounts.

## Street Lighting Central management system (cms)

Monmouthshire County Council operates the Harvard Central Management Systems (CMS). This is a system that allows remote dynamic street lighting control through Harvards Leaf Nut program . Using the Harvard system, the operator can choose

exactly when to switch each individual street light on or off and/or by how much to reduce the lamp power. This allows any number of switching events and/or dimming levels to be selected. The system can use web based technology to control lighting times based on official lighting up time and traffic conditions as well as fault reporting and warning of imminent lamp failure

To ensure consistent records it is essential that there is an effective interaction between the inventory and CMS databases. CMS is best characterised as a communication system for providing 'Monitoring', 'Reporting' and 'Control' of street lighting.

The CMS allows detail monitoring and reporting of key aspects of the asset including:

- whether the light is operating as expected or not – i.e. faults or outages;
- circuit characteristics - current, voltage, power factor;
- switch on and off times;
- adapting levels;
- total energy consumed

In addition, it is possible to include the following:

- predictive faults based on history to date and component characteristics;

# Asset Condition and Investigatory Levels Lighting

## Monitoring for inoperative lighting

Monmouthshire County Council identifies failed lighting in the following manner.

- Through the Harvard's central management system (CMS) Leaf Nut, which remotely monitors the equipment with an electronic device at each luminaire which is capable of recording and reporting the status and/or failure (or imminent failure) of the equipment including dayburners.
- Direct reports of failures from the public which are encouraged using notices in both local press and the Authorities Website.

Currently The Harvard Leaf Nut system is deployed on approximately 74.6 % of the network.

Calls regarding the Authorities Street lighting systems are passed directly to the street lighting Engineers. for attention The Authority operates a duty officer system for out of hours queries and all officers undertaking this role have received sufficient

training to enable them to identify emergencies, and to assure appropriate coordination between them and emergency teams.

Public reporting will still be relied upon to identify the following defects:

- wilful damage;
- overhanging trees and vegetation;
- vehicle damage;
- misaligned brackets;
- missing doors;
- unsecured or missing lantern bowls;
- missing identification numbers; and
- partial faults in LED lanterns.

The response times associated with defects are set out within the term contract the Authority has entered into with SEC and are as detailed in the response times section.

## Response times

The following response times associated with street lighting defects are as follows.

- Emergency — Two hours
- Sign/bollard — Two days
- Zebra crossing — Two days
- Street light — Five days

## Emergency service

Parts of the installation can become a danger to the public as a result of incidents such as vehicle impact, cable damage, vandalism, storm damage and deterioration of components. Such incidents can result in potential danger and require emergency response.

The Authority has put arrangements are in place to provide an emergency response at any time.

Reports of such problems are handled through the Authorities Duty Officer who will evaluate the report made and take the necessary action. The Duty Officer may then contact the Authorities term contractor SEC ltd who provides an out of hours emergency service for such events. The Duty Officer will also issue a works order to the term contractor in respect of these activities.

The action to be taken will depend on a technical assessment at the time a report of damage or fault is received. Typically a Road Traffic Collision involving an electrified asset, an access panel off, exposed wires and a lantern or shade hanging will trigger a two hour emergency response.

Staff involved in providing the emergency service are experienced officers who have extensive experience of dealing with such issues. The term contractors personnel who are directly involved on-site are appropriately qualified as evidenced through the contractors submission prior to the award of the term contract and their personnel's ongoing training records. The term contractor also has the appropriate tools and plant to deal with the incident and the ability to mobilise additional resources to assist or to attend other emergency calls which is a requirement of the term contract.

Where temporary repairs cannot be put in place adequate signage and temporary warning lights will be provided.

Work instructions are created in the Mayrise and forwarded to the Street Lighting Term contractor for action. The term contractor then provides the street lighting team with a copy of the instruction onto which the following details are entered.

- the time and source of the call-out;
- time arrived and extent of work undertaken;
- further work required; and
- time left site.

The above details are entered onto the Mayrise system by the street lighting team.

If the incident was a result of vehicle impact then details of the vehicle(s) will be recorded if they are still present on site in order to institute procedures for the recovery of costs.



# Inspection Assessment and Recording Lighting

## Electrical inspection and testing

### Introduction

In terms of possible dangers from electricity, the Electricity at Work Regulations 1989 require all systems to be constructed, maintained and operated, so far as is reasonably practicable to prevent danger.

A rolling annual inspection of one sixth of the street lighting assets is made in order to determine the condition of those assets and to confirm that the installation is in a safe condition.

### Visual inspection of electrical equipment

The general visual conditions of the electrical installation is recorded at every visit to the asset i.e. in order to change the lamp, attend to any other fault, or every 6 years as part of the electrical testing process. The information gathered is recorded in the Mayrise system.

During this visual inspection, if any problems are encountered that are considered as dangerous, the item of equipment is either repaired immediately or taken out of service by removing the fuse from the supply termination until the fault has been rectified.

Problems related to the Western Power cable or cut-out (cracked, broken fuse carrier, loose connection, exposed live conductors, etc.) will be reported to Western Power. Under no circumstances will an electrically dangerous item of equipment be left in operation.

In exceptional circumstances it may not be possible to undertake the electrical inspection and in these rare incidences the term contractor is required to resolve the issue preventing the inspection in order to allow the inspection to be undertaken.

All inspections are undertaken in accordance with the requirements of BS7671 and associated guidance including in particular Guidance Note 3.

## Electrical Testing

Testing is carried out by the Authorities Term Contractor whose operatives are appropriately qualified. It is a requirement of the term contract that all test equipment is correctly calibrated and regularly certified. Copies of these certificates are held on file.

## Electrical testing records

The results of periodic electrical inspection and testing are recorded in paper format and held on file.

The testing of highway lighting circuits and columns extends to 5th core distributor cabling in relation to the measurement of external earth fault loop impedance.

## Structural inspections

A visual inspection of each lighting column and illuminated traffic sign post will be carried out and recorded at every visit to the asset i.e. in order to change the lamp, attend to any other fault, or every 6 years as part of the electrical testing process. The information gathered is recorded in the Mayrise system.

## lighting columns and illuminated traffic sign posts

Within Monmouthshire County Council Lighting columns and illuminated traffic sign posts are hot dipped galvanised steel. In conservation and town centre areas further protection may also be given by the application of an additional protective system such as paint or powder coating.

The condition of lighting columns' and illuminated traffic sign posts' protective systems, including the finish is inspected at each maintenance visit i.e. in order to change the lamp, attend to any other fault, or every 6 years as part of the electrical testing process. The information gathered is recorded in the Mayrise system.

The inspections which are undertaken by the Street Lighting Term Contractor are undertaken by appropriately qualified operatives.

## Protective coatings and their application

Lighting columns are particularly vulnerable to corrosion underground. In recognition of this replacement columns are specified with an additional coating of bitumen below ground which extends above ground by 0.5 metres.

## trees

The effect of trees on the performance of the lighting installation is considered at the section 38 design stage in order to ensure that there are no potential negative impacts on the lighting installation as a result of the presence of trees.

Where there are specific site related tree issues on older street lighting networks advice is sought from the Authorities Tree Officer in order to avoid unnecessary damage to roots and branches when erecting or removing lighting columns or excavating cable trenches.

## Competence

Staff working on lighting installations, including client and contractor's personnel, are suitably trained and qualified for the activities they undertake. All term contractors personnel are G39 qualified allowing them to undertake works on Western Power Grid system and they also hold the Association of Street Lighting and Electrical Contractors ASLEC qualification. A competency book is also maintained by those staff.

The operatives training, technical knowledge and experience is sufficient to provide:

- adequate knowledge of electricity
- adequate knowledge of the system to be worked on
- adequate knowledge of the hazards which might arise and the precautions to be taken
- adequate experience of electrical work
- adequate experience of working on the appropriate system; and
- ability to recognise at all times when it is safe for work to continue.

All Term Contractors activities are detailed through method statements and Operatives are trained and instructed to ensure that they work in accordance with those instructions.

Operatives operating or working on the Western Power cut-outs are appropriately trained to G39 and have been approved by Western Power.

On-site competence is demonstrated through the operatives possession of ASLEC National Highway Sector Scheme 8 (NHSS 8) and the associated Highway Electrical Registration Scheme (HERS) that sets out a reasonably practicable approach to the identification, achievement, recording and maintenance of competence. Western Power also requires evidence of training and assessment to Electricity Association Engineering Recommendation G39/2 (which includes a reference to HERS). G39/2 is also supported by the possession of the ASLEC qualification as reliance solely on G39/2 without additional training and assessment of competence would leave the employing organisation open to failures to meet the requirements of the Health & Safety at Work etc. Act, the Management of Health and Safety at Work Regulations, the Electricity at Work Regulations and the Construction Design and Management Regulations amongst others.

### recording of information

Information from all inspections and surveys, together with any immediate or programmed action, including nil returns, is accurately and promptly recorded, on Mayrise which is particularly relevant in the case of safety inspections.

## Programming and Priorities Lighting

### introduction

Programming and priorities are dealt with in the UKRLG Highway Infrastructure Asset Management Guidance (HIAMG), Part B. This document should be referred to and the advice below considered supplementary.

The general principles to be applied to programming and priorities are outlined in Section A.8 of this Code, with this section covering guidance relating to lighting assets.

## Management of maintenance

### Strategy

The lighting systems require inspection and maintenance to ensure that it is safe, operates correctly, continues to provide the designed performance in order to maximise its useful life. Maintenance is undertaken on a reactive basis, where failures of equipment are recorded and the equipment repaired or replaced.

### Design for maintenance

LED lighting is being deployed across Monmouthshire, with currently 20% of the network being served by this technology. It is planned to continue this roll out with 100% of the network running on LED lighting technology in five years. LED lighting systems offers significant energy efficiencies from its use.

The Institution of Engineering and Technology (IET) have published the Code of Practice for the Application of LED Lighting Systems and Recommendations for Energy Efficient Exterior Lighting Systems.

### Recycling and waste disposal

Lamps and luminaires are recycled by the lighting term contractor through the supplying manufacturer. The Lamp and Luminaire Producer Schemes, funded by a levy on new products, exist to ensure the disposal of such equipment in line with the WEEE Regulations and Environment Agency requirements.

### Commuted sums

Commuted sums are rarely required from Develops as the MCC lighting Engineers are often approached to provide a suitable lighting design. The designers are therefore aware of potential maintenance burdens and can therefore design them out. Where developers specifically required units which were considered to place a large maintenance burden on the Authority a commuted sum would be sought from the Developer. ADEPT has published guidance on the commuted sums mechanism, through which developers may be required to contribute to future maintenance of areas adopted by local authorities and this would be used as the framework for the application of commuted sums..

### Lamp replacement

## Burn to Extinction

The Authority operates a burn to extinction policy, under which lamps are replaced on failure.

The move two LED lighting technologies which offer very long service life for lamps compliment this strategy. Monitoring through the Harvard Leaf Nut system will ensure that lighting levels are maintained

## Lighting components

Monmouthshire County Council is moving towards full introduction of LED lighting technology over the next five years using the Harvard Leaf Nut system.

This will ensure that the Harvard CMS can be fully utilised and the benefits of the CMS realised.

# Service Agreements

## introduction

Monmouthshire County Council complies with the following criteria in order to maintain its access to an unmetered electrical supply as provide by Western Power:

- the criteria identified in The Electricity (Unmetered Supply) Regulations 2001;
- the National Measurement of Regulation Office NMRO issued guidance about compliance;
- a Connection agreement with Western Power which follows the national terms of connection; and
- the obligations described in the Balancing and Settlement Code (BSC) for unmetered supplies captured in BSCP520 and its associated documents.

## Service agreement

The provision of public lighting is dependent on the supply of electricity through the network of Western Power.

Arrangements are in place for connections, disconnections and transfers to be made by SEC

## Procedures for new installations

New installations include the following:

- new capital lighting schemes;
- road improvement schemes;
- provision of connections and/or disconnections;
- transfers; and
- new services.

The procedures to be followed by both parties are set out in the contract in respect of the following:

- placing orders;
- notifying that equipment is installed and ready for connection; and
- notifying that equipment has been connected.

In order for SEC/Western Power to comply with the required response time for a new installation the authority needs to supply the following information:

- an accurate location of the equipment involved including:
    - postcode;
    - asset number;
    - location, road name and, for example, side of, rear of, outside house number, etc;
    - a map of the area (minimum size 1:1250 with the apparatus highlighted); and
    - Ordnance Survey co-ordinates or GIS co-ordinates.
- a description of the work involved and the number of points involved.
-

The estimate from Western Power/SEC includes the following information:

- a plan showing the extent of the works together with any civil engineering works (for instance ducts) required from the authority;
- a schedule detailing the estimated costs based on the standard schedule of rates where applicable; and
- a breakdown of contestable and non-contestable works

The authority, on accepting the estimate, shall provide an order for the works together with a programme of works.

On installation of the new equipment, or when existing equipment is ready to be disconnected/transferred, the authority shall advise SEC/Western Power that the site is now ready for their works.

The authority will amend the Asset Management System accordingly as soon as practicable with all connections, disconnection and alterations. Identifying Western Power as the DNO.

## Procedures for repairs

The agreement or contract should detail the procedures to be followed by both parties when placing orders.

When the authority has identified a fault on a Western Power electricity service it notifies Western Power as soon as possible.

Western Power shall respond to faults within or better than the timescales set out in the Electricity (Connection Standards of Performance) Regulations 2015 and the Quality of Service Guaranteed Standards.

The authority is responsible for providing a safe enclosure for the Western Power service termination equipment and reporting any concerns or faults with the cut-out or service termination equipment.

The authority should monitor Western Powers performance in order to validate or, if required, claim rebates.

Monmouthshire County Council Authorities ensures that Western Power is provided with accurate and reliable information in a timely manner when they are requested to carry out work as failure to do so could lead to a failure to enforce any remedial action or rebates.

## Cut-outs

Monmouthshire  and is term street lighting contractor are able and authorised to operate the cut-out for the purpose of connecting internal wiring, withdrawing fuse carriers during maintenance of equipment and replacing failed fuse cartridges. This is included within ENA EREC G39/2 and the Competition in Connections Code of Practice.

## electricity settlement inventory

Monmouthshire maintains an accurate inventory of all unmetered equipment as required by its connection agreement and the Balancing and Settlement Code (BSC) obligations. This inventory is submitted to Western Power every month.

The content and file structure of the inventory submission is as defined in the BSC Operational Information Document.

The key data items are the Charge Code which is a 13 digit code defining the type of unmetered equipment and the Switch Regime defines the type of operation of the

equipment (i.e. continuous, electronic photocell 35/18lux, or part night) these details being recorded in the Mayrise system

Generic LED Charge Codes and variable power switch regimes have been produced by Elexon.

The Mayrise asset management system lists Western Power as the District Network Office to which the equipment is connected to as an unmetered supply.

Western Power audits the identified street furniture and the inventory records to identify material discrepancies. The Managing Unmetered Energy Street Lighting Inventories (MUESLI) covers the audit methodology.

## trading arrangements

The unmetered supplies are traded on a Half Hourly (HH) basis.

Monmouthshires Half Hourly trading utilises a PECU Array and the CMS equipment switching information to give more reflective consumption data.
Monmouthshire has contracted with Western Power who are a BSC approved Meter Administrator to use the inventory and switching data to calculate HH data.

Monmouthshire is part of the South Wales energy procurement framework which is managed by Rhondda Cynon Taff energy prices being negotiated on an annual basis.