Maintenance & Inspections Strategy:

Structures

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Essex County Council

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1.1 Introduction

The Essex County Council approach to Structures Maintenance & Inspections has been fundamentally reviewed with maintenance engineers, inspectors and other practitioners to take account of the recommendations and best practice set out in the October 2016 “Well-managed Highway Infrastructure: A Code of Practice” and those from the Design Manual for Roads and Bridges.

The Code of Practice is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service through risk-based assessment.

This document supports the overarching Essex County Council Highways Maintenance Policy and describes the service levels relating to the Council’s risk-based approach to managing how it organises, inspects and maintains the Structures that it is responsible for. The document will also set out the service levels and details of its risk based approach.

Alongside this strategy will be supporting documents that detail the processes & procedures to be operated.

This strategy covers the following key areas:

- Network Hierarchies
- Inspections
- Defect Investigatory levels
- Items for Inspection
- Defect Assessments
- Response times.

1.2 Network Hierarchies

The Council have produced a tailored, risk-based functional route hierarchy that organised the structures that Essex County Council Highways are responsible for into four hierarchies:

- Structures Priority 1 (STR1)
- Structures Priority 2 (STR2)
- Structures Priority 3 (STR3)
- Structures Priority 4 (STR4).

This hierarchy ensures that all structures on the network are addressed appropriately, based on their unique factors. The hierarchy allows the flexibility for the network to evolve along with the industry, commerce, habits and needs of Essex and the highway user.

Table outlining the Essex Structures Hierarchy.

Structures Hierarchy	Hierarchy Description title	Description
STR1 - Structures that are the highest priority of the network. The majority of these structures endure a higher amount of usage through frequency of traffic and loads or provide essential links. They are vital to ensure the continued unhindered flow for commerce, goods and people.	All of the PR1 Network	All structures that either support or span a PR1 route are classified as an STR1 structure due to the volume of fast moving, long distance traffic and commercial use of the network. As a result of prioritising the structures on the PR1 routes this will maintain the safety, availability and resilience of the network. This will ensure ECC's robust resilient approach towards prioritising and maintaining free flowing traffic on the Essex network (can include Footbridges.)
	Highways England High and Heavy Routes (Abnormal loads transporting transformers)	Prioritising the availability on selected routes of the network for Abnormal load vehicles and all structures that are on Highways England High and Heavy routes must be safe and sustainable to allow for applicable vehicles to use the network.
	Single access to residential and commercial properties	Structures that are the only available access to properties will be treated as a high priority.
	Critical economic developments (Abnormal load routes)	Keeping selected Abnormal load routes in the county accessible to promote critical industrial and commercial developments.
	Highways England diversion routes	Ensure that Highways England diversion routes are kept available for suitable traffic.
	Access points for Abnormal loads	Maintain access points to known heavy Abnormal loads users. (E.g. Railway Museum, Barracks and boat yards etc.)

Structures Hierarchy	Hierarchy Description title	Description
	Road over rail	To reduce the risk to road rail incursion and prevent disruption to rail users.
	Non-vehicular access into town/city centre where there is no safe alternative	Pedestrian/cyclist specific structures that provide the only available access to the city/town centre will be treated as a STR1.
	Emergency services	All applicable structures that are necessary for emergency services to gain access in and out of depots will be treated as an STR1 structure.
	Supporting key public services (e.g. Hospitals, Ports, Airports and Bradwell)	All applicable structures that are necessary for key public services to gain access in and out of will be treated as an STR1 structure.
	High-risk structures (materials/construction type)	Due to the unique material properties and construction of cast iron, half-joint and post-tensioned structures they are prioritised as STR1.
	Monitoring List	Structures that are on the monitoring list as an interim protection measure following assessment by a competent officer, are included as STR1. These structures will remain as STR1 until relevant remedial works, interim protection measures, full asset replacement or permanent works have been carried out and the structure has been reassessed and no longer requires monitoring.
STR2 - Structures that are of a high importance to ensure the continued unhindered flow for commerce, goods and people.	All PR2 Network + relevant local access structures	Structures on PR2 routes will be part of interconnecting or links with PR1 or further PR2 routes. Relevant local access routes with a structure/ structures will often lead off or onto a PR2 route. This can be the only link between two rural villages.
	Filler beam construction type	Since their last assessment, the codes that the filler beams were assessed to have been re-examined and less conservative assessment

Structures Hierarchy	Hierarchy Description title	Description
		methods have been developed.
STR3 - Structures located mainly on the local road network.	Remaining Road Structures	All remaining road structures that have not been categorized as being part of the STR1/ STR2 network. All of the remaining road structures will be located on local roads.
STR4 - The lowest priority structures assets on the network.	Footbridges and PRoW	Footbridges and Public Rights of Way will serve as one of many ways to access further Public Rights of Way or Local Road footpaths. These areas will be mostly rural.
	Noise Barriers	Noise Barriers are minor ancillary assets managed by the structures team that reduce noise pollution to nearby properties.

1.3 Safety Inspection – Strategy and Service Levels

1.3.1 General Principles for completion of Structures Inspections

Inspections are undertaken in accordance with the latest version of the relevant codes/standards. The Council shall carry out structures inspections undertaken by suitably experienced and competent staff in the manner deemed appropriate for the particular inspection site. The safety of the Structures Inspector will be paramount in determining the method of inspection.

Prior to undertaking any inspection, the inspector must review the structure records to familiarise themselves with the characteristics of the structure, any hazards, the condition at the time of the last inspection and any significant maintenance/ modifications since the last inspection.

There are five types of structures inspection that are undertaken;

- Routine Inspections;
  - General Inspection (GI)
  - Principal Inspection (PI)

- Reactive Inspections;
  - Safety Inspection
  - Special Inspection
  - Inspection for Assessment

1.3.1.1 Investigatory Levels

Throughout this document investigatory levels are not referred to. Structures are a complex asset group and similar defects have entirely different consequences on each individual structure. Therefore it is not possible to assign generic investigatory levels. Instead the Structures Inspector/Engineer will determine the appropriate response at the time of inspection.

1.3.1.2 General Inspection (GI)

The purpose of a General Inspection is to provide information on the physical condition of all visible elements on a highway structure and is scheduled to be undertaken biennially. A GI comprises of the visual inspection of all parts of the structure that can be inspected usually without the need for special access equipment or extensive traffic management arrangements.

1.3.1.3 Principal Inspection (PI)

The purpose of a Principal Inspection is to provide information on the physical condition of all inspectable parts of a highway structure. A PI is more comprehensive and provides more detailed information than a GI. A PI comprises a close examination, within touching distance of all inspectable parts of a structure. A PI should utilise as necessary suitable inspection techniques such as; access and/or traffic management works.

Suitable inspection techniques that should be considered for a PI include hammer tapping, paint thickness measurements and material testing. Testing is not a requirement for a PI however, will only be undertaken when there is concern regarding; condition, age, current assessment scores or the previous inspection score of the structure.

PIs are required to be undertaken every six years unless an altered inspection interval has been agreed, providing the proposal is supported by a risk assessment. Where a risk assessment has not been approved to increase the PI interval beyond six years, intervals shall remain at six years. PI intervals determined through risk assessment shall not exceed twelve years.

When a General Inspection coincides with a due Principal Inspection only the latter is undertaken.

In the event of conditions that affect business continuity for example, severe weather events, the inspections may be suspended and re-programmed at the decision of the Inspections Manager.

Further details on the methodology and procedures for carrying out safety inspections are set out in supporting documents.

1.3.1.4 Routine Inspection Frequency

The inspection frequency guidance that sits the current standard is shown on the table below. This shows the best practice guidance for routine inspection frequencies.

Feature	Inspection type	Inspection frequency
Structures	General Inspection Principal Inspection	Every two years Every six years (Can be extended to up to twelve years)

The Council carries out GIs every two years, as per the guidance found above. The PI programme is developed using a risk based approach

1.3.2 Reactive Inspections

1.3.2.1 Safety Inspection

The Council receives defect reports and enquiries relating to condition concerns from a number of sources regarding its highway structures. Due to their nature urgent reports cannot be reported online and the website provides the contact number for the customer to call to report anything that in their opinion is urgent.

An ad hoc Safety inspection may be required following notification of a defect by a third party, e.g. Emergency services. Should any Safety Inspection, or other source, reveal a possible defect requiring urgent attention, including defects that may represent a hazard to road, rail and other users, the Council shall immediately take action as is required to safeguard the public and/or sustain structural functionality.

Both the Structures Asset Management Team and Structures Team receive and triage structures related enquiries. If following triage there is believed to be either a public safety concern or structural damage to an asset, a Structures Inspector/ Engineer will visit the site to assess the query and carry out a Safety Inspection. An enquiry is not considered to be a defect until it has been assessed as a defect on site by a Structures Inspector/Engineer. Until that time it remains a query from the public. Any enquiry relating to a structure must be passed on to the Structures Team to assess, this includes enquiries received out of hours.

On receipt of the report the unconfirmed defect will be triaged, based on the information received, and assigned one of the following two categories.

Urgent	Urgent enquiries will be assessed the same working day. *
Standard	The aim is to have an average assessment response time of 28 days including site visit if required.

**During periods of high demand such as the period following severe weather it may not be possible to comply with these response times.*

1.3.2.2 Special Inspection

Special Inspections are carried out when a need is identified by a competent engineer. The purpose of a Special Inspection is to provide detailed information on a particular part, area or defect that is causing concern. Special Inspections can also be undertaken when the issue is beyond the requirements of the General/Principal Inspection regime. Specific construction forms that may require additional inspections that go over the remit for a GI or PI, and such would have a Special Inspection programmed include;

- Post-tensioned structures
- Cast Iron structures
- Half-joint structures
- Structures with Cathodic Protection

A Special Inspection will be tailored for specific structure type or defect/issue and may require a close visual inspection, testing and/or monitoring. It may involve a tailored one-off inspection, a series of inspections or an ongoing programme of inspections. As such, Special Inspections are tailored to specific needs.

Refer to the latest codes / standards for monitoring, associated with the management of substandard structures.

1.3.2.3 Inspection for Assessment

The sole purpose of an Inspection for Assessment is to provide the information that is required to enable a structural assessment. Once an Inspection for Assessment has been complete, the Assessment can take place, Assessments are carried out to calculate the load capacity of the structure.

1.4 Items to be inspected

The main purpose of a routine inspection is to provide information on the physical condition of all inspectable elements on the structure. Defects that are likely to be a possible source of hazard or of serious inconvenience to the highway user should also be identified. The inspection also identifies non-safety defects that have an impact on long term serviceability and sustainability of the highway asset.

During routine inspections, all defects are recorded, assessed and prioritised and the worst defect present on each element is scored using the severity and extent tables to calculate the structures' BCI score.

All defects that are recorded are assessed by the inspector and prescribed an appropriate works priority code, using their experience, training and engineering judgement. These can be either;

- Very High (Urgent: Make Safe Required)
- High
- Medium
- Low

Due to the nature and complexity of highway structures any assessment or inspection must be carried out by a competent team member that has experience, sound engineering judgement and has received relevant training in all aspects of the inspection process including thorough understanding of the following five tables which are used to describe and score defects.

The tables show the following;

1. Severity Descriptions
2. Extent Codes
3. Generic Severity Descriptions
4. Permissible Combinations of Severity and Extent
5. Element Importance

Table 1
Severity Descriptions

No	Item	Severity					
			1	2	3	4	5
1	Metalwork	.1	No signs of rusting or damage	Minor surface rusting	Moderate pitting	Deep pits and perforations (localised sever corrosion)	Disintegrating by corrosion mechanisms
		.2	No loss of section thickness	Minor section loss (penetration less than 5% of section)	Moderate section loss causing some reduction in functionality (penetration 5 to 20% of section thickness)	Major section loss causing significant reduction in functionality (penetration more than 20% of section)	Collapsed or collapsing
		.3	No signs of rusting or damage to bolts, nuts and rivets	Non structural bolts loose, minor corrosion of nuts and washers	Non structural bolts missing, moderate corrosion of rivet heads, nuts and washers	Structural bolts missing, rivets loose or missing, crack through bolt	Failure of element due to missed/failed bolts/rivets
		.4	No corrosion or damage of weld runs	Slight corrosion of weld run	Crack at toe of weld, moderate reduction in size of weld due to corrosion	Longitudinally cracked weld, major reduction in size of weld due to corrosion	Weld connection failure (longitudinal crack)
2	Reinforced Concrete, Prestressed Concrete & Filler Joist	.1	No spalls	Minor localised spalls exposing shear links	Major localised spalls exposing shear links and main bars with general corrosion	Joined up, deep spalls exposing shear links and main bars with general and pitting corrosion	Collapsed
		.2	Hairline cracks, difficult to detect visually	Cracks and crazing in areas of low flexural behaviour (cracks less than 0.3mm)	Cracks and crazing in areas of high flexure. Cracks approx' 1mm and easily visible	Wide/deep cracks (more than 2mm). Shear cracks	Element unable to function due to structural cracks
		.3	No signs of damage to prestressing	Substandard grouting of ducts (may not be visible)	Cracks along line of prestressing duct	Exposed prestressing cables	Failed prestressing cables
		.4	No signs of delamination	Early signs of delamination e.g. cracks with rust staining	Delamination in areas of low flexural and/or shear action	Delamination in areas of high flexure and/or shear action	Failure due to delaminated bars
		.5	No signs of thaumasite or freeze-thaw attack	Slight cracking caused by thaumasite or freeze-thaw	Moderate thaumasite or freeze-thaw attack	Major thaumasite or freeze-thaw attack	Failure due to thaumasite or freeze-thaw attack

Severity Descriptions (continued)							
No	**Item**	**Severity**					
		1		**2**	**3**	**4**	**5**
3	Masonry, Brickwork & Mass Concrete	**.1**	No evidence of deformation	Minor deformation	Moderate deformation	Major deformation	Collapsed
		.2	Pointing sound	Minor depth of pointing deteriorated	Moderate to significant depth of pointing lost, but does not appear to be rapidly disintegratingor crumbling, bricks noteasily loosened	Pointing in very poor condition, severely weathered, crumbling to touch and/or significant depth loss, bricks easily loosened	Collapsed
		.3	No arch ring cracking or separation	Arch ring cracks difficultto see	Arch ring separation (gap less than 25mm)	Arch ring separation(gap greater than 25mm)	Disintegrated
		.4	No arch barrel cracks	No diagonal cracks, longitudinal cracks lessthan 3mm wide, lateralcracks	Diagonal cracks, longitudinal cracks greater than 3mm wide	Diagonal cracks, longitudinal cracks breaking barrel into 1msections or less	Arch barrel failure
		.5	No cracks	Minor hairline cracksand shallow spalls	Moderate cracks (easily visible, crazing) and deep localised spalls	Major cracks and spalling	Failure due to structural cracks
		.6	No bricks/masonry blocks missing, minorsurface weathering	Few bricks/stones missing (no adjacentones missing), majorsurface weathering	Moderate loss of bricks/stones	Severe loss of bricks/stones	Failure due to missing stones/bricks
		.7	No bulging, leaning or displacement	Minor bulging, leaningor displacement	Moderate bulging, leaning or displacement	Severe bulging, leaningor displacement	Collapsed or non functional
4	Paintwork and Protective Coatings	**.1**	Finish coat sound, slight weathering	Normal weathering of finishing coat	Spot, chips and cracksof the finishing coat, undercoat exposed butsound	Failure of finishing coatand spots, chips and cracks to undercoat/substrate	All coats failed

Severity Descriptions (continued)								
No	**Item**	**Severity**						
		1		**2**	**3**	**4**	**5**	
5	Vegetation	**.1**	Slight to no vegetation	Minor vegetation causing no structuraldamage (surface mosses, small grassand weeds)	Vegetation growth on ornear bridge causing structural damage and/or deformation e.g. roots and branches of nearby trees, small tree/plants growing on structure	Vegetation growth on ornear bridge causing major structural damageand/or deformation e.g. roots and branches of nearby trees, large tree growing on structure	Failure caused by vegetation growth or atree collapsing on the structure	
		.2	Slight to no vegetation	Low depth/density of vegetation cover, easily removed	Significant depth/density of vegetation, obscuring inspection e.g. ivy	Inspection impossibledue to vegetation growth but structural damage due to vegetation unlikely	Inspection of critical structural elements not possible due to densityof vegetation and rot systems likely to be causing structural damage	
6	Foundations	**.1**	No visible settlement of structure	No visible settlement, but cracks may be dueto it	Minor settlement of structure	Major settlement of structure	Collapsed due to settlement	
		.2	No visible differential movement of structure	No visible movement, but cracks may be dueto it	Minor differential movement of structure	Major differential movement of structure	Collapsed due to differential movement	
		.3	No visible sliding of structure	No visible sliding, but cracks may be due to it	Minor sliding of structure	Major sliding of structure	Collapsed due to sliding	
		.4	No visible rotation of structure	No visible rotation, but cracks may be due to it	Minor rotation of structure	Major rotation of structure	Collapsed due to rotation	
		.5	No scour	Minor scour	Moderate scour	Major scour	Dangerous scour or failure	
		.6	Substructure appears unaffected by foundation faults (assume no foundation faults)	Foundation faults causing minor cracks insubstructure	Foundation faults causing moderate cracking in substructure	Foundation faults causing major cracksand deformation in substructure	Failure due to foundation faults	

Severity Descriptions (continued)								
No	**Item**	**Severity**						
			1		**2**	**3**	**4**	**5**
7	Invert, apron& river bed (also see 2 and 3)	**.1**	No scour		Minor scour	Moderate scour	Major scour	Dangerous scour or failure
		.2	No vegetation growth or silting		Vegetation growth, trapped debris and silting causing slight disruption to flow	Vegetation growth, trapped debris and silting, significant disruption to flow causing faster flow in areas of river	Vegetation growth, trapped debris and silting severe disruptionto flow causing much flow in areas of the river	Failure caused by vegetation growth, trapped debris and silting
8	Drainage	**.1**	In sound condition andfully functional		Mostly functional (lessthan 25% of cross section blocked)	Part functional (25% to50% of cross section blocked)	Mostly non functional (more than 50% of cross section blocked)	Totally blocked/non-functional/broken
		.2	Causing no staining		Causing minor staining	Cleaning of staining required	Urgent cleaning required	Urgent & frequent cleaning
		.3	No structural damage		Causing minor structural damage	Causing structural damage	Causing major structural damage	Causing severe damageto adjacent elements
		.4	No blockage of weep holes, outlets		Minor blockage of weep holes, outlets	Moderate blockage of weep holes, outlets	Major blockage of weep holes, outlets	Non functioning weep holes
9	Surfacing	**.1**	Little to no wear and weathering		Minor wear/weathering	Moderate wear/weathering	Major wear/weathering	Dangerous
		.2	No crazing, tracking or fretting		Minor crazing, tracking and/or fretting	Moderate crazing, tracking and/or fretting	Major cracks, tracking and/or fretting	Complete break up
		.3	Dense		Poor texture	Open texture	Very open texture	Dangerous
		.4	Sound		Cracks in top layer	Top layer breached	Deep cracks and potholes	Top layer completely missing
		.5	Not slippery		Starting to become slippery	Definitely becoming slippery	Slippery	Dangerous
	Flagged Surfacing	**.6**	No defects		Trips <5mm	Cracked flags Trips > 5mm and <10mm	Trips > 10mm and <20mm	Trips > 20mm

Severity Descriptions (continued)							
No	**Item**	**Severity**					
		1		**2**	**3**	**4**	**5**
11	Embankments	**.1**	Sound. No deformation	Minor subsidence. Minor deformation	Minor slip/settlement causing slight crackingof carriageway	Major slip/settlement causing major crackingof carriageway	Critical slip/settlement
12	Bearings (alsosee 1)	**.1**	Negligible rusting, minor weathering	Minor rusting, moderate weathering	Moderate rusting	Major rusting	Failed or seized due to rusting
		.2	Correct position	Minor offset	Moderate offset/tilt	Dislodged	Off bearing/missing
		.3	Sliding bearing in correct position	Sliding bearing in slightly skewed (off centre) position at normal temp	Sliding bearing at endof travel in normal temperatures	Sliding bearing beyond designed extent of travel at normal temperatures	Sliding bearing failed
		.4	No crazing	External crazing	External breakdown	Major breakdown (PTFE, laminations, rubber etc.)	Complete breakdown
		.5	Sliding plate sound	Minor deformation of sliding plate	Moderate deformationof sliding plate	Major deformation of sliding plate	Bearings seized by sliding plate deformations
		.6	Bearings sound	Minor cracks	Moderate cracks or loose	Splitting and deformation	Disintegrated
13	Impact damage	**.1**	No damage	Slight surface scoring, minor displacement of element e.g. marking and chipping of beam faces, several bricks across arch barrel width, slight impact deformation of steelwork	Moderate displacementof element e.g. beam slightly offset on bearings, significant number of bricks knocked out across arch barrel width, moderate impact deformation of steelwork	Severe displacement of element e.g. beam dislodged off bearings, many bricks knocked out across arch barrel width, major impact deformation of steelwork	Knocked down, broken, collapsing
14	Waterpro ofing (try to exclude leaks through joints)	**.1**	No visible sign ofseepage	Minor seepage through deck/arch etc. (slow dripping)	Moderate seepage through deck/arch etc. (some resistance to seepage)	Major seepage (little resistance) through deck/arch etc. causing structural damage	Non-functional Causing critical structural damage

Table G.10 - Severity Descriptions (continued)							
No	**Item**	**Severity**					
		1		**2**	**3**	**4**	**5**
15	Stone Slab Bridges	**.2**	No visible sign ofseepage	Damp surface, slightwater stains on soffit	Wet surface, drops ofwater falling and significant staining	Very wet surface and stalactites causing structural damage	Major structural damage caused by waterproofing not functioning properly
16	Timber	**.1**	No sign of damage	Minor signs of damage	Moderate signs of damage	Major signs of damage	Disintegrated through damage
		.2	No loss of section	Minor section loss (decay less than 5% ofsection)	Moderate section loss causing some reductionin functionality (decay 5to 20% of section thickness)	Major section loss causing significant reduction in functionality(decay more than 20% of section thickness)	Collapsed or collapsing
		.3	No visible signs of openjoints	Joints/shakes open slightly on surface or cracked coating at joints/shakes	Open joints/shakes < 50% width beam, in areas of low flexure or <25% in areas of high flexure	Open joints/shakes < 50% width beam, in areas of low flexure or <25% in areas of high flexure	Beam separated into multiple elements
		.4	No signs of rusting or damage to fixings	Non structural bolts loose, minor corrosionof fixings	Non structural bolts missing, moderate corrosion of fixings	Structural fixings missing	Failure of element dueto missed/failed fixings
17	**All Joint Types**						
	Joint leakage	**.1**	The area below the expansion joint shows no sign of water or water staining. This includes the underside of the deck, the bearing shelf and the abutment wall.	Small amounts of water appear to be leaking from the expansion joint. There is no apparent damage to other parts of the structure.	Noticeable volumes of water are passing through the expansion joint, and there is now a reasonable expectation that durability of the structure will be affected. Damage is occurring to protective systems such as the paint system.	High volumes of water are draining through the expansion joint, causing some minor structural damage including minor corrosion to the bearings or bearing shelf.	The expansion joint is open and water is freely Passing from the carriageway through the expansion gap. Corrosion is significant to the bearings, bearing shelf or abutment.

Severity Descriptions							
No	**Item**	**Severity**					
			1	**2**	**3**	**4**	**5**
	Joint sub-surface drainage	**.2**	Joint drainage appears to be functioning correctly There are no signs of ponding adjacent to the expansion joint. Outlets for the drainage are clear.	The outlets to the drainage are slightly blocked, but there is no obvious sign of ponding on the carriageway by the expansion joint.	There are signs of ponding on the carriageway by the expansion joint, but they are not extensive. The outlets are partially blocked.	Surface water on the carriageway is significant. The drainage outlets are almost fully blocked (>75%).	Joint drainage is completely non-functional Ponding is severe. The drainage outlets appear blocked.
	Adjacent road surfacing	**.3**	The road surfacing adjacent to the joint is in as-new condition, with no cracks, tracking or rutting.	There is some cracking, but this is not affecting the ride quality, or exposing any part of the joint.	The road surfacing is significantly cracked, but there are no pot-holes, nor is any part of the joint exposed.	The cracking is such that pot-holes are expected to form shortly. The joint or nosing is becoming exposed.	The surfacing has disintegrated, exposing the nosing or the joint component. There may be leakage
	Fixtures	**.4**	All plates and cover plates are in good condition, securely attached.	A plate is slightly defective, either bent or loose, but it is not causing any loss of functionality or a hazard.	A plate is significantly loose or heavily damaged but is generally functional and is not causing a hazard.	A plate is missing, but not causing a significant hazard but may affect durability in the long term.	A plate is missing or sufficiently loose to cause a significant hazard.
	Joint vegetation	**.5**	There is no vegetation growing from any part of the expansion joint, either in the carriageway, verge, reserve or from underneath.	Small, insignificant amount of vegetation are growing from the joint, and are causing no hazard or not affecting functionality.	Small amounts of vegetation are growing from the joint, and are causing a limited inconvenience, for example to pedestrians.	Vegetation is present in the joint and is fairly widespread, causing inconvenience and reduced durability of the joint.	There is a significant amount of vegetation growing from the expansion joint, causing corrosion to the joint.
	Buried Joint						
	Surfacing over buried joint	**.6**	The presence of the joint is not obvious from the surface (except for the sealed saw-cut, if present). There are no defects to the carriageway surfacing or verges/ footways /reserve over the joint	There are some cracks in the surfacing over the joint, but these cracks are very narrow and shallow (max depth 25mm).	The cracks are clearly visible, up to but not exceeding 5mm in width at the extreme. The depth of the crack is less than 50mm. There is no evidence of water leakage.	Cracks have developed, up to 25mm in width at the extreme. The depth of the crack is less than the depth of the surfacing.	The width of the crack is greater than 25mm and the depth is similar to the depth of the surfacing. The surfacing around the cracks is breaking up. There is evidence of leakage.
	Crack inducer sealant	**.7**	The sealant in the saw-cut is fully present, fully bonded to each side of the crack and is not raised above the surfacing level.	The seal has some cracks, which are hairline and short and do not affect the integrity of the seal. The seal has not been pushed upwards to any noticeable degree.	The cracks are clearly visible, or some of the seal is unbonded. Generally, it is still functional.	There is major cracking of break up of the sealant, so it can no longer be considered fully functional.	The seal is completely missing at some point causing break up of the adjacent but unsupported surfacing.

Severity Descriptions							
No	**Item**	**Severity**					
		1		**2**	**3**	**4**	**5**
	Asphaltic plug joint						
	Plug debonding	**.8**	The plug/ surfacing interface is bonded, with no gap evident, at any point across the carriageway, verge, reserve or footway.	The plug has debonded from the surfacing at some point across the carriageway, but the gap is still narrow (12mm). The depth of the debonded area is maximum 25mm. The adjacent road surface remains in good condition.	The debonded gap is now significant. The adjacent road surfacing is unsupported in the affected areas and has potential to start breaking up under traffic loading. The gap is around 5mm wide and the depth is less than 50mm.	The debonded gap is now greater, there are visible signs of the adjacent surface breaking up because it is now clearly unsupported. The gap is greater than 5mm wide but the depth is less than the depth of the surfacing. There is some leakage evident.	The joint is now sufficiently debonded that the adjacent surfacing is breaking up due to lack of support. The plug material is also damaged as the leading edge is unprotected. The debonded area is to the full depth of the surfacing. The joint is leaking as a result.
	Loss of plug material	**.9**	The plug is 100% intact with no missing material.	A small amount of material is missing, with shallow holes in the plug (<20mm penetration). There is very little effect on ride quality or very little noise produced.	There is significant loss of material, with penetration up to 50mm. Ride quality is affected and noise is produced	There is a serious loss of material, with holes deeper than 50mm. There is some leakage evident.	Some of the joint is missing to the full depth of the plug, or the plug is broken up as a result of missing material. The joint is leaking.
	Tracking and flow of material	**.10**	The plug follows the alignment of the adjacent surfacing, which is untracked, with no flow of plug material onto it.	Slight depressions in the plug are visible on inspection, but are not significant, or some plug material has flowed beyond the boundary. The effect is purely aesthetic	Tracking is clearly visible or a significant amount of binder has flowed onto the adjacent surfacing. Where tracking has occurred, there are small mounds of displaced material at the edges of the carriageway.	A very large amount of binder has flowed, or tracking is serious, generating significant mounds at the edges of the carriageway.	The tracking or flow of material has occurred to such an extent that the joint has disintegrated. The joint is leaking
	Nosing defects	Reinforced elastomeric					
		.11	The transition strip is in an as-new condition and is completely bonded to the joint and adjacent surfacing and is completely uncracked.	Cracks in the transition strip are visible on close inspection, but are having no effect on joint functionality	The cracking is extensive, leading to some break up of the material or the transition strip is no longer fully bonded to the surfacing or joint.	Cracking has developed sufficiently that the transition strip has broken up, with some material missing from the strip. The joint component is becoming exposed.	The nosing material is beyond isolated break up – it has disintegrated, leaving other elements of the joint exposed. The joint is leaking.
			Elastomeric in metal runners (resin-encapsulated)				

Severity Descriptions							
No	**Item**	**Severity**					
		1		**2**	**3**	**4**	**5**
			All joint components are in good condition, with no visible signs of defects. There are no cracks or tears visible.	Cracks or tears are visible. They are hairline and require careful inspection to detect.	Cracks or tears are easily visible, but the joint is still able to function.	Cracks or tears are significant, but there remains some limited functionality. The steel in the plates is exposed. Complete failure is expected shortly	A component has completely failed. Part of it has detached or is missing. A steel plate is loose or missing.
	Missing or loose bolts	**.12**	No bolts are missing or loose. There is no more than minor wear to the bolts. .	A maximum of one bolt is missing/loose at any cross section of the joint, and this one missing bolt is not causing failure.	More than one bolt is missing/loose and up to half are missing/loose at a particular cross section. This severity class will only apply where there are more than two bolts at any cross section of the joint.	At any particular cross section of the joint, more than half of the bolts are missing/loose, but this is not causing failure.	The joint has failed due to missing/loose bolts, regardless of how many are missing/loose
	Seal	**.13**	The seal appears in good condition, with nobreaches, cracks or tears. It is securely attached on both sides. No debris is present in the seal.	The seal has some cracks,or very minor tears orbreaches, but is still able to function to a large extent. The defects require closeinspection to see. There is a small amount of debris in theseal.	The seal is visibly breached, allowing some water through the joint. There is a small amount of debris in the seal.	The seal is missing or significantly breached at least at some point acrossthe joint. It does, however,retain some functionality.There is evidence of waterleakage. The seal is holdinga significant amount of debris.	The seal is missing orsufficiently disintegrated toallow large amounts of water to flow through the joint. The seal is full of debris.
	Components	**.14**	Reinforced elastomeric				
			All joint components are ingood condition, with no visible signs of defects. There are no cracks or tears visible.	Cracks or tears are visible. They are hairline, and require careful inspection to detect.	Cracks or tears are easily visible, but the joint is still able to function.	Cracks or tears are significant, but there remainssome limited functionality. The steel in the plates is exposed. Complete failure is expected shortly.	A component has completely failed. Part of it has detachedor is missing. A steel plate is loose or missing.
			Elastomeric in metal runners				
			The rails are in good condition. They are straight, level and flush with adjacent surfacing. There are no cracks in therails.	The rails are generally in good condition, but on close inspection there are very slight deformities in the rails, but no vertical deflection.	A rail is clearly deformed, butis still able to function safely. There is no vertical deflection of the rail.	There has been some limited vertical deflection of the rail, or there are short hairline cracks in the rail.	A rail has completely cracked, is missing, has dropped due to failure of the supporting mechanism belowor there has been significant vertical upward deflection of the rail, which is now likely to be pulled up by passing vehicles.

Severity Descriptions							
No	**Item**	**Severity**					
		1		**2**	**3**	**4**	**5**
		Steel comb/tooth					
			The comb components are in good condition, withno corrosion or cracks.There is no deformation ofteeth.	The teeth are showing minor signs of corrosion, but no cracks are visible. Any lossof section is unidentifiable and there is no deformation of any teeth.	The teeth are moderately corroded with very minor loss of section (<5%). There is no limitation of movement and there are no signs of cracks or deformation of the teeth.	The teeth are severely corroded with significant lossof section (<20%), or there issome deformation but not to the extent where movement is restrained or traffic is affected.	At least one tooth hasfractured, or the teeth are sufficiently misaligned so thatmovement will cause interference, or there is a crack in the metalwork. Corrosion has caused aserious loss of section of a tooth (>20%).
18	Movement/ constructionjoints	**.1**	Seal is well bonded, uncracked, non-protrudingand fully present along thewhole length of the joint.	Seal is unbonded, cracked,or has been pushed out, but the joint retains a significant amount of functionality.	Joint displacement which is not in the designed plane of movement. Joint has not lostits functionality.	Significant amount of joint displacement which is not in the designed plane of movement. Joint approaching failure.	Extreme 'out of plane' displacement. Joint failed/non functional.
19	Graffiti	**.1**	No graffiti	Non offensive graffiti out of sight of the general public	Low levels of non offensive graffiti within public view	High levels of non offensive graffiti within public view	Offensive Graffiti
20	Aesthetic Issues (possibly affecting long term durability eg. algae, lican, moss, leachate, efflorescence,water staining,general staining, etc)	**.1**	None, Low or Medium levels of aesthetic issuesnot visible to the public. Not significant to longterm durability.	High levels of aesthetic issues not visible to public and/or low levels visible tothe public. Not significant to long term durability.	High levels of aestheticissues in areas with low to moderate footfall. Affecting long term durability.	High levels of aestheticissues in areas of high publicfootfall. Affecting long term durability.	Extreme levels of aesthetic issues which should be removed immediately.
21	Pigeon proofing/ Guano	**.1**	None, insignificant defectto the pigeon proofing, insignificant deposits of guano	Missing spikes, small breaks in the mesh/netting or gapsat connections. Guano build up not noticeable by public but could affect durability of element.	Missing spikes and evidenceof guano, breaks in nettinglarge enough to allow avian access. Guano build up noticeable by the public.	Missing spikes and evidenceof large volumes of guano affecting aesthetics and operative H&S. Large gapsin netting. Guano aesthetically affecting area accessed by public.	Issue of pigeon proofing likely to cause complaint fromthe public or Health and Safety concern (Cat 1). Large scale failure of netting. Guano which is causing H&Sissues.

Table 2
Generic Extent Codes

Code	Description
A	No significant defect
B	Slight, not more that 5% of surface area/length/number
C	Moderate, 5% - 20% of surface area/length/number
D	Wide: 20% - 50% of surface area/length/number
E	Extensive, more than 50% of surface area/length/number

Table 3
Generic Severity Descriptions

Code	Description
1	As new condition or defect has no significant effect on the element (visually or functionally).
2	Early signs of deterioration, minor defect/damage, no reduction in functionality of element
3	Moderate defect/damage, some loss of functionality could be expected
4	Severe defect/damage, significant loss of functionality and/or is close to failure/collapse
5	The element is non-functional/failed

Table 4
Permissible Combinations of Severity and Extent

Extent	**Severity**				
	1	**2**	**3**	**4**	**5**
A	**1A**	**-**	**-**	**-**	**-**
B	-	2B	3B	4B	5B
C	-	2C	3C	4C	5C
D	-	2D	3D	4D	5D
E	-	2E	3E	4E	5E

Table 5
Element Importance

Set	Item No.	Element Description		Element Importance
Deck Elements	1	Primary Deck Element		Very High
	2	Secondary Deck Element/s	Transverse Beams	Very High
	3		Element from Table 2 of Ref. 3	Very High
	4	Half Joints		Very High
	5	Tie beam/rod		Very High
	6	Parapet beam or cantilever		Very High
	7	Deck bracing		High
Load-Bearing Substructure	8	Foundations		High
	9	Abutments (incl. arch springing)		High
	10	Spandrel wall/head wall		High
	11	Pier/column		Very High
	12	Cross-head/capping beam		Very High
	13	Bearings		High
	14	Bearing plinth/shelf		Medium
Durability Elements	15	Superstructure drainage		Medium
	16	Substructure drainage		Medium
	17	Water proofing		Medium
	18	Movement/expansion joints		High
	19	Painting: deck elements		Medium
	20	Painting: substructure elements		Medium
	21	Painting: parapets/safety fences		Medium
Safety Elements	22	Access/walkways/gantries		Medium
	23	Handrail/parapets/safety fences		High
	24	Carriageway surfacing		Medium
	25	Footway/verge/footbridge surfacing		Low
Other Bridge Elements	26	Invert/river bed		Medium
	27	Aprons		Medium
	28	Fenders/cutwaters/collision protection		Medium
	29	River training works		Medium
	30	Revetment/batter paving		Low
	31	Wing walls		High
	32	Retaining walls		Medium
	33	Embankments		Low
	34	Machinery		Medium
Ancillary Elements	35	Approach rails/barriers/walls		Elements not used in BCI evaluation, thus importance not required
	36	Signs		
	37	Lighting		
	38	Services		

1.4.1 Defect response times

All defects that are recorded are assessed by the inspector and prescribed an appropriate works priority code, using their experience, training and engineering judgement. These can be either:

- Very High (Urgent: Make Safe Required)
- High
- Medium
- Low

Urgent - Make Safe Required:

These defects are those that require an urgent prioritised repair or to be made safe within a 2 hour response time to ensure the safety of the highway user following risk assessment by a competent officer. A make safe can be the protection and/or closure to part or all of the asset or just the defective section and will be site specific.

Once the site has been temporarily made safe, the defect shall then be re-assessed by a competent officer to determine the priority of remedial works.

All other priority codes:

All other priority defects (high, medium, low) are those that following a risk assessment are of lower risk of causing harm and considered to be defects that may impact long term serviceability and sustainability of the highway asset. Due to the lead-ins associated with mobilisation for structures repairs a time scale is not provided, these defects will be addressed in a planned manner as resources permit.

1.4.2 Exceptions

There will be occasions where the inspector will be faced with exceptional situations or when having completed the defect assessment the Inspector feels a higher priority is warranted. In such situations the inspector may use their discretion to increase the priority of a defect.

In these cases, the inspector will record this increase on the notes relevant to the defect summarising their reasoning. Supporting evidence in the form of extra photographs, etc., may be linked or attached within the asset management system.

1.4.3 Recording of inspections and defects

All routine inspections are to be electronically recorded with the following information.

- Date and time of inspection
- Identity of the lead inspector
- Weather conditions and highway surface state
- Type of inspection
- Identity of secondary inspector (if applicable)
- Notes of any issues or concerns noted by the inspector.
- General photographs of all elements inspected.

Defects will be recorded with the following information.

- Date and time that the defect was recorded
- Identity of the inspector
- Description of the defect (including any measurements)
- Location of the defect
- The Severity/Extent scores
- The defect priority
- Linked photographs

1.4.4 Performance Management

The following measures and indicators will be recorded in order to assess and manage the delivery

1. Monitoring and reporting each year on the number of complete inspections by type
2. Monitoring and reporting each month the number of defects being recorded split by priority

These reports shall be maintained and presented as Safety Inspection Performance Measures

1.4.5 Key roles and Competencies

There is a dedicated team whose key role is to undertake Structures Routine Inspections and reactive Inspections in accordance with this Strategy. All members of the team will be assessed against the Structures Inspections Competency Framework to ensure they meet the required standards for their role. The Competency Framework will set out the expected knowledge level against the relevant tasks or requirements for each role in the team.

This information is issued by:
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