Central Bedfordshire Council
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Network Maintenance Management Plan

Annex C

Bridges, Highway Structures and Road Restraint Systems

Part 1: Highway Structures

Including Bridges, Culverts, Subways, Cattle Grids, Retaining Walls and on Carriageways, Footways, Rights of Way and Cycleways and a Multi-Storey Car Park

The road Highways network in Central Bedfordshire contains 394 total structures, varying from simple culverts for water courses up to structures which pass over railways, or retaining structures which retain the highway. There are 98 over bridges, 2 under bridges, 255 culverts, 6 subways, 12 footbridges over roads and 11 retaining walls totaling 9568 metres , along with 9 cattle grids and 1 multi-storey car park.

The Public Rights of Way network (PROW) contains 1259 total structures compromising bridges (736) & culverts (523).

A well managed Structure stock requires Asset Management Planning and Maintenance Planning and Management. These assets form a key element of the network, as if any one of them fails there could not only be a serious accident, but it may interrupt the transport network, affecting both residents and businesses which use the network on a daily basis. Careful management and maintenance of these structures is therefore needed to ensure that they remain in a serviceable state, safe for the travelling public to use.

Definition of a road structure for the purpose of this Annex is one with a span over 0.9m. Below this span it is managed with the rest of the carriageway.

C.1.1 Historic Structures

Central Bedfordshire has four bridges that are classified as Scheduled Ancient Monuments [SAM] and one that is a Grade II Listed Building [LB].
These are:

Bridge Name and Number	Scheduled Ancient Monument or Listed Building (with grade)	Ancient Monument Number	Grid Reference
Blunham River Bridge (181)	S.A.M	24	TL 156 519
Blunham Navigation Bridge (182)	S.A.M	24	TL 156 519
Holme Mills / Lock Bridge, Broom, Southill (143)	S.A.M	87	TL 184 430
Pack Horse Bridge, Sutton (423)	S.A.M	9	TL 220 474
Girtford Bridge, Sandy (9)	L.B Grade II	NA	TL 163 490

Consent for any work on theses bridges has to be obtained from the Conservation Authority e.g. English Heritage for Ancient Monuments. For all historic bridges great care will be taken to replicate the original materials and finishes. In the event of a historic bridge requiring emergency action, appropriate measures will be taken without first obtaining consent but the Conserving Authority will then be informed retrospectively. The Conservation Officer of Central Bedfordshire shall be kept informed in advance of any work required on historic bridges.

C.1.2 Recording of Structures Information

Each structure has a unique hard copy folder which contains all information pertaining to that structure including as-built drawings, any alterations and a copy of all inspections.

The Inspection regime and the defect codes for each structure shall be noted in the Bridge Management system on Insight.

C.1.3 – Inspections and Testing

The overall purpose of inspection, testing and monitoring is to check that the each highway structure stock is safe for use and fit for purpose. It also provides the data required to support good management practices such as Asset Management Planning and Maintenance Planning and Management.

Through various types of inspection, the intention is to provide data on the current condition, performance and environment of the structure, which can then lead to informed analyses, assessments and processes. This data also contributes towards improved information databases on the structures by filling any missing data, verifying existing data and updating data where necessary.

The inspections produce a Bridge Condition Indicator (BCI) score for each structure.

C.1.3.1 - Routine Surveillance

All structures should be subject to routine surveillance as part of regular Highway Inspections carried out by trained and suitable experienced highway maintenance staff. Routine surveillance will normally be undertaken by the passenger in a slow moving vehicle. Inspectors should immediately report any obvious defects that are apparent from the vehicle and need urgent attention, to the Senior Highways Officer (Structures). This will include but is not limited to damage to the superstructure or bridge supports, damage to parapets, flood damage, insecure expansion joint plates, damage from vehicular impact etc. The frequency of routine surveillance shall be the same as for the carriageway, footpath, cycle track or public right of way which runs over or under the structure.

C.1.3.2 - General Inspection

Highway structures associated with carriageways and footways should be subject to regular General Inspections every 2 years from the previous General or Principal Inspection. General Inspections comprise a visual inspection of all parts of the structure and, where relevant to the behaviour or stability of the structure, adjacent earthworks or waterways that can be inspected without the need for special access or traffic management arrangements.

Guidance on General Inspections for highways structures in included in *CSS Bridge Condition Indicators Volume 2: Guidance Note on Bridge Inspection Reporting* and also Addendum *to CSS Bridge Condition Indicator Volume 2*.

C.1.3.3 - Principal Inspection

Highway structures associated with carriageways and footways should be subject to regular Principal Inspections usually 6 years from the previous Principal Inspection. This shall be varied based upon risk analysis as per paragraphs 6.4.27 to 6.4.34 of Management of Structures, Well Managed Highway Infrastructure: Part C: Structures (2016). The risk assessment should be specific to a structure taking into account, the likelihood of rapid deterioration or other incidents, and the consequences of unchecked deterioration or incidents. The Principal Inspection regime for each structure shall be noted in the Bridge Management File.

Principal Inspection comprises a close examination, within touching distance, of all accessible parts of the structure, including, where relevant, underwater parts and adjacent earthworks and waterways, utilising suitable access and/or traffic management works as necessary. Closed circuit television may be used for areas of difficult or dangerous access. Principal Inspections may also include a modest programme of tests when considered necessary.

Principal Inspections should be sufficient in scope 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. The Principal Inspection should establish the scope and urgency of any remedial action identified the need for any special inspections or further investigations and the accuracy of data held for the structure in the inventory.

Management of Highway Structures: A Code of Practice allows for variation in the frequencies of Principle Inspections.

C.1.3.4 - Special Inspection

Where a Structure is deemed to be defective or sub-standard, there may be times when a more frequent inspection concentrating on the condition of particular parts of a structure is required. This is known as a Special Inspection. This may be following Routine Surveillance, a Principal or General Inspection or following a report of damage to the structure. The frequency of subsequent Special Inspections is

based on the Risk Rating of the Structure which is calculated in accordance with DMRB Highways Standard BD 79/13 Management of Sub Standard Structures.

C.1.3.5 - Inspection for Assessment

Inspection for Assessment is carried out prior to a Structural Assessment which calculates the load capacity of the Structure. This type of inspection should include comments and observations on the condition of the structure, and if any deterioration is identified, this should be noted along with its importance, and if appropriate, how the deterioration should be taken into account in the assessment calculations i.e. condition factor or size of structural element to be taken for calculation purposes.

C.1.3.6 - Acceptance Inspection

An Acceptance Inspection is to occur before any existing structure becomes maintainable at Public Expense, or if an existing structure is altered or replaced by another party. This occurs when there is a changeover of responsibility for the operation, maintenance and safety of a structure from one party to another e.g. the adoption of new Highway, or following the de-trunking of Principal Roads.

The intent of this Acceptance Inspection is to provide the party taking over the structure a formal mechanism for agreeing the current status of, and outstanding work on, a structure prior to handover.

The Acceptance Inspection should include the permanent access provisions and features affecting the safety and security of the structure, the identification and handover of all necessary records, maintenance and operating manuals which will have an impact upon the future management of the structure and agreement of the date on which the authority takes on the responsibility of the structure.

Additional requirements for New, Existing and Concession Structures can be found in the Management of Highways Structures: A Code of Practice.

C.1.3.7 Inspection of Structures on PROW and Cycleways

The majority of the structures on or adjacent to the PROW or cycleway network are classified as shown in the table below. The larger structures or those structures which accommodate vehicular access shall be inspected with a General Inspection by the Senior Highways Officer (Structures) on a five year cycle, and the remainder shall be inspected by Area Team Rights of Way Officer. The exception being PROW and cycleway bridges which go over CBC maintained roads and which are managed with the Carriageway Structures. These include the following:

- Route 6 - Cycleway bridge over the A505
- Bridleway 1 - Moat Farm Accommodation Bridge over the C94 in Marston Moretaine,
- Bridleways 2 & 4 - Bridle-bridges over the Ridgemont Bypass
- Route 6 - Black Bridge cycle bridge over the Grand Union Canal

- Tiddenfoot Narrows footbridge over the Grand Union Canal

PROW structures which go over or under Highways England Roads are inspected within the PROW inspection programme.

Table of PROW Structure classification and body to undertake surveys:

Category	Use	Type	Span	Surveyed by
A1	Non-vehicular	Pipe	any	Area Team
A2	Non-vehicular	Brick/Stone Arch	<1.5m	Area Team
A3	Non-vehicular	Structural Beam Timber (inc Kit)	<5m	Area Team
A4	Non-vehicular	Sleeper	<5m	Area Team
A5	Non-vehicular	Crash Barrier	<5m	Area Team
A6	Non-vehicular	Structural Beam Steel	<5m	Area Team
A7	Non-vehicular	Structural Beam Concrete	<5m	Area Team
A8	Non-vehicular	Concrete Slab (inc Box)	<5m	Area Team
A9	Vehicular	Pipe	<0.9m	Area Team
A10	Vehicular	Brick/Stone Arch	<0.9m	Area Team
A11	Vehicular	Concrete Slab (inc Box)	<0.9m	Area Team
B1	Non-vehicular	Brick/Stone Arch	1.5m +	Engineer
B2	Non-vehicular	Structural Beam Timber (inc Kit)	5m +	Engineer
B3	Non-vehicular	Structural Beam Steel	5m +	Engineer
B4	Non-vehicular	Structural Beam Concrete	5m +	Engineer
B5	Non-vehicular	Concrete Slab (inc Box)	5m +	Engineer
B6	Vehicular	Pipe	0.9m +	Engineer
B7	Vehicular	Brick/Stone Arch	0.9m +	Engineer
B8	Vehicular	Structural Beam Steel	0.9m +	Engineer
B9	Vehicular	Structural Beam Concrete	0.9m +	Engineer
B10	Vehicular	Concrete Slab (inc Box)	0.9m +	Engineer
D1	Retaining wall	Any	<2m height	Area Team
D2	Retaining wall	Any	2m +	Engineer
D3	Cattle Grid	Any		Engineer

The PROW network and Cycleway contains 1259 total structures compromising bridges (736) & culverts (523). Of that 166 are to be inspected by the Senior Highways Officer (Structures). The remaining 1093 are to be inspected by the Highways inspectors during the Highways Inspection.

C.1.4 Categorisation of Structural Defects

General, Principle and Special Inspections will identify defects and give each defect on a scale Low, Medium, High or Urgent and a recommended redial work.

Developed from NMMP Core document 12.0 Defect Categorisation:

Degree of Deficiency	Structure Defect Scale	Timeframe for action
Category 0 Defects	Urgent	Emergency make safe response in 2 hours
Category 1 Defects	High	These require prompt attention and will require a permanent repair to be made within 5 working days of the defect being assessed.
Category 2 Defects	Medium and Low	All other defects. These will be prioritised and considered for repair within planned programmes of work.

C.1.5 – Maintenance of Structures

The overarching principle of holistic working as discussed in Core document of the Network Maintenance Management Plan will be considered during the organisation of maintenance works. Consideration of rectification of not only defects of a lesser nature, but also those on other assets shall be considered under the same traffic management and works order.

C.1.5.1 – Maintenance of Structures on PROW and Cycleways with Higher Private Rights

The Council maintains all bridges used for Public Rights of Way and that cross a natural feature only. When major new structures are installed on the network the Council shall ensure the structure is appropriate for its location and purpose. Structures shall be selected so as not limit to constrain future access improvements to the adjacent network. However, where there are there are private vehicular rights over a public footpath or bridleway bridge the landowner may be responsible for certain maintenance and repairs and the Council may seek a contribution towards the cost of works. In cases where a bridge is washed away, or has to be demolished on safety grounds, the landowner will have the option of replacing it with a suitable structure. The Council shall thereafter be wholly responsible for maintaining the new structure. Should a defect on a structure which is not maintained by the Council be apparent during an inspection this will be notified to the owning authority, and if necessary the PROW or cycleway closed.

Cattle grids are found on the ROW network in a handful of locations for the purpose of retaining stock and must be maintained by the farmer.

C.1.5.2 PROW Structures within the road network highway boundary

Where a small bridge or culverted ditch exists at the point a PROW leaves highway metalled carriageway, the presumption shall be that the structure is maintained as part of the PROW network. Most ditches are provided for the purpose of draining the adjoining land, with the road highway boundary starting at the roadside bank of the ditch. Therefore the structure used to bridge that ditch is on the PROW and shall be maintained as part of its network.

C.1.5.3 Reactive and Planned Maintenance

Accident damage, severe water scour or any other bridge defect that represents an immediate or imminent hazard (Cat 0) shall be rectified as follows:
The means of making safe shall be assessed and enacted immediately. This may involve restrictions to traffic or pedestrians or even closure with associated diversions.
Should any structure be found to present immediate or imminent hazard (Cat 0), the following shall be notified by CBC Highways with an assessment of the risk and recommended 'make safe' measures:

- Team Leader Highways Assets
- Assistant Director for Highways and Transport;
- Director for Community Services;
- Executive Members for Community Services;
- Key stakeholders, particularly blue light services.

Long-term repair measures shall be assessed. If traffic restrictions are necessary or public safety affected then permanent repairs are to be carried out as a matter of urgency. Otherwise, the work will be assessed for inclusion within the scheduled programme.

Planned Maintenance is to meet the need identified through Structural Inspections (including General, Principal and Special) as Medium and to address defects while they are in their 'infancy' as a result of a report by the public or the Area Teams.

Whenever possible, measures taken shall be in the form of a permanent repair.

Any work identified during these inspections deemed as urgent will be dealt with as above. Any other work required will be classified as 'Medium' or 'Low' priority and will be linked to the BCI for the structure. Maintenance work will then be programmed in order of priority and within a suitable financial year, depending on available funding.

Planned maintenance of bridges should take into account the environment and the surrounding ecology. Watercourses are often populated by sensitive or protected species and vegetation clearance is often required during routine maintenance operations. The possibility that the bridge may support roosting bats is a particular issue in masonry structures but should be considered at all sites. All bat species are protected under the provisions of both the Wildlife and Countryside Act 1981 (as amended); the Countryside and Rights of Way Act, 2000; the Natural Environment and Rural Communities Act (NERC, 2006); and by the Conservation of Habitats and Species Regulations (2010). The latter legislation makes them "European Protected Species". Maintenance could easily seal cracks being used by bats and works of this type should not occur until a bridge has been checked by a suitably qualified and licensed bat surveyor.

C.1.5.4 Obscene Graffiti on Highway Structures

Graffiti that is obscene or offensive represents an immediate or imminent hazard (category 1 defect) and shall be removed from highway structures as follows:
If the graffiti cannot be removed by the use of proprietary cleansing products, then it should be hidden by over-painting.

If the location means that the structure is difficult to get to then consideration will be given to the use of anti-graffiti coatings. Graffiti will then be cleaned on a regular basis or referred to the CBC Waste Team as appropriate.

Materials will also be supplied at the request of accredited voluntary bodies for more frequent cleaning or alternatively for the periodic over-painting of graffiti. Consideration will be given to the proposed provision of murals in subways and underpasses by accredited voluntary bodies to improve their appearance and to deter graffiti.

C.1.5.5 Programmed Maintenance

There is a four year programme of strengthening works which takes in to account the criteria of:

- Safety
- Serviceability
- Sustainability
- Community Effect

Where practicable improvement works shall also be delivered in conjunction with the strengthening programme.

Any programmed maintenance shall be planned to address environmental management issues as identified in the Environmental Impact Assessment section in the NMMP Core document and shall adhere to the Town and Country Planning (Environmental Impact Assessment) Regulations 2011.

In all other cases, account will be taken of the advice given in the BRE publication: "Guidance on specifying recycled content in Local Authority contracts for highway maintenance"

The programme of assessment and strengthening shall take into account the Authority's Resilient Network and adhere to national standards of assessment and the management of sub-standard structures. "Added value" shall also be considered in the design phase, with examples being addition of cycle lanes or improving transportation links and combining works with other programmed highway maintenance requirements.

C.1.6 – GAP Analysis of Current Practice (CoP) Guidelines

In July 2011 the Council commissioned a GAP analysis of the current management systems and processes of the structures stock, in comparison to the November 2011 Management of Highways Structures Code of Practice.
The analysis looked at each individual chapter of the CoP and then split this down into the key milestones, so that prioritisation of any corrective actions could occur.

The analysis found that:
29% of the Milestone 1 Actions were not being met;
65% of the Milestone 2 Actions were not being met; and
78% of the Milestone 3 Actions were not being met.

Milestone 1 Actions relate to processes that are required for a highway structures stock that is safe to use, inspect and maintain. There were 9 number Milestone 1 Actions that were not being met, of which corrective action has been prioritised as a matter of urgency.

Milestone 2 Actions encompass Milestone 1 and also intend to broadly include adoption of additional processes necessary to provide highway structures fit for purpose and that meet Government requirements. There were 20 number Milestone 2 Actions which were not being met.

Milestone 3 Actions additionally required the adoption of a process necessary to deliver agreed levels of service at minimum whole life cost. The analysis found that there were 14 number Milestone 3 Actions not being met.

The report presented reasons as to why each was or was not being adequately addressed, one of which being that the contract was let before the 2005 version of the Code of Practice was released, and so some gaps were not covered in that contract.

For further information, reference should be made to Central Bedfordshire Council Management of Highway Structures, GAP Analysis, July 2011 (Amey Document Reference 500387 (410924))

This GAP analysis is to be repeated in the financial year 2017/18

C.1.7 – Implementation Plan for GAP Analysis Results

Following the GAP analysis, an implementation plan was commissioned in 2012. The plan was produced to provide a programme for implementation of the recommendations over a 5 year period. This did not occur within the previous contract. Following the production of the revised GAP analysis, a new implementation programme is to be produced in 2018 and then incorporated in future reviews of the NMMP.

Part 2: Road Restraint Systems

Road Restraint Systems are used both locally and nationally to contain errant vehicles within the highway boundary, and protect them from objects which are located off of the highway which may serious injury or death. An operational road restraint system should not only contain errant vehicles to the carriageway but also be able to deflect and absorb the force of the collision and control the errant vehicle in such a way as to minimise risk to other vehicles in the same section of carriageway.

Examples of locations for road restraint systems would be on the approaches to over bridges, to prevent errant vehicles from rolling down the embankment, or on the approach to under bridges where protection is required to prevent errant vehicles striking the structure.

C.2.1 Inspections of Road Restraint Systems

The overall purpose of inspection, testing and monitoring is to check that the highway restraint systems are safe for use and fit for purpose. It also provides the data required to support good management practices such as Asset Management Planning and Maintenance Planning and Management.

All information from the network inspection regime, together with any immediate or programmed action, including nil returns, shall be recorded. Such information shall, whenever systems are available be recorded in a GIS format so that it may be utilised together with other relevant information in the review of the maintenance strategy, practices and the development of works programmes. Accurate recording of inspection results are crucial in assisting a defence against any third party claims.

Where inspections identify that a Road Restraint System is not constructed to current standards, a note should be added to the Asset Inventory so that future replacement may occur under a programme of works.

C.2.1.1 Highways Inspections of Road Restraint Systems

Highway Inspections of the Road Restraint Systems are carried out by Highways Inspectors as part of their Highway Inspection Programme. It is undertaken to identify defects likely to create danger or serious inconvenience to users of the network or the wider community. The risk of danger is assessed on site and categorised so as to allow for an appropriate priority response.

The frequency of Highway Inspections shall be as per the Carriageway, Footway or Cycleway network upon which, or adjacent to which, the Road Restraint System asset is to be found.

From NMMP Core Document 12.0 - Defect Categorisation:

Degree of Deficiency	Timeframe for action
Category 0 Defects	Emergency make safe response in 2 hours
Category 1 Defects	These require prompt attention and will require a permanent repair to be made within 5 working days of the defect being assessed.
Category 2 Defects	All other defects. These will be prioritised and considered for repair within planned programmes of work.

The Risk Matrix shall be used to classify the degree of risk posed by all identified defects as identified in the Network maintenance Management Plan Core document 12.0.

Where defects with potentially serious consequences for network safety are made safe by means of temporary signing or repair, arrangements should be made for a special inspection regime to ensure the continued integrity of the signing or repair is maintained, until a permanent repair can be made.

Definition of a Road Restraint System Defect at Investigatory Level

- Unprotected vertical or horizontal protrusions from the Road Restraint System, which could cause damage
- A total loss of containment for one or more sections of Road Restraint System, including, but not limited to, damage caused by collision
- A permanent deformation of the guard rail or displacement of the support posts, foundations and anchorages
- Unprotected drops at the edge of carriageway
- Clearance of the restraint barrier shall be checked to ensure a clearance of 600mm above the carriageway within 1500mm of the edge of carriageway and from ground level when greater than 1500mm
- Obstructions within the working width of the barrier which could impinge upon the designed dynamic deflection of the barrier under impact loading

An example of what should be recorded during a routine Highway Inspection can be found on page 40 of “BS 7669-3:1994 Vehicle Restraint Systems – Part 3 Guide to the installation, inspection and repair of Safety Fences”.

C.2.1.2 Detailed Inspections

Highways Road Restraint Systems should be subject to regular Detailed Inspections, with a period of 5 years between inspections for assets which are less than 10 years old and a period of 2 years between inspections for assets which are over 10 years old. These Detailed inspections will be undertaken by the Service Provider.

Detailed Inspection comprises a close examination, within touching distance, of all accessible parts of the structure, utilising suitable access and/or traffic management works as necessary.

The clearance of the restraint barrier shall be checked to ensure a clearance of 600mm above the carriageway within 1500mm of the edge of carriageway and from ground level when greater than 1500mm.

The clearance behind the barrier shall be inspected to ensure that it meets the minimum requirements of manufacturer's specified working width or overhang from high sided vehicles impacting the barrier, as defined in BS EN 1317-2. For the correct minimum distances of Safety Barrier from the top or toe of slopes in verges or in central reserves where safety barrier is required for other reasons, reference shall be made to Chapter 3 of Section 2 Part 8 of Volume 2 of the Design Manual for Roads and Bridges (TD 19/06).

Detailed Inspections may also include a modest programme of tests when considered necessary.

Detailed Inspections should be sufficient in scope to determine the condition of all parts of the Road Restraint System, the extent of any significant change or deterioration since the last Detailed Inspection and any information relevant to the stability of the fence. The Detailed Inspection should establish the scope and urgency of any remedial action identified.

An example of record sheets for detailed inspection can be found on pages 42-44, 45-46, 47-48 and 49-50 of "BS 7669-3:1994 Vehicle Restraint Systems – Part 3 Guide to the Installation, Inspection and Repair of Road Restraint Systems", for tensioned corrugated beam, un-tensioned corrugated beam, open box beam and tensioned rectangular hollow section beam respectively. The Authority does not have any wire rope Road Restraint Systems.

C.2.2 Network Maintenance Types

C.2.2.1 Reactive and Planned Maintenance

Having confirmed that a Road Restraint System (Road Restraint System), parapet or pedestrian barrier represents an immediate or imminent hazard (category 1 defect)

The means of making safe shall be assessed and enacted as soon as possible and shall be rectified as described below.

C.2.2.1.1 Beams

Any structural damage to the beam will render it unserviceable. Particular attention should be paid to bolt holes. Any corroded adjuster or anchorage bolt should be replaced.

Mounting Height

If the damaged section is not more than 10 standard beam lengths, replace to match existing fence height.

If the damaged section is in excess of 10 standard beam lengths then the beam should be replaced at a mounting height of 610mm +/- 75mm, measured from the top of the paved surface if less than 1500mm from the edge of carriageway, or from ground level if greater than 1500mm from the edge of carriageway. Any variance in the mounting heights of the old and new beams should be taken out over two or three beam lengths at each end of the damaged section.

Replacement of tension corrugated beams

All beams that are installed as part of repair works should be podgered-out from the adjacent beam.

Where this results in the replacement length exceeding the length of gap to be enclosed, then either:

A. Slacken post bolts up to adjacent adjuster assembly and draw the beams back (replacing post bolts); or

B. Use an additional adjuster assembly within the replaced section.

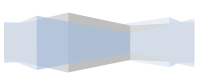
Replacement of open box beams

If the damaged section is in excess of 100m but does not include an expansion assembly, then opportunity should be taken to include one within the section of the repaired fence.

If the replacement beams are too long for the length of section to be replaced then either:

A. Assemble several beams away from the posts suitably supported and attached at each end to an existing length of fence. Push the assembled beam up to the posts, taking care not to damage the galvanizing; or

B. Use an expansion assembly with the expansion gap set as required, this should accommodate up to 36mm. A half standard beam may also be required



Incomplete works

When no work is being undertaken on an incomplete section of fence, or where there is a delay between a damaged beam being removed and replacement installed, the gap should be protected by an assembled beam, with hand tightened fasteners, ramped down and dug into ground or protected with sand bags.

C.2.2.1.2 Posts

Any structural damage to a post will render it unserviceable. It is necessary to identify the type of post used.

Where a post has moved out of the correct upright position in the ground but has not yielded near the ground level, this will indicate that the stability of the ground is suspect. Post foundation tests such as push/pull tests should be considered

A post that is loose in the ground should be removed and replaced; attempting to consolidate the soil around an in-situ post is not satisfactory.

Where the post is unserviceable but the beam is undamaged, there may be no need to dismantle the beam prior to replacing the post.

Driven Posts

Where a standard driven post has moved out of the correct upright position in the ground, it should be normally replaced with a long driven post unless there is evidence to suggest that a designed concrete footing is required, the size of which should be determined by an engineer. A check on the location of buried services should be carried out prior to the driving of any posts.

Where a long driven post is no longer in the correct upright position, it will be necessary to provide a concrete foundation, the size of which should be determined by an engineer.

Driven Post Centres

In tensioned corrugated beams, if the posts are at standard centres, then the new posts should be driven at a position to correspond with the post bolt slot mid way between the original post locations. This will result in the posts at either end of the repaired section being 1.6m from the adjacent undisturbed post.

In open box beams and Rectangular Hollow Section (RHS) beams, the posts should be driven into undisturbed ground at standard spacings. This will result in the posts at either end of the repaired section being closer than the standard spacing to the undisturbed post.

Posts in Concrete Foundations

Any concrete foundation that has been disturbed should be removed and replaced with a new designed foundation, the size of which should be determined by an engineer.

A damaged post in any special undisturbed designed concrete foundation may be cut off at surface level and the concrete cored to provide a socket foundation, in this case non-setting passive filler should be used to fill the void to a level slightly above the top of the socket. Alternatively a surface-mounted post may be used; in this case non-setting passive filler should be used to fill the void to a level slightly above the top of the socket.

Surface-mounted Posts
Prior to the replacement of a surface mounted post, the holding down bolts should be examined to ensure that none of them have been pulled out of the concrete. Any movement or structural damage will render the bolts unsuitable for further use and they should be replaced with suitable fastenings which are able to withstand the pull-out load specified in then Manual of Contract Documents for Highways Works (Series 400).

C.2.2.1.3 Anchors

Anchorages
If an accident occurs within 50m of a ramped end or full height anchor, then the anchor block should be inspected. The Engineers instructions should be sought if there is any sign of movement

Full Height Anchorages
Where full height anchorages are set directly into concrete and the frame is damaged, but the concrete foundation is sound and undisturbed, then either:

A. Cut off the frame at the surface of the concrete and core to provide sockets for the new frame; or

B. Cut off the frame at the surface of the concrete; fill the holes with concrete and install a surface mounted frame.

C.2.2.1.4 Fasteners

Any fastener in the damaged section should be replaced with new components conforming to current specifications.

Any post screws affected by re-tensioning should be replaced with a new component conforming to the current specification.

C 2.2.1.5 Planned Re-tensioning

The Road Restraint Systems maintained by Central Bedfordshire Council shall be subject to a routine re-tensioning of Tensioned Corrugated Beams. It must be carried out at two yearly intervals and preferably in conjunction with the two yearly detailed inspections (as referenced in C.2.3.3). Note that when re-tensioning Tension Corrugated Beam, all post screws must be replaced. Re-tensioning must be carried out in accordance with the procedures set out in BS 7669-3.

C.2.2.2 - Programmed Maintenance

Programmed replacement of Road Restraint Systems shall be subject to the Road Restraint Risk Assessment Process (RRRAP) and TD19/06 (Requirement for Road Restraint Systems) which shall identify risks and the mitigations for those risks.

Appendix 1: Version Control

Version	Author	Checked	Approved	Comment
16th Nov 2017	C Nicol	J.Cross		Revised draft for Committee

Contact us...

Për Informacion | Per Informazione | Za Informacije | ਜਾਣਕਾਰੀ ਲਈ | برای اطلاع

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