VOLUME 3 HIGHWAY STRUCTURES: INSPECTION AND MAINTENANCE

SECTION 1 INSPECTION

PART 4

BD 63/17

INSPECTION OF HIGHWAY STRUCTURES

SUMMARY

This standard gives the Overseeing Organisation's requirements for inspection of its highway structures.

INSTRUCTIONS FOR USE

1. Remove Contents pages from Volume 3 and insert new Contents dated November 2017.
2. Remove BD 63/07 from Volume 3, Section 1 which is superseded by this new standard and archive as appropriate.
3. Insert BD 63/17 into Volume 3, Section 1.
4. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.

HIGHWAYS ENGLAND

TRANSPORT SCOTLAND

LLYWODRAETH CYMRU
WELSH GOVERNMENT

DEPARTMENT FOR INFRASTRUCTURE
NORTHERN IRELAND

BD 63/17
Volume 3, Section 1,
Part 4

Inspection of Highway Structures

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Volume 3 home page

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PART 4

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INSPECTION OF HIGHWAYS STRUCTURES

Contents

1. INTRODUCTION

1.1 Background

1.1.1 This standard describes the inspection and reporting requirements for highway structures on motorway and all purpose trunk roads as defined in GD 1.

1.1.2 This standard covers the use of the Inspection Manual for Highway Structures and should be read in conjunction with BD 62 'As Built, Operational and Maintenance Records for Highway Structures'. It should be read in conjunction with BD 53, 'Inspection and Records for Road Tunnels', when dealing with tunnels.

1.2 Scope

1.2.1 This standard applies to highway structures over, under or alongside roads under the responsibility of the Overseeing Organisation as defined in accordance with GD 1.

1.2.2 The scope of highway structures are defined as those requiring technical approval in accordance with BD2, unless stated otherwise in Table 2.1.

1.2.3 Some special types of structures, for example, cable stayed bridges, may require different inspection management arrangements to those described in this standard. When such a structure is identified by the Agent they shall discuss an appropriate inspection management arrangement with the Overseeing Organisation. The Overseeing Organisation, may also inform the Agent of structures that require alternative inspection management arrangements.

1.3 Definitions

The following definitions apply in this standard:

1.3.1 **Agent** – a party appointed by the Overseeing Organisation to manage highway assets on their behalf, e.g. Maintaining Agent, Managing Agent, Managing Agent Contractor, Trunk Road Agent, Concessionaire, Service Provider or Operating Company. Where the Overseeing Organisation manages the highway assets internally, the Agent will be the branch or section to which the duties have been delegated.

1.3.2 **Inspection Organisation** – the organisation contracted by the Overseeing Organisation or the Agent to undertake inspections on its behalf. Where the Overseeing Organisation inspects the highway assets internally, the Inspection Organisation will be the branch or section to which the duties have been delegated.

1.3.3 **Supervising Engineer** – the engineer within the Agent who supervises the inspection programme and is ultimately responsible for inspections of highway structures.

1.3.4 **Contractor** – the organisation contracted by the Overseeing Organisation or the Agent to undertake construction works on its behalf.

1.3.5 **Designer** – the organisation responsible for the overall design including proprietary components.

1.3.6 **Defects Liability Period** – the period, as specified in the contract, following completion of the project during which the Contractor will be liable for defects in their work. This may also be referred to as the Defects Correction Period, Period of Maintenance or Prescriptive Period. In general, and in the absence of an express provision to the contrary, the Defects Liability Period provisions are in addition to, and not in substitution for, the common law rights.

1.3.7 **Technical Approval Authority** – As defined in BD 2.

1.4 Equality Impact Assessment

1.4.1 In accordance with the equality act this document has not been subject to an equality impact assessment.

1.5 Mutual Recognition

1.5.1 Where there is a requirement in this standard for compliance with any part of a "British Standard" or other technical specification, that requirement may be met by compliance with the Mutual Recognition clause in GD 1.

1.6 Implementation

1.6.1 Implementation of this standard shall be in accordance with GD 1. Sections of the standard may be subject to a delay in implementation and these will be instructed by the Overseeing Organisation if applicable.

1.6.2 This standard supersedes BD 63/07 – Inspection of Highway Structures.

1.7 Application in Overseeing Organisations

1.7.1 Special requirements for the four Overseeing Organisations in England, Scotland, Wales, and Northern Ireland are given in Annexes A to D respectively.

1.8 Assumptions made in the Preparation of the Document

1.8.1. The inspection requirements described in this standard are based on the following overarching principles:

a. To detect in good time any defect that may cause an unacceptable safety or serviceability risk or a serious maintenance requirement in order to safeguard the public, the structure and the environment and to enable appropriate remedial action to be taken.

b. To provide information that enables the management and maintenance of a stock of structures to be planned on a rational basis in a systematic manner, in order to support the achievement of the objectives of the Overseeing Organisation.

c. To ensure that inspections are undertaken by suitably experienced and competent staff.

1.8.2 These overarching principles align with Management of Highway Structures: A Code of Practice.

1.9 Feedback

1.9.1 All technical enquiries or comments on this standard should be sent to Standards_Enquries@highwaysengland.co.uk.

1.10 Management Arrangements

1.10.1 The Agent shall determine an appropriate inspection regime for special structures and agree it with the Overseeing Organisation before proceeding.

1.10.2 The programme for inspection of structures shall be agreed between the Agent and the Overseeing Organisation.

1.11 Quality Assurance and Audit

1.11.1 The Agent shall amend, their Quality Management System to reflect the requirements of this standard if necessary, in accordance with GD 2.

1.11.2 The Overseeing Organisation reserves the right to audit Agents against this standard, including but not restricted to, achievement of required quantity and quality of inspection reports, inspector competence and training, inspection regimes and Health and Safety arrangements.

2. SCOPE OF INSPECTION

2.1 Introduction

2.1.1 Table 2.1 sets out the scope of inspection according to structure type. The specific requirements of each Overseeing Organisation are provided in the Annexes.

2.2 Health and Safety

2.2 The scope described in Table 2.1 does not affect the inspector's duty of care under Health and Safety legislation to report any safety hazards they encounter that are outside the scope of their inspection. Inspectors must note any deficiencies at or near the structure which, in their opinion, may constitute a significant safety hazard and report them in accordance with paragraph 3.3.1.

2.2.2 Where any structure including sign/signal gantries are also subject to separate Electrical and Mechanical inspections, the Agent shall ensure that staff undertaking any inspection are vigilant at all times and report defects of any nature considered to require urgent attention.

2.2.3 Chapter 10 has more details of health and safety requirements.

2.3 Scope of Inspection

2.3.1 Highway structures which are marginally outside the dimensions stated in Table 2.1, especially those which are subject to hydraulic action, may be included within the scope of this standard by agreement with the Overseeing Organisation. Also see the Annexes for specific requirements in each Overseeing Organisation.

2.3.2. Signs/signal gantries and masts – structural aspects shall include foundations, columns, beams, arms and any structural connections and components. The inspection shall also cover the structural performance of any significant attachments (eg fixed signs and variable message signs) and their connections. See Chapter 6 for more detailed requirements for gantries.

2.3.3 Where other owners have structures within the footprint of the Overseeing Organisation's highway, they are responsible for ensuring the safety, integrity and adequacy of those structures. In certain cases the Overseeing Organisation can be reasonably confident on the basis of available information that other owners are acting responsibly and have an adequate regime of inspections in place. Where this conclusion cannot be justified the Overseeing Organisation, or their Agent if instructed, will liaise with the other owner, in the wider interest of public safety, to understand their regime of inspections. However, this does not negate the responsibility of the Agent to check all structures within the footprint of the highway during Safety Inspections (see subsection 3.4) in the wider interest of public safety.

2.3.4 Access gantries which are either attached to the structure on a permanent basis, or are moved into position from storage, shall be managed and inspected in accordance with the Institution of Structural Engineers publication 'The Operation and Maintenance of Bridge Access gantries and Runways'.

Table 2.1 Scope of Inspection According to Structure Type

Structure Type	Definition	Scope (see subsection 2.3)
Bridge, buried structure, subway underpass, culvert and any other similar structure	A structure supporting the highway as it crosses an obstacle (e.g. river, valley or flood plain) or a service (e.g. local road, railway or canal) OR A structure supporting the passage of a service (e.g. local road, railway, canal) over the highway	All structures with a clear span or internal diameter greater than 0.9m (0.9m or greater in Scotland)
Earth retaining structure	A structure associated with the highway where the dominant function is to retain earth	All structures with an effective retained height, i.e. the level of fill at the back of the structure above the finished ground level at the front of the structure, of 1.5m or greater
Reinforced/ strengthened soil/fill structure with hard facings	A structure associated with the highway where the dominant function is to stabilise the slope and/or retain earth	All structures with an effective retained height of 1.5m or greater
Sign and/or signal gantry (see paragraph 2.3.2 and Chapter 6)	Portal and cantilever gantries that support signs and/or signals	Structural aspects of all sign/signal gantries
Mast (see paragraph 2.3.2)	Cantilever mast for traffic signal	Structural aspects of all cantilever masts
	High mast for lighting	Structural aspects of all lighting masts of 20m or greater, i.e. the vertical distance from top of post to bottom of flange
	Mast for camera, radio, speed camera and telecommunication transmission equipment	Structural aspects of all masts
	Catenary lighting support system	Structural aspects of all catenary support systems
	Highway signs on posts	Structural aspects of any signs defined as requiring technical approval in accordance with BD2
Access gantry (see paragraph 2.3.4)	A moveable structure providing access to a highway asset, typically for bridge inspection and maintenance.	All moveable access gantries
Tunnels	An enclosed length of road of 150m or more	Structural aspects of all tunnels (refer to BD 53 for other criteria relevant to tunnels, e.g. M&E requirements)
Other structures	Other structures that are within the footprint of the highway, e.g. service/utility crossings	Structures providing service only crossings either above or below the carriageway
	Other structures not in above subgroup as agreed with Overseeing Organisation	Any remaining structures defined as requiring technical approval in accordance with BD2 or any agreed with the Overseeing Organisation.
Third Party structures	Any of the above categories but owned by others, e.g. private owners or utility companies	As agreed with the Overseeing Organisation

3. MAINTENANCE INSPECTIONS

3.1 Inspection Types

3.1.1 This section describes the five types of maintenance inspection that should be used for highway structures; these are:

a. Safety Inspection;

b. General Inspection;

c. Principal Inspection;

d. Special Inspection;

e. Inspection for Assessment.

3.1.2 The overall purpose and format of each type of inspection are described. The required frequency of inspection and/or initiating event is also described with additional requirements set down by the Overseeing Organisation (see Annexes A to D).

3.2 Competence of Inspection Staff

3.2.1 Competence requirements for the Overseeing Organisation are given in Annexes A to D.

3.2.2 All maintenance inspections shall be undertaken by personnel that satisfy the minimum health, experience and where appropriate, qualification and certification requirements for the particular inspection type.

3.2.3 Appropriate measures for the management and monitoring of physical fitness of all inspection staff must be carried out in accordance with the procedures of the Inspection Organisation.

3.2.4 Competence of all inspection staff shall be managed in accordance with the competence management system of the Inspection Organisation, developed under the general provisions of GD 2 and BS EN ISO 9001.

3.2.5 Specific requirements for inspector competencies are set out in Chapter 9

3.2.6 The Supervising Engineer shall be a Chartered Civil or Structural Engineer (or possess an equivalent EU qualification) with a background in design, construction or maintenance of highway structures. The appointment of an Incorporated Civil or Structural Engineer for this position shall be subject to the agreement of the Overseeing Organisation.

3.3 Management and Reporting of Risks

Immediate Risk to Public Safety

3.3.1 The Agent must establish a procedure, common to all maintenance inspections, whereby inspection staff have a clearly defined duty to inform the Supervising Engineer or designated staff, at the earliest possible opportunity, of any defect or hazard that may represent an immediate risk to public safety and/or structural stability.

Fire Risks

3.3.2 The following fire hazards and factors shall be reported during any maintenance inspection:

a) any significant or potential fire hazards such as the open air storage of combustible materials, industrial buildings, scrap yards, agricultural storage of combustible materials, or other potential fire safety hazards or any other perceived high level of risk such as the storage of fuel tanks, gas bottles, chemicals, agricultural materials, a significant number of vehicle tyres, other combustible materials.

b) any significant factors to indicate any history of fires, such as evidence of vandalism, burnt vehicles, or other incidents underneath or adjacent to the structure.

3.3.3 Any significant fire hazards or factors reported during the inspection shall be immediately notified to the Overseeing Organisation and recorded on the asset information management system of the Overseeing Organisation.

3.3.4 Any significant fire damage shall be recorded and made subject of a risk assessment or recommendation for immediate closure of the structure or further investigation eg special inspection, testing and assessment in light of the damage. See also paragraph 3.3.1.

3.4 Safety Inspection

3.4.1 The purpose of a Safety Inspection is to identify obvious deficiencies which represent, or might lead to, a danger to the public and, therefore, require immediate or urgent attention.

3.4.2 Safety Inspections are not specific to highway structures and generally cover all fixed assets on the highway network, including carriageways, footways, structures, drainage, verges and lighting. Safety Inspections are normally carried out by trained highway maintenance staff from a slow moving vehicle, although alternatives may be acceptable to the Overseeing Organisation. In certain circumstances staff may need to proceed on foot either to confirm suspected defects or to complete the inspection. For example, some bridges may require a weekly or monthly walkover.

3.4.3 Safety Inspections for highway structures shall be carried out at frequencies which ensure the timely identification of safety related defects and reflect the importance of a particular route or asset. The frequencies shall adhere to any specific requirements set down by the Overseeing Organisation and also give due regard to any special considerations, for example, does the structure form, material, usage or location influence the required frequency.

3.4.4 Safety inspections may also be necessary as a result of notification of a defect by a third party, e.g. police or public

3.4.5 A Safety Inspection only provides a cursory check of those parts of a highway structure that are visible from the highway with the aim of identifying any obvious deficiencies or signs of damage and deterioration that may require urgent attention or may lead to accidents or high maintenance costs, e.g. collision damage to superstructure or bridge supports, damage to parapets, spalling concrete and insecure expansion joint plates.

3.4.6 In addition to planned Safety Inspections, Agents have a corporate responsibility to safety that requires all staff to report anything on the network needing urgent attention, including defects on highway structures. To facilitate this, Agents shall encourage their staff to be vigilant at all times when moving around the network.

3.4.7 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 Agent shall immediately take such action as is required to safeguard the public and/or sustain structural functionality. The Overseeing Organisation and any other owner of the structure shall be informed without delay.

3.4.8 Appropriate follow-up action for a highway structure in response to a concern raised by a Safety Inspection normally includes a "call-out" whereby a member of the highway structures team will visit the site to determine whether or not further action is required, e.g. close structure to traffic, carry out a Special Inspection, undertake detailed testing, and schedule remedial works. Details of Special Inspections are provided in subsection 3.7.

3.5 General Inspection

3.5.1 The purpose of a General Inspection is to provide information on the physical condition of all visible elements on a highway structure.

3.5.2 A General Inspection comprises a visual inspection of all parts of the structure that can be inspected without the need for special access equipment, or extensive traffic management arrangements. This should include adjacent earthworks and waterways where they could affect the behaviour or stability of the structure. 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. Extensive traffic management arrangements shall be defined as arrangements which are outside the scope of the DfT publication 'Safety at Street Works and Road Works'.

3.5.3 Prior to undertaking a General 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. A risk assessment and method statement must be prepared, and agreed by the Supervising Engineer, before undertaking the inspection. The Inspection Manual for Highway Structures provides details of a suitable review and method statement for a General Inspection.

3.5.4 General Inspections shall be scheduled for 24 month intervals and carried out at the scheduled dates. When a General Inspection coincides with a due Principal Inspection only the latter is undertaken. Tolerance on the scheduled date may be permitted in accordance with subsection 3.11

3.5.5 The programme of General Inspections shall be agreed between the Agent and the Overseeing Organisation.

3.5.6 In certain circumstances more frequent inspections may be required, for example, when a structure is known or suspected to be subject to a rapid change in condition or circumstances. In such circumstances the Supervising Engineer should supplement the General Inspection with other inspections/activities, for example:

- Special Inspections – may be appropriate where specific parts of the structure require more frequent inspection to ascertain condition, e.g. bridge piers situated in a fast flowing river. Other prompts for a Special Inspection might be where visible defects are not explained by a single cause, or where the extent of a defect needs to be ascertained, in these situations further investigation and testing would be appropriate. Further details on Special Inspections are given in subsection 3.7.

- Monitoring – periodic or continuous monitoring may be appropriate to check against a specific problem from worsening, e.g. crack growth and deformations.

3.5.7 Supplementary inspections/activities shall be agreed by the Overseeing Organisation before being implemented by the Agent. The agreed inspections/activities and the reasons for adopting them shall be fully documented and recorded on the asset information management system of the Overseeing Organisation.

3.6 Principal Inspection

3.6.1 The purpose of a Principal Inspection is to provide information on the physical condition of all inspectable parts of a highway structure. A Principal Inspection is more comprehensive and provides more detailed information than a General Inspection.

3.6.2 A Principal Inspection comprises a close examination, within touching distance, of all inspectable parts of a structure. This should include adjacent earthworks and waterways where they could affect the behaviour or stability of the structure. A Principal Inspection should utilise as necessary suitable inspection techniques, access and/or traffic management works. Suitable inspection techniques that should be considered for a Principal Inspection include hammer tapping to detect loose concrete cover and paint thickness measurements. Testing is not a requirement for a Principal Inspection.

3.6.3 The Agent may propose, for the agreement of the Overseeing Organisation, the use of alternative means of access for areas of difficult or dangerous access, e.g. obscured parts of a structure and/or confined spaces. See Chapter 7 for more details.

3.6.4 When planning Principal Inspections the Agent should seek to identify opportunities that make effective use of resources, i.e. combining a Principal Inspection with other activities in order to share special access equipment and/or traffic management works. For example, a Principal Inspection may be combined with a Special Inspection, monitoring activities, detailed testing work or routine/planned maintenance, when appropriate.

3.6.5 Any visible elements which have not been inspected shall be recorded, and brought to the attention of Overseeing Organisation in accordance with Subsection 3.12. If the justification is not accepted by the Overseeing Organisation the requirement to inspect those elements remains unaffected. It is advised that any such proposed omissions should be discussed with the Overseeing Organisation prior to the inspection to avoid any need to revisit the structure.

3.6.6 Prior to undertaking a Principal Inspection, the inspector/engineer must review all the structure records to familiarise themselves with the characteristics of the structure, any hazards, the condition at the time of the last inspection; any worsening of defects over time; and any significant maintenance/modifications since the last inspection. A risk assessment and method statement must be prepared, and agreed by the Supervising Engineer, before undertaking the inspection. The Inspection Manual for Highway Structures provides details of a suitable review and method statement for a Principal Inspection.

3.6.7 For the scheduling of Principal Inspections see subsection 3.11. The Principal Inspection shall be a replacement of a General Inspection due in accordance with paragraph 3.5.4. The frequency of inspections may be varied from the default in accordance with paragraphs 3.6.10 and 3.6.11.

3.6.8 The programme of Principal Inspections shall be agreed between the Agent and the Overseeing Organisation.

3.6.9 In certain circumstances more frequent Principal Inspections may be required and justifiable, for example, when a structure is known or suspected to be subject to a rapid change in condition or circumstances and a General Inspection is not sufficient to provide the access/information required. However, only part of the structure may be of concern and a more efficient approach may be to supplement the Principal Inspection with other activities, e.g. Special Inspections or monitoring. This approach can be used to provide the necessary information and make more efficient use of resources. See BD 79 for further guidance on the management of sub-standard highway structures.

3.6.10 A shorter Principal Inspection interval and/or supplementary inspections/activities shall be agreed by the Overseeing Organisation before being implemented by the Agent. The agreed interval and/or inspections/activities and the reasons for adopting it/them shall be fully documented and recorded on the asset information management system of the Overseeing Organisation.

3.6.11 A longer period between Principal Inspections may be agreed with the Overseeing Organisation providing the proposal is supported by a risk assessment. The risk assessment and interval shall be fully documented and agreed prior to implementation and the details recorded on the asset information management system of the Overseeing Organisation. Chapter 8 has details of the recommended format and criteria for the risk assessment for different types of structures.

3.6.12 Principal Inspection intervals determined through risk assessment shall not exceed twelve years.

3.7 Special Inspection

3.7.1 The purpose of a Special Inspection is to provide detailed information on a particular part, area or defect that is causing concern, or inspection of which is beyond the requirements of the General/Principal Inspection regime.

3.7.2 A Special Inspection may comprise a close visual inspection, testing and/or monitoring and may involve a one-off inspection, a series of inspections or an ongoing programme of inspections. As such, Special Inspections are tailored to specific needs. Refer to BD 79 for monitoring associated with the management of substandard structures.

3.7.3 Special Inspections are carried out when a need is identified. For example, based on the specific characteristics of the structure, identified by a General, Principal or Safety Inspection, to follow certain events, or to consider parts of the structure more closely or at a more frequent interval than the normal General/Principal Inspection regime. Examples are provided in paragraph 3.7.6.

3.7.4 All Special Inspections shall be agreed by the Overseeing Organisation, and their justification recorded on the asset information management system of the Overseeing Organisation.

3.7.5 A "call-out" site visit as described in paragraph 3.4.8 is not categorised as a Special Inspection and as such the Agent is not required to agree this activity with the Overseeing Organisation. However, paragraph 3.4.7 requires the Agent to inform the Overseeing Organisation and other parties.

3.7.6 Special inspections are recommended for:

a. Cast iron structures, at intervals not exceeding six months.

b. Structures strengthened by the use of bonded plates, at intervals of six months for the first two years and thereafter in accordance with the intervals prescribed in the maintenance records.

c. Structures that have weight restrictions, or other forms of restriction to reduce traffic loading, at intervals not exceeding six months or as agreed by the Overseeing Organisation.

d. Structures that have to carry an abnormal heavy load. The structure should be inspected before, during and after the passage of the load if either:

- an assessment has indicated that the margin of safety is below that which would be provided for a design to current Standards; or
- similar loads are not known to have been carried.

e. Structures in areas of mineral extraction, when subsidence occurs.

f. Structures if settlement is observed greater than that allowed for in the design. The cause should be identified and steps taken to monitor the rate of settlement and to assess the urgency of remedial measures.

g. Structures involved in a major accident, chemical spillage or fire. The inspection should investigate the damage to the structure.

h. Probing of river bridge foundations after flooding. Where probing indicates the possibility of scour, further Underwater Inspection should be carried out (see subsection 3.8).

i. Permanent access gantries prior to use and at intervals in accordance with The Institution of Structural Engineers report on The Operation and Maintenance of Bridge Access Gantries and Runways.

j. Hoists, winches and associated cables. They should be inspected in accordance with the relevant chapters of the Factories Act.

k. Post tensioned concrete bridges as described in BD 54.

3.7.7 Further examples of when Special Inspections are recommended are given in the Inspection Manual for Highway Structures.

3.7.8 BA 35 provides guidance on limited site testing that may be undertaken as part of a Special Inspection for concrete structures, i.e. half-cell potential, chloride level, covermeter and depth of carbonation. Additionally the wall thickness of steel hollow sections can diminish through internal corrosion and may go unnoticed. The non- destructive measurement of wall thickness of sections at critical areas, eg. Base of parapet posts, rails near ends or joints, is recommended for elements which exceed or are approaching the end of their design life, or where poor detailing for durability is evident, or where there are visible signs of distress or deterioration. Agents may find it appropriate to combine these Special Inspection activities with a Principal Inspection in some circumstances.

3.8 Underwater Inspection

3.8.1 An Underwater Inspection is a specific type of Special Inspection concerned with parts of highway structures that are below water level.

3.8.2 In addition to paragraph 3.7.6(h), a programme of Underwater Inspections shall be implemented for structures where the foundations and parts of the structure are below water. The inspection shall record the condition below water level, the existing stream bed profiles and any evidence of scour in accordance with BD 97.

3.8.3 Any photographic records provided by remotely operated vehicles or unmanned underwater vehicles shall comply with subsection 4.2.

3.8.4 The programme for Underwater Inspections shall be agreed with the Overseeing Organisation.

3.8.5 For further guidance see the Inspection Manual for Highway Structures. Also see BD97 which provides guidance on inspections for highway bridges which may be subject to scour.

3.8.6 See also Chapter 10 for health and safety provisions.

3.9 Access Gantries

3.9.1. Prior to using any access gantries which form a permanent part of the structure, the Agent shall check the existence and validity of operational certificate(s) for access gantries and confirm they cover the proposed inspection activity. If necessary the Agent shall ensure that inspection and certification of the access gantry is carried out and issued in accordance with The Institution of Structural Engineers publication *The Operation and Maintenance of Bridge Access Gantries and Runways*. If during the course of an inspection of an access gantry, or at any other time, any defects become apparent, the Agent shall make them known to the Overseeing Organisation, with a recommended course of action. See also paragraph 4.9.1.

3.10 Inspection for Assessment

3.10.1 The purpose of an Inspection for Assessment is to provide information required to undertake a structural assessment. BD 21provides guidance on undertaking an Inspection for Assessment and recommends that these be done in conjunction with a Principal Inspection.

3.11 Scheduling Inspections

3.11.1 Inspections should be scheduled to make the most efficient use of resources and to minimise disturbance to the public, e.g. schedule inspections to take advantage of traffic management measures planned for other reasons.

3.11.2 General and Principal Inspections shall be scheduled in accordance with paragraphs 3.5.4 and 3.6.7, and Table 3.1.

3.11.3 In developing inspection plans and groups of structures for combined activity, Agents and Supervising Engineers should take account of local factors (eg the route, geography, junction layouts and common structure types) to provide the most efficient use of temporary traffic management and inspection resources over the whole inspection cycle.

3.11.4 The scheduled date of an inspection may be varied by up to ± 6 months provided the Supervising Engineer is satisfied that any such increased inspection interval is acceptable. The timing of the following General or Principal inspection shall remain as per the original schedule, and shall not be changed to accommodate the altered timing of this inspection.

3.11.5 The ± 6 month variation does not apply in circumstances where a shorter or longer inspection interval has been agreed by the Overseeing Organisation (see paragraphs 3.5.6, 3.5.7, 3.6.7 and 3.6.11).

3.11.6 For large structures which may require several visits to complete an inspection the inspection date shall be the date of completion of the inspection.

3.11.7 Where access is required to the property of outside parties in order to undertake an inspection then the scheduling should be prepared with due allowance for the time required to gain access, e.g. for access to the main rail network approximately 32 weeks is generally the minimum notice required.

3.12 Notification of Incomplete Inspections

3.12.1 An incomplete inspection is where any of the inspection coverage or proximity requirements for the type of inspection given in Chapter 3 have not been met.

3.12.2 The Inspection Organisation shall immediately inform the Overseeing Organisation when they become aware of any incomplete inspections.

3.12.3 Where it becomes evident from an inspection report that the inspection is incomplete, this shall be subject to discussion with the Overseeing Organisation.

3.12.4 Any discussions shall address the short fall and options to complete the inspection and the associated time scales for revisiting the structure.

4. RECORDS FOR MAINTENANCE INSPECTIONS

4.1 Introduction

4.1.1 Inspection records provide important information for identifying, assessing, quantifying and prioritising maintenance in a systematic manner. This chapter describes the core records requirements associated with each type of maintenance inspection. Annexes A to D describe additional requirements for each Overseeing Organisation and provide specific details of how their respective management systems deal with maintenance inspection records.

4.1.2 Inspection information shall be recorded in the format set down by the Overseeing Organisation (see Annexes A to D).

4.1.3 Where a format is not specified the Agent shall produce records that are appropriate to the scope and detail of the inspection type and that give a clear and accurate indication of the structure's condition.

4.1.4 Where a format is not specified by the Overseeing Organisation the Agent should, where possible, seek to develop and use Standardised formats for inspection records. The format should be clear, follow a logical sequence and incorporate all the necessary information. This format should be relatively consistent from one inspection cycle to the next in order to assist and streamline maintenance planning and management.

4.1.5 In addition to the information described below, inspection records shall also contain the date of the inspection, those responsible for undertaking the inspection (including their certification numbers if applicable), general information about the structure (e.g. name, reference and location) and details of the prevailing weather conditions at the time of the inspection.

4.1.6 The inspection shall be checked, reviewed, accepted/ authorised and uploaded onto the asset information system of the Overseeing Organisation. This shall be done within three months of the date of the inspection, unless stated otherwise in Annexes A to D.

4.2 Photographic or Video records

4.2.1 Any photographic or video records shall include:

- An accompanying schedule and/or key drawing, indicating the coverage of the relevant parts and elements of the structure.
- A description of the scene and any defects shown, and its precise location on the structure. The location of the viewed elements and their defects shall be capable of being easily identified by anyone reviewing the inspection report, photographic or video record and schedule.
- Deterioration or status of existing defects recorded in previous photographic or video records.

4.2.2 The photographic or video electronic files shall be uniquely referenced according to the schedule.

4.2.3 The accompanying inspector's report shall discuss the findings of the photographic record and shall be referenced according to the schedule.

4.2.4 Each video clip file shall be referenced by a unique identifier. Additionally times specific elements and defects that are in view in video clips shall be noted in the schedule if multiple elements are included in the video clip.

4.2.5 The photographic or video record shall be of such quality/resolution that allows all visible defects in the materials to be readily identified and then subsequently reviewed and the condition of the element to be scored by the inspector. As an example, cracks in concrete of 0.2mm width should be capable of being identified and recorded.

4.2.6 A ruler to indicate the scale of the defect or element should be included in close up photographs.

4.2.7 Close up photographs should be accompanied by a wider view to assist location of the defect and feature being shown.

4.3 Records of Immediate Risks to Public Safety

4.3.1 The procedure described in paragraph 3.3.1 shall result in a record of the defect identified and/or safety concern raised, including times and dates, and the subsequent action planned/taken.

4.4 Records for Safety Inspection

4.4.1 Records for safety inspections must be created and maintained in accordance with the requirements of the Overseeing Organisation.

4.4.2 When urgent action is required the procedure described in paragraphs 3.3.1 and 4.3.1 must be followed.

4.5 Records for General Inspection

4.5.1 The records created by a General Inspection shall include the condition of all of the elements inspected. Defects shall have their location, severity, extent and type of defect recorded in a manner compatible with the asset information management system of the Overseeing Organisation.

4.5.2 Specific requirements for the Overseeing Organisations are given in Annexes A to D.

4.6 Records for Principal Inspection

4.6.1 A Principal Inspection shall include a review of the completeness and accuracy of the inventory records (see Annexes A to D for additional requirements). A statement confirming the records reviewed should form part of the report. Any deficiencies in the records should be rectified as part of the Principal Inspection.

4.6.2 The records created/updated by a Principal Inspection shall include the condition of all of the elements inspected and the following as a minimum:

a. The location, severity, extent and type of all defects on the structure, including, where appropriate, detailed descriptions, photographs and sketches of the defects that clearly identify their location and illustrate the severity/extent of damage.

b. For bridges over roads the relevant headroom information based on measurements taken during the inspection.

c. Any significant change (e.g. works carried out or deterioration) since the last Principal Inspection.

d. Any information relevant to the integrity and stability of the structure.

e. The scope and timing of any remedial or other actions recommended before the next inspection.

f. The need for a Special Inspection, additional investigations and/or monitoring.

g. A description of any testing that was undertaken, details of the information collected and an interpretation of the information.

h. A list of visible elements or regions that have not been inspected in accordance with subsection 3.12.

4.6.3 Specific requirements for the Overseeing Organisations are given in Annexes A to D.

4.7 Records for Special Inspection

4.7.1 The records created by a Special Inspection shall include the following as a minimum:

a. Background and reasons for the Special Inspection.

b. A detailed description of the condition of those parts of the structure that have been inspected including, where appropriate, photographs and sketches.

c For a strike on a bridge deck, in addition to b) the headroom at the impact point(s) and a measurement of the height and photographs of the vehicle involved in the collision.

d. Any significant change (e.g. works carried out or deterioration) since the last maintenance inspection to those parts of the structure that have been inspected.

e. A description of any testing that was undertaken, details of the information collected and an interpretation of the information.

f. Any information relevant to the integrity and stability of the structure.

g. The scope and timing of any remedial or other actions recommended before the next inspection.

h. The need for any additional investigations and/or monitoring.

i. All aspects identified and/or required by the Monitoring Specification for structures managed in accordance with BD 79.

4.8 Records for Inspection for Assessment

4.8.1 BD 21 provides guidance on the information required from an Inspection for Assessment which would be recorded as part of the Assessment Report.

4.9 Records for Access Gantries

4.9.1 For any permanent access gantries as defined in paragraph 2.3.4 Agents shall create, read and amend inspection records and operational certificates stored on the health and safety file or structure file for the structure.

4.10 Headroom Measurements and Records

4.10.1 In accordance with TD 27 the measurement and recording of minimum headrooms shall include separate measurements for each structure free zone (verge), where present, and the paved width including separate measurements for each running lane, each hardstrip and each hardshoulder, at the down-chain and up-chain edges of the structure.

4.10.2 The equipment and method used shall have a tolerance of not greater than +/- 10mm.

4.10.3 Any headroom deficiencies shall be managed and notified to the Overseeing Organisation in accordance with TD 27.

4.10.4 If there is any evidence of collision by road vehicles or waterborne vessels these should be documented including dimensioned sketches and photographs to show the extent and location of the damage and the members affected.

4.10.5 Any safety concerns as a result of collisions eg significant deformations or damaged concrete or reinforcement must be reported immediately in accordance with paragraph 3.3.1.

4.10.6 The condition of any low headroom warning signs attached to the structure shall be recorded, in accordance with TD 25.

5. ACCEPTANCE INSPECTIONS

5.1 General

5.1.1 A successful Acceptance Inspection requires liaison and cooperation between the Overseeing Organisation, the current occupier and/or owner, Agent and Contractor, as well as within the Overseeing Organisation.

5.1.2 By their nature an acceptance inspection can only ascertain the finished quality of any visible elements. Effective supervision and records taken throughout the construction phase is an essential assumption for acceptance inspections to provide the necessary confidence in the performance of the structure and to ensure that hidden elements have been constructed in accordance with the requirements.

5.1.3 If an acceptance inspection is relied on as the principal means to check the structure, major defects may not become apparent before the most cost effective opportunity to correct them eg whilst relevant specialist teams are on site and a means of access such as scaffolding is in place.

5.2 Introduction

5.2.1 In general, the purpose of an Acceptance Inspection is to provide a formal mechanism for exchanging information and documenting and agreeing the current status of, and outstanding work on, a structure prior to changeover of responsibility for operation, maintenance and safety from one party to another. This includes an inspection after changeover, e.g. at the end of the Defects Liability Period (DLP). An Acceptance Inspection is mainly for the benefit of the party taking over responsibility for the structure.

5.2.2 The format, content and timing of an Acceptance Inspection depends on its specific purpose. Four types of Acceptance Inspection are generally used: Pre Opening Inspection (POI), a Defects Liability Inspection (DLI), a Transfer Inspection and a Handback Inspection. These Acceptance Inspections are described in Table 5.2.

5.2.3 A POI and a DLI shall be undertaken for new structures, reconstructions, and major modifications prior to changeover of responsibility and the end of DLP respectively. Transfer and Handback Inspections relate to existing structures and occurs either at transfer of responsibility or ownership of the structure, or at handback of the structure at the end of a concession period. For the purpose of this standard, transfer of responsibility does not include the transfer of structures between Agents during or at the start/end of their contract unless agreed by the Overseeing Organisation.

5.2.4 The term “major modification” in paragraph 5.2.3 shall include any bridge widening, strengthening, replacement of structural members and/or major refurbishments. The need for Acceptance Inspections on other major modifications shall be agreed by the Overseeing Organisation.

5.2.5 An Acceptance Inspection is normally carried out or organised by the party taking over responsibility in liaison with the current occupier and/or owner who should be notified and given the opportunity to attend. The inspection should be carried out by the party taking over responsibility but accompanied by representatives of the current owner/occupier to facilitate agreement, together with any other party considered appropriate. Accepted variations to this are set out in the relevant clauses of this Section. Table 5.2 provides guidance on the parties that should be notified of an Acceptance Inspection.

5.2.6 The whole structure shall be inspected in an Acceptance Inspection.

5.2.7. The party carrying out the inspection shall notify the relevant parties listed. It is at the discretion of the notified party as to whether they attend the inspection.

5.2.8. The defects/snagging list should have originated from the inspections/checks carried out during the construction period

Table 5.2 Summary of Acceptance Inspections

Event	Carried out by	Notified (see paragraph 5.2.7)	Outcomes	Time
Pre Opening Inspection (POI)	Overseeing Organisations representative and/or Agent	Contractor, TAA, Overseeing Organisation (or their representative) and/or local authority, rail and waterways authorities etc as appropriate	Inspection records including any additions to the defects/snagging list (see paragraph 5.2.8), and facilitation of the identification and transfer of information and records identified in paragraph 5.8.3	About one month before the issue of completion documentation or the opening/re-opening of the structure to the public
Defects Liability Inspection (DLI)	Overseeing Organisations representative and/or Agent	Contractor, Overseeing Organisation (or their representative) and/or local authority, rail and waterways authorities etc as appropriate	Confirmation of all defects rectified and any latent defects and developing problems that were not previously reported	Just prior to end of the DLP – timing should be sufficient to allow any agreed outstanding work to be undertaken by the Contractor before the end of the DLP and, if necessary, enforcement of contractual obligations
Transfer Inspection	Party taking over responsibility	Current owner and Agent and/or Local Authority, rail and, waterways authorities, etc as appropriate	Principal or General Inspection records (identify and agree any defects to be rectified before transfer or handback) Facilitate the identification and transfer of information and records identified in paragraph 5.8.3	Prior to transfer – timing should be sufficient to allow any agreed work to be undertaken by the current owner/occupier before transfer
Handback Inspection	Party taking over responsibility	Current Maintainer/ Owner and Agent and/ or local authority, rail and waterways authorities etc as appropriate	Principal Inspection records (identify and agree any defects to be rectified before transfer or handback) Facilitate the identification and transfer of information and records identified in paragraph 5.8.3	Prior to handback – timing should be sufficient to allow any agreed outstanding work to be undertaken by the Current Maintainer/Contractor before the end of the concession period, in order to allow completion of any outstanding contractual obligations

5.3 Pre Opening Inspection

5.3.1 Upon receipt of the Contractor's notification that works are complete a Pre Opening Inspection (POI) shall be carried out. The POI shall take the form of a Principal Inspection. In certain circumstances this requirement may be relaxed to a General Inspection, eg if all structural elements are readily accessible without the need for access equipment, subject to the agreement of the Technical Approval Authority.

5.3.2 The inspection shall be carried out by the Agent, or other party designated by the Overseeing Organisation, prior to the issue of the completion documentation and prior to the opening/re-opening of the structure to the public. It is good practice to programme the POI one month before opening of the structure to the public, to allow sufficient time for the necessary reports to be developed and accepted.

5.3.3 Wherever possible the opportunity should be taken to make use of existing traffic management and access arrangements and/or to combine the POI, if appropriate, with inspections/checks schedule under the construction contract.

5.3.4 The Agent should be aware that the responsibility for checking and accepting the works on any structure and what this entails will depend on the form of contract and the wording included therein. Under normal contractual arrangements and existing Standards, it is the responsibility of the Contractor and/or Designer to carry out checks/inspections during construction and, in collaboration with the Overseeing Organisation, or other party designated by the Overseeing Organisation, produce a snagging list prior to completion. These inspections/checks facilitate the issue of completion documentation.

5.3.5 The Agent or other party designated by the Overseeing Organisation shall arrange to undertake the POI, and shall notify the Contractor and other interested parties (see Table 5.2). The Contractor's approval shall be obtained before undertaking the inspection as they retain responsibility for the site until completion of the changeover.

5.3.6 In normal circumstances the Contractor would be expected to facilitate the inspection with the provision of access equipment as they retain responsibility for the site. During the inspection the Agent must follow the Contractor's direction and operate under their safe system of work. Where this restricts the intended extent of the inspection this should be recorded with details of the agreement between the Agent and Contractor as to how the condition of uninspected elements are to be determined.

5.3.7 The POI shall record any defects or work outstanding under the contract and any works that shall be completed prior to the Agent taking responsibility for the maintenance of the structure.

5.3.8 Following the POI, the Agent, or other party designated by the Overseeing Organisation, shall produce a POI report/record informing the Overseeing Organisation of all defects/work outstanding identified during the inspection. The report/record shall be in accordance with subsection 5.8.

5.3.9 The Overseeing Organisation or Agent may inform the Contractor, in the way laid down in the contract, of any defects/work outstanding. The Agent and contractor shall agree those that need to be completed prior to road opening.

5.3.10 The Overseeing Organisation, or party designated by the Overseeing Organisation, shall check that all necessary certification has been supplied prior to the issue of the completion documentation in accordance with the contract.

5.3.11 Once the Overseeing Organisation has accepted that the structure can be handed over, they shall arrange for the Agent and other necessary parties to be formally notified.

5.3.12 The records to be created/transferred as part of a POI are referred to in subsection 5.8.

5.4 Defects Liability Inspection

5.4.1 It is normal for a construction contract to include a DLP during which the Contractor will be liable for defects in their work. The DLP is also referred to as a Defects Correction Period, Period of Maintenance or Prescriptive Period. The DLP usually commences upon practical completion of the works and runs for the period specified in the contract.

5.4.2 The scope of defects for which the Contractor is liable is set out in the contract. The Contractor's liability normally includes the responsibility for making good any latent defects or developing problems that appear.

5.4.3 In general, and in the absence of an express provision to the contrary, the DLP provisions are in addition to, and not in substitution for, the common law rights.

5.4.4 The Agent, or other party designated by the Overseeing Organisation, shall undertake maintenance inspections in accordance with this standard, or as agreed with the Overseeing Organisation, during the DLP. This shall include an inspection, General or Principal as appropriate, prior to the completion of the DLP to check that all latent defects and developing problems are detected before the expiry of contractual obligations. Any latent defects/developing problems identified shall be set down and agreed with the Contractor as specified by the contract, and the outcome communicated to the Overseeing Organisation.

5.4.5 The timing of the inspection will depend upon the length of the DLP, but should be sufficient to allow any agreed work to be undertaken by the Contractor before the end of the DLP and, if necessary, enforcement of contractual obligations.

5.4.6 A DLI shall be carried out in the final months of the DLP to confirm that all defects identified and agreed by the aforementioned inspection have been rectified. The outcome of the DLI shall be communicated to the Overseeing Organisation.

5.4.7 If latent defects/developing problems are identified during the DLI, which were not previously identified as per paragraph 5.4.4, then these shall be reported to the Overseeing Organisation without delay.

5.5 Transfer Inspections

5.5.1 Circumstances where the responsibility for an existing structure changes from one party to another include transfer of structures (e.g. trunking and detrunking) and handback of structures (e.g. after a PFI or PPP concession period). For both transfer and handback it is the duty of the Overseeing Organisation, or their representative, to arrange the inspection, and this should include notifying the current owner/occupier and other interested parties and giving them the opportunity to attend.

5.6 Transfer of Existing Structures

5.6.1 An inspection shall be carried out prior to the transfer of responsibilities.

5.6.2 This should generally be a Principal Inspection, but a General Inspection may be used where appropriate to the structure type and size. When the results of a recent Principal Inspection are deemed to be relevant and sufficient then these may be used in place of a Transfer Inspection.

5.6.3 The timing of the inspection should be sufficient to allow any agreed work to be undertaken by the current owner/occupier before transfer.

5.6.4 The records to be created/transferred as part of a transfer are referred to in subsection 5.8.

5.7 Handback Inspections

5.7.1 A Handback Inspection shall be carried out prior to handback at the end of a concession period.

5.7.2 The Handback Inspection should enable the comparison of 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. The outstanding work to be completed would be based on the measures specified in the contract.

5.7.3 The timing of the Handback Inspection should be sufficient to allow any agreed outstanding work to be undertaken by the Contractor before the end of the concession period and, if necessary, enforcement of contractual obligations.

5.7.4 The records to be created/transferred as part of a handback are referred to in subsection 5.8 and paragraph 5.8.5.

5.8 Acceptance Inspection Records

5.8.1 All Acceptance Inspections (except the DLI which is dealt with in subsection 5.4) are forms of either a General or a Principal Inspection. Records should therefore comply as a minimum with the relevant requirements set down in this standard for those inspections, and in addition with paragraphs 5.8.2 through 5.8.5 and 5.4.7

5.8.2 The information and records created and/or transferred as part of an Acceptance Inspection should be commensurate with the circumstances and scope of the inspection.

5.8.3 As a minimum, a POI and Transfer Inspection shall facilitate the identification, documentation and agreement of the following; refer to paragraph 5.4.7 for the DLI:

a. Any defects to be rectified before changeover. This should include, as appropriate, the identification of developing problems and work outstanding and securing agreement on any works to be completed before changeover.

b. Any permanent access provisions and features affecting general safety and security of the structure. These shall be discussed in detail and agreement reached before changeover.

c. Any outstanding responsibilities the Contractor/existing owner retains after transfer; these shall be made clear to the Contractor/existing owner and the party taking over responsibility.

d. Any Special Inspection requirements.

e. The date on which the changeover of responsibility occurs.

f. Confirm the accuracy and coverage of “as-built” records

5.8.4 An Acceptance Inspection shall also facilitate the identification and handover of all the necessary records (electronic and/or hard copies), which have an impact on the current and future management of the structure. Details of appropriate records for highway structures are provided in BD 62

5.8.5 The above information/records should be supplemented with any other information considered relevant to the current and future management of the structure.

5.9 Efficient use of Inspection Resources

5.9.1 Acceptance and Maintenance Inspections should be combined or aligned where appropriate in order to make efficient use of resources.

5.10 Combining Inspections

5.10.1 The POI should not be seen as a replacement for inspections/checks carried out as part of the construction contract, since the latter shall comply with the appropriate contract requirements. However, they may be combined when agreed by all parties.

6. SIGN AND SIGNAL GANTRIES

6.1 Background

6.1.1 A number of problems have been found with a particular set of sign and signal gantries and this chapter shall be used to supplement the Inspection Manual for Highway Structures. These reported issues on gantries are not generally prevalent outside England.

6.1.2 Reported problems on gantries include:

a. Non-access gantries with sign support frames suffering failure of the supporting frame structure causing it to fall onto the carriageway.

b. Structural bolted connections found to have loose or missing bolts.

c. Loosening of the fixings, possibly due to vibration.

d. Failure of Gantry equipment fixings when combined with lack of structural redundancy in remaining fixings, resulting in equipment falling onto the carriageway.

e. Plastic cable ties locating aluminium mesh to walkways on lattice type gantries constructed between 2009 and 2016 degrading and failing, resulting in the mesh being lost or damaged and needing to be replaced.

f. Aluminium pop rivets used to attach small signs to gantries and in contact with steel corroding and failing, allowing a sign to fall.

g. Weld failures to the upper aluminium pivot trunion on matrix lane signs giving rise to extensive remedial work including the installation of some secondary restraints.

h. Structural bolts to many cantilever gantries were masked by tape and were incorrectly installed with large slotted holes without suitable structural washers, and have had to be replaced.

i. The dropping of a spanner from a gantry onto the carriageway below.

6.2 Inspection of Sign/Signal Gantries

6.2.1 a) In order to achieve the requirements of Table 2.1 and paragraph 2.2.1 inspectors shall inspect all attachments to all signs and gantry equipment and record any defects. Insecure cable trays and cables should be secured during the inspection if this can be safely achieved or shall be recorded and reported immediately in accordance with paragraph 3.3.1.

b) Examine all fixings for corrosion, security and, if plastic, for UV degradation. Plastic cable ties have been used to secure the perforated aluminium mesh panels to walkways on some lattice type gantries constructed between 2009 and 2016. Some of these ties have been known to have a life as short as two years. If they have not been replaced by a hook type metal mechanical fixing then the ties should be recorded and reported for remedial works in accordance with paragraph 3.3.1.

c) Examine frames to any matrix lane signs over each lane and look for evidence of any excess play, weld fracture or other problems with the pivot mechanism and associated components.

d) In examining for structural defects as referred to in (a) above, examine all structural joints for evidence of movement, bolt distortion, structure distortion or other problems. In doing so inspectors shall remove and where appropriate replace any protective covering such as tape to bolts.

e) Look for corrosion where aluminium pop rivets are used for any purpose including fixing signs, cover plates or cladding to the gantry, and record and report condition. Any recommendations to provide replacement fastenings should be of a type that do not cause bi-metallic corrosion at the fastening, for example nickel copper alloy rivets that are non-reactive with steel or aluminium.

f) Look for trip hazards on access walkways and either remove or report for removal.

6.2.2 The above list is not comprehensive and the inspector shall critically view the gantry and its equipment (including all signs, electrical equipment, and any covers screens or similar). At any inspection, where it is possible that items could fall or be dislodged from the gantry, the inspector should take appropriate measures in accordance with paragraph 3.3.1.

6.2.3 Where a gantry does not have an access walkway many of the above operations must only be undertaken with the appropriate access equipment.

6.3 Gantries with Handrails Less than 1100mm High

6.3.1 Sign/Signal Gantries have been built to varying standards over the years and consequently not all gantries have handrails to the current standard height of 1100 mm. Inspecting organisations and maintainers must ensure that their staff are suitably trained and equipped for access and working on gantries, giving due regard to the walkway handrail height.

6.3.2 Walkway handrail heights less than 1100mm should by now have been recorded as a ‘constraint’ for the structure on the Overseeing Organisation’s asset information management system as it has been a requirement for this to be done on inspections since 2006.

6.3.3 Where the handrail is less than 1100mm, the inspector shall recommend actions to either bring the handrail up to standard or to install suitable safety provisions.

6.3.4 Any recommended maintenance actions shall be risk assessed for a number of relevant criteria, for example;

- Suitability of raising rail or alternatively installing other safety equipment
- Actual handrail height
- Condition of handrail
- Frequency of access and by whom
- Type of work undertaken and nature of equipment on the gantry
- If raising the handrails would obscure the view of any sign

6.3.5 An exercise to prioritise any maintenance actions to handrails should be recommended to the Agent.

6.3.6 Where any major maintenance (including painting) or structural works are recommended for any gantry with low handrails subject to the above risk assessment a recommendation should be made to upgrade the access provision to current standards as given in BD 51.

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7. ALTERNATIVE MEANS OF ACCESS

7.1 Background

7.1.1 There is provision in paragraph 3.6.3 for the use of alternatives to close examination for structural inspections with the prior agreement of the Overseeing Organisation.

7.1.2 Equipment and methods, such as cameras on long reach poles, binoculars, high resolution and telephoto photography from ground level and thermal imaging, remote controlled vehicles (or propelled by winch) with mounted video equipment, unmanned underwater vehicles (UUV), small unmanned aircraft (SUA) or other such systems, may be acceptable alternatives to close inspection, provided they have been designed, developed and suitable for the proposed use. Such alternatives have been suggested for use in structural inspections however their use should be limited to viewing small areas of particular difficult access or small span low risk structures. The prior agreement of the Overseeing Organisation shall be obtained and recorded and the appropriate permissions obtained from the CAA in all cases.

7.1.3 While such remote systems can be a useful tool in the range of inspection techniques available to inspectors and agents, they can have significant shortfalls and any proposal to use them should address their limitations as compared to a close up inspection undertaken by an inspector. As such alternative means of access and inspection should not be proposed to replace close up inspections carried out under a principal inspection unless it eliminates a significant safety hazard, while avoiding or mitigating the shortfalls of remote inspection.

7.2 Use of Small Unmanned Aircraft For Inspections

7.2.1 There has been considerable interest in the use of Small Unmanned Aircraft (SUA), or 'Drones' of under 20kg, in inspections and some trials have been undertaken to evaluate their potential.

7.2.2 The potential benefits of using SUA to view structures are widely recognised. However having a close up visual record of the structures for which SUA's would be of benefit, is not equivalent to the touching distance experience afforded by a Principal Inspection (PI). See paragraph 7.1.3

7.3 Management and Planning for the Use of Small Unmanned Aircraft

7.3.1 When proposing or planning the use of a Small Unmanned Aircraft (SUA) for undertaking inspection/ survey work the inspecting organisation must confirm and apply the limitations on their use that are imposed by the Civil Aviation Authority (CAA). It is clear that the use of SUA for inspections/surveys is a 'commercial operation' and as such the operator must have all necessary permissions issued by the CAA prior to undertaking the work.

7.3.2 The current CAA requirements must be obtained from the CAA.

7.3.3 Prior to each flight a specific risk assessment and flight plan must be undertaken and prepared, which shall include any ground level aspects which need to be under the control of the operator. As a minimum the risk assessment for the flight should address possible distraction to road users, and others likely to be affected; presence of overhead power lines or similar; location of controlled air space; adverse weather conditions and any permissions required for flying over privately owned land adjacent to the network.

7.3.4 The privacy of any persons or their vehicles which are incidentally recorded during the flight must be protected in accordance with relevant UK laws.

7.3.5 The Inspection Organisation and operator must be insured for each flight to the appropriate level indicated in terms of their contract and commensurate with the potential risk to cause damage.

7.3.6 As experience in the use of SUA grows the limitations imposed by the CAA (or equivalent body) are liable to change and the regulations and requirements that are in effect at the time of the inspection or survey must be applied.

7.4 Selection of Small Unmanned Aircraft

7.4.1 The operator must select an appropriate SUA which will satisfy the requirements of the CAA and suit the physical constraints of each proposed location.

7.4.2 The SUA shall be equipped to gather the necessary information to undertake the inspection in accordance with Subsection 4.2.

7.4.3 Potential issues for consideration:

a. Payload and overall weight

b. Battery life

c. Collision damage protection (Sense and Avoid)

d. Wind speed in which it can operate

e. Size of SUA and the spaces to be accessed, e.g. between bridge beams

f. The need for ground control or other reference points

g. The ability of the camera to view above and below the aircraft

8. RISK BASED PRINCIPAL INSPECTION INTERVALS

8.1 General Procedures

8.1.1 This chapter outlines the requirements for risk based Principal Inspection intervals as well as detailing the roles and responsibilities of the various parties. It details the risk assessment process and how it is to be used to determine the appropriate interval between Principal Inspections.

8.1.2 Any procedure to change the inspection interval shall be taken from the Overseeing Organisation Annexes A-D. Where no procedure is given a procedure shall be proposed by the Agent and subject to agreement with the Overseeing Organisation, prior to any assessments being undertaken.

8.1.3 In accordance with paragraph 3.6.7, only Principal Inspection intervals may be varied. General Inspections shall be undertaken every two years unless a Principal Inspection is due that year.

8.1.4 The following structures shall not be subject to risk assessment to increase the interval between Principal Inspections:

- Strategic structures, including long span structures (suspension and cable stayed bridges) and tunnels
- Relatively high risk structures (including half-joint, hinge deck, segmental post- tensioned, and scour susceptible structures)
- Structures subject to management under BD 79
- Bridges with severe (marine environment) exposure
- Structures which are scour susceptible (risk rating 1-4) to BD 97
- Structures which would affect an operational railway if a failure occurred
- Structures which have a condition rating of 'Poor' (score 0-40)

8.1.5 Where the Agent determines it is appropriate, they shall use this chapter to develop risk assessments to determine the interval between principal inspections for any structure under their stewardship.

8.2 Principles of Risk Based Inspection Intervals

8.2.1 Assessments shall be based on principles of risk analysis to support decisions as to whether increased inspection intervals may be used. It is assumed that engineering judgement will be used throughout any assessment.

8.2.2 Risk assessment considers the likelihood and consequences of failure as essentially:

Risk = f (Likelihood of Event, Consequence of Event)

8.2.3 A risk rating should be calculated for each structure under consideration based on certain parameters, representing the likelihood of an event (defect occurring, structural failure) and its potential consequences. Where given, these parameters are defined in Overseeing Organisation Annexes A-D. It is intended that by using a qualitative scoring system, structures can be ranked or grouped in terms of relative risk.

8.2.4 The potential reduction in exposure to inspector safety risk must be assessed as a factor of any risk assessment.

8.3 Roles and Responsibilities

8.3.1 All risk assessments shall be undertaken by appropriately qualified and competent staff, whose responsibility it is to make an informed decision based on the risk assessment as well as other known factors and information. The completed risk assessments shall be authorised by the Supervising Engineer.

8.3.2 Where an increased Principal Inspection interval is proposed the Service Provider shall send a copy of the risk assessment to the Overseeing Organisation's Technical Approval Authority (TAA) for agreement in accordance with paragraph 3.6.12. Principal Inspection intervals shall not be increased without the TAA's prior written agreement.

8.4 Scheduling Inspections

8.4.1 Where the interval between successive Principal Inspections has been increased beyond six years, a General Inspection shall be carried out in their place. When a General Inspection coincides with a due Principal Inspection, a Principal Inspection shall be undertaken. Scheduling of inspections remains in accordance with subsection 3.11.

8.4.2 Where a risk assessment has not been approved to increase the Principal Inspection interval beyond 6 years, intervals shall remain at 6 years. Subject to the risk assessment, Principal Inspections may be held at intervals of 6, 8, 10 or 12 years. A maximum period of 12 years is permitted for cases where there is very low risk exposure.

8.4.3 Principal Inspection intervals shall not exceed the period determined by the risk assessment.

8.4.4 Where a structure has been subject to a risk assessment process resulting in an increased interval between Principal Inspections, a review of the risk assessment shall be carried out following each subsequent General Inspection. This is in order to ensure that the assumptions on the risk levels remain valid. eg unexpected deterioration of defects or other risks which may become apparent.

8.5 Records Management

8.5.1 The time to the next Principal Inspection shall be recorded in the Overseeing Organisation's record management system, as defined in the Provider contract and the Asset Data Manual Provider Requirements. Inspection Schedules should then be updated to reflect any changes made to the frequency.

8.5.2 Signed and authorised risk assessments shall be uploaded to the appropriate document storage module of the Overseeing Organisation's record management system, as defined in the Provider contract and the Asset Data Manual Provider Requirements.

8.6 Risk Assessment Process

8.6.1 The procedure for determining risk based inspection intervals is shown in Figure 8.6.

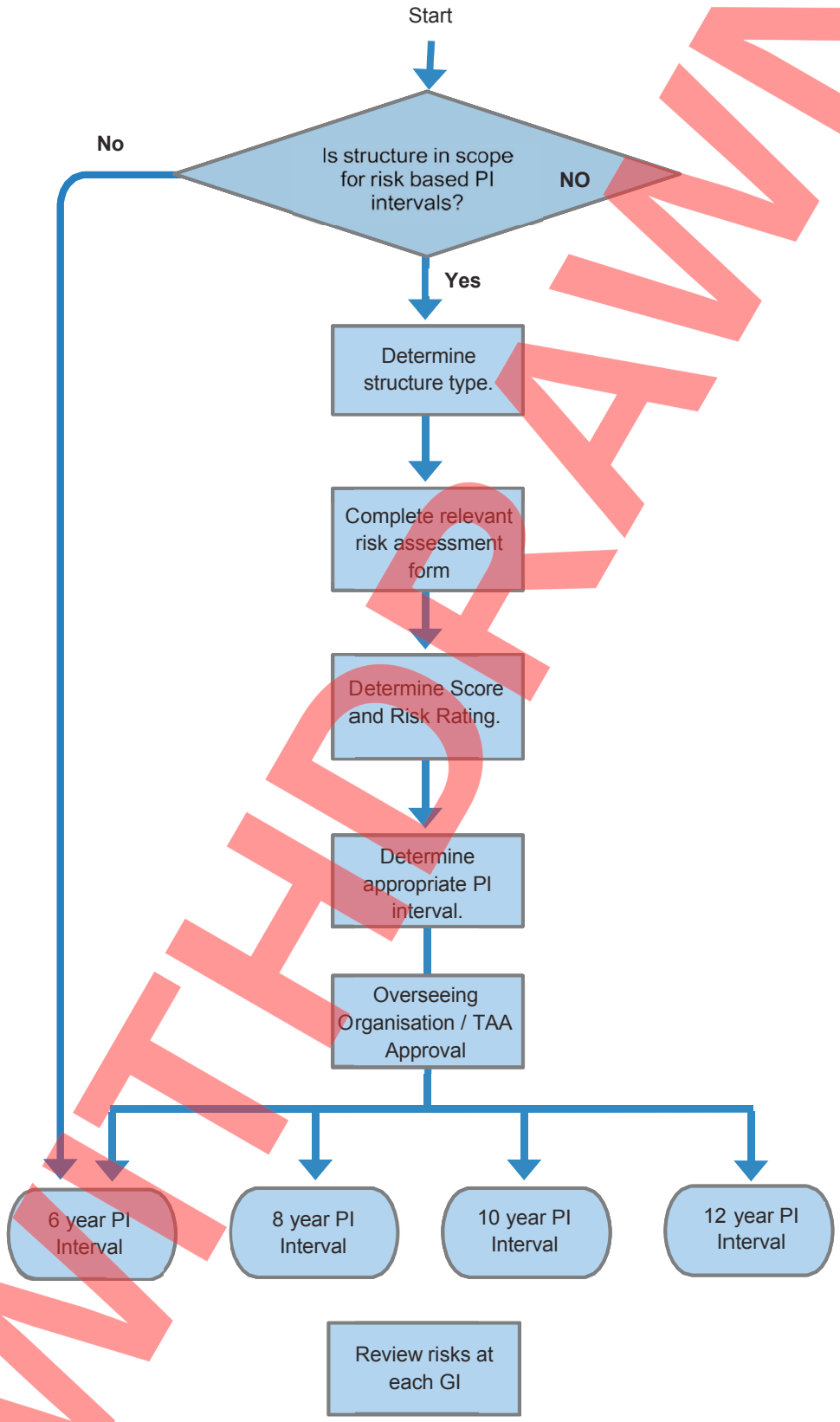

Figure 8. 6 – Flow chart to show Risk Assessment Methodology

8.7 Risk Assessment Forms and Procedures

8.7.1 Structures shall be assessed using the Overseeing Organisation's risk assessment spreadsheet forms whose locations are given in Annexes A-D .

8.7.2 The risk assessment's role is to assist and inform, not replace, engineering judgement on structures. Upon completion, the record management procedures described in subsection 8.5 shall be followed.

9. STRUCTURES INSPECTORS COMPETENCIES AND CERTIFICATION

9.1 Introduction

9.1.1 National Highway Sector Scheme 31 has been established for the certification of bridge inspectors. This chapter sets out the competencies that bridge inspectors shall demonstrate achievement of and situations that the different categories of inspector shall apply to.

9.1.2 Where the term 'bridge' or 'bridges' appears in this chapter it shall be deemed to include any highway structure or structures defined in subsection 1.2.

9.2 Action

9.2.1 Personnel planning to undertake inspections on highway structures shall demonstrate the level of competence for the role which they are proposing to undertake. Two categories of inspector have been developed:

Inspector (I) and Senior Inspector (SI)

These categories recognise different skills and experience of existing inspectors and requirements for the future. Different levels of competencies are prescribed for Inspectors and Senior Inspectors and subsection 9.5 describes the requirements in detail. The primary differences between the two competence requirements are that a Senior Inspector must be able to demonstrate broader experience and proficiency of the relevant areas and have evidence of having advised others.

9.2.2 A comprehensive package of evidence which demonstrates achievement of the competence requirements shall be assessed by an independent person, the assessor. The assessor shall undertake a review of the evidence presented and if this is acceptable a face to face interview shall be undertaken to confirm that the candidate is suitable and they would become a 'certified' Inspector or Senior Inspector. Once assessed a further review of experience and knowledge would be undertaken at regular intervals of approximately 5 years. Whilst compiling their evidence prior to submission and examination by an assessor the inspector will be regarded as a 'trainee inspector' and their role will be limited as set out in paragraph 9.2.6.

9.2.3 The Supervising Engineer shall assess the suitability of the level of certification and experience of prospective inspectors before engaging them for particular structures inspections.

9.2.4 The assessor shall be a person who has had their competencies reviewed and examined by a relevant quality assured independent organisation and the certification shall be issued by, or on behalf of, that organisation.

9.2.5 Both inspector roles require Inspectors to have the necessary competencies to undertake Principal Inspections, General Inspections, and Acceptance Inspections. Inspections for Assessment, Special Inspections and Monitoring Inspections should be undertaken by personnel with the specialist expertise and experience relevant to the purpose of the inspection and it is expected that these personnel will be accompanied by a certified Inspector or certified Senior Inspector.

9.2.6 The following are the requirements for the suitability of personnel undertaking inspections:

a) Personnel undertaking inspections shall have achieved the competencies required as set out in subsection 9.5 and achieved certification, except as in b) below;

b) Trainee Inspectors may assist certified Inspectors or certified Senior Inspectors; however their numbers and role shall be limited. For a small or medium structure which requires a 1 or 2 person inspection team to complete the inspection a Trainee Inspector may accompany a certified Inspector or Senior Inspector but cannot undertake an inspection on his/her own. For the inspection of a more complex or larger structure the certified Inspectors and Senior Inspectors may be supplemented by Trainee Inspectors who can make up to 25% of the team which are on site throughout the inspection. This is intended to balance the requirement for experienced personnel and requirements for training;

c) It is recognised that junior engineers/technicians can gain useful experience by being involved on bridge inspections, although this may form a small part of their workload. This experience can be gained by observing the work being undertaken by the Inspector(s) and possibly assisting with access;

d) For complex structures, where unusual elements or load paths exist, a certified Senior Inspector with the relevant competencies should lead and undertake the inspection. Such structures are likely to have one or more of the following features :

i. Skews greater than 25°;

ii. Unconventional or novel design aspects;

iii. Half-joints, hinge-joints or post-tensioning;

iv. Any individual span exceeding 50m;

v. History of unresolved foundation problems, significant structural defects, or significant safety issues, or subject to BD79 interim measures;

vi. Moveable bridges;

vii. Scour susceptibility;

viii. Moveable inspection access gantries, gantry rail and gantry support systems;

ix. Suspension systems (e.g. cable stayed, or suspension bridges); and

x. Retaining walls greater than 7.0m in height.

e) For structures which incorporate uncommon materials, such as laminated timber or fibre composite materials, certified inspectors with knowledge and experience of those materials and the mechanisms of deterioration shall only be used. Alternatively a certified inspector shall undertake a joint inspection with a specialist with knowledge and experience of those materials and the mechanisms of deterioration who shall be accompanied on the inspection and provide their written advice to the inspector.

9.2.7 Applications for review and examination of evidence of competencies should be made in sufficient time, with the aim that continuous certification is achieved.

9.3 Bridge Inspector Certification Scheme

9.3.1 In order to streamline the process of reviewing and examining the competencies of prospective inspectors there is a certification scheme for Bridge Inspectors, entitled ‘Bridge Inspector Certification Scheme’ (BICS).

9.3.2 Within the scheme the route to becoming a certified Inspector or Senior Inspector involves four key stages:

Stage 1 – Enrolment on the BICS

Stage 2 – Achievement of the required level

Stage 3 – Successful review of completed evidence and external interview to achieve Certification

Stage 4 – Continued consolidation and broadening of experience for additional competencies and to maintain registration.

9.3.3 The Bridge Inspector Certification Scheme has the Administrator as detailed below:

Lantra Awards,
Lantra
Stoneleigh Park
Coventry
Warwickshire
CV8 2LG

9.3.4 Further details of how these competencies can be certified via the BICS, and registration of interest in the scheme at:

http://www.bridge-inspectors.com

9.4 Existing Structures Inspectors

9.4.1 There are a significant number of people currently undertaking inspections who have been doing so for a large number of years and have extensive knowledge and experience. They are highly valued and it is critical to the bridge community that these people are not 'lost' through the introduction of the requirement for review and examination of competencies. With their knowledge and experience, it is expected that the demonstration of meeting the required competencies should be readily achievable. In the BICS this may be facilitated through support and guidance from a mentor.

9.4.2 Where there are shortcomings in the awareness, knowledge, experience or proficiency in some of the modules this may require some targeted additional experience or training. There are training courses currently available which can be used to supplement a Trainee Inspector's knowledge and assist in meeting the competence requirements; however participation in formal learning courses is not mandatory to attain scheme certification.

9.5 Core Competence Requirements

The competencies are set out as seven 'headline' competencies and sub-competencies together with the level of competency in terms of Awareness (A), Knowledge (K), Experience (E), Proficiency (P).

Achievement Rating		Description	
A	**Awareness**	General **understanding** of the competence, including an **appreciation** of its relevance.	*These apply to **theory** only*
K	**Knowledge**	Knowledge and understanding of the competence with an ability to **demonstrate** its relevance/ application.	
E	**Experience**	Knowledge, understanding and **experience** of undertaking the competence.	*These apply to **practical application**, as well as theory*
P	**Proficiency**	Knowledge, understanding and **experience** of undertaking the competence and **competent to advise others**.	

9.5.1 Introduction to Inspections

This skill set outlines the background to the importance of undertaking inspections. Fundamental to effective management is an inspection regime that provides timely, accurate and appropriately detailed information on asset condition and performance. The overall purpose of inspection, testing and monitoring is to check that structures are safe for use and fit for purpose and to provide the data required to support effective maintenance management and planning.

Ref.	Outcome/Skill	I	SI
C1.1	Purpose of Inspections		
	• be able to outline the importance of undertaking inspections	K	K
	• be able to explain the terms 'safe for use' and 'fit for purpose'	K	K
C1.2	Inspector Roles, Responsibilities and Competencies		
	• be able to describe the two inspector roles and their associated responsibilities.	K	K
	• demonstrate appropriate level of knowledge of the competencies for the different roles	K	K
C1.3	Inspection types		
	• be able to explain the different inspection types	K	K
	• demonstrate the importance of having an appropriate inspection regime	K	K
	• demonstrate awareness of the range of different Special Inspections, their function and which factors typically initiate their use	K	K
C1.4	Codes of Practice and guidance		
	• demonstrate appropriate knowledge and use of the relevant structure inspection codes of practice and guidance e.g. Inspection Manual for Highway Structures etc.	E	P

9.5.2 Structures Types and Elements / Behaviour of Structures

This skill set outlines common types of structures, their key elements and materials. It also covers background information and guidance on the fundamentals of structural behaviour, the basic principles of structural mechanics and material properties.

Ref.	Outcome/Skill	I	SI
C2.1	Bridges		
	• Demonstrate knowledge of the major bridge elements: Superstructure, Substructure, Safety Elements, Durability Elements and Ancillary Elements	E	P
	• Demonstrate knowledge of typical Primary and Secondary deck element types	E	P
	• Demonstrate knowledge of bridge types using: span form, construction form and construction material	E	P
	• Demonstrate knowledge of water management systems, their function and importance	E	P
	• Demonstrate knowledge of utilities, private services, signs and lighting	E	P
C2.2	Other Structure Types		
	• Demonstrate knowledge of the definition of a culvert and the different types	E	P
	• Demonstrate knowledge of the definition of a subway and the different types	E	P
	• Demonstrate knowledge of the definition of a retaining wall and the different forms	E	P
	• Demonstrate knowledge of sign/signal gantries and the different types	E	P
	• Demonstrate knowledge of the different mast types and functions	K	E
	• Demonstrate knowledge of ancillary structures, function and type	K	E
C2.3	Structural Mechanics		
	• Be able to describe the loadings to which bridges are subjected	K	E
	• Be able to demonstrate knowledge/experience of the loadpath for a structure	K	E
	• Be able to demonstrate knowledge of modes of failure	K	E
	• Demonstrate an understanding of materials' responses to loadings	K	E
	• Demonstrate an understanding of structures' responses to loadings	K	E
C2.4	Properties of Common Construction Materials		
	• Demonstrate an understanding of the properties of the following common primary materials and how they influence the safety, durability and functionality of a specific component and the whole structure: – concrete; reinforced concrete; pre-stressed concrete (pre-tensioned and post-tensioned); steel; masonry; timber	K	E
	• Demonstrate an understanding of the following secondary materials: – asphalt; asbestos	K	E
C2.5	Properties of Specialist Construction Materials		
	• Demonstrate an understanding of the properties of the following materials and how they influence the safety, durability and functionality of a specific component and the whole structure: – wrought iron; cast iron; aluminium and its alloys; advanced composites	A	K

9.5.3 Inspection Process

This skill set outlines the fundamentals of the inspection process, including scheduling, planning, undertaking, reviewing and interpreting the results. It also includes consideration of environmental impacts, selection of appropriate access equipment and safe working practices. In addition, it highlights the importance of accurate, reliable data capture and storage post the inspection.

Ref.	Outcome/Skill	I	SI
C3.1	Scheduling Groups of Inspections		
	• Demonstrate knowledge of relevant documentation which outlines details regarding the frequency of inspections	E	P
	• Demonstrate understanding of criteria which can constrain or influence a schedule, for example, confined spaces, use of MEWPs etc.	E	P
	• Explain the objectives of each cyclical inspection type	E	P
	• Demonstrate ability to monitor progress of inspections against schedules	E	P
	• Demonstrate experience of access requirements, for example, roadspace booking, track possessions, waterways access, major events, etc.	E	P
	• Demonstrate knowledge of the ability to vary frequency of inspections based on a risk based approach, including special inspections	A	K
C3.2	Planning and Preparing for an Inspection		
	• Explain the function and importance of existing records	E	P
	• Demonstrate ability to challenge validity of existing structures records	E	P
	• Demonstrate awareness of the importance of the structures current assessed capacity	E	P
	• Explain what further information may need to be determined from pre-inspection visit	E	P
	• Demonstrate experience of and an appreciation of the importance of method statements, health and safety considerations and risk assessments in undertaking inspections	E	P
	• Demonstrate understanding of aspects to be considered in deciding method of access. This may include: consideration of types of access equipment, restrictions/obstructions caused by equipment, lone working, traffic management requirements and routes to be used to and from the site	E	P
	• Explain the types of notifications which may be required prior to gaining access	E	P
	• Demonstrate an understanding of the range of equipment which may be utilised to undertake an inspection. Range to include: access equipment; PPE; data recording equipment; measuring or inspection equipment	E	P
	• Demonstrate an understanding of the environmental considerations to be taken into account, for example, asbestos, bats, badgers etc.	E	P
	• Explain the process for planning any testing which may be required as part of an inspection	E	P
	• Outline the key aspects for an inspection method statement.	E	P
	• Demonstrate knowledge of how to cost undertaking inspections, the procurement of 3rd party support and budgetary constraints	E	P

Ref.	Outcome/Skill	I	SI
C3.3	Performing Inspections		
	• Describe a practical approach of undertaking an inspection, highlighting the key aspects	E	P
	• Explain the reasons and implications of restricted working hours on the process of undertaking an inspection	E	P
	• Explain the reasons why 'good housekeeping' whilst on site is imperative and what does it involve	E	P
	• Demonstrate an understanding of the need to escalate potential safety critical defects	E	P
	• Demonstrate an understanding of substandard parapets & road restraint systems	E	P
	• Demonstrate an understanding of communication protocols (for example, who is the Principal Contractor etc) and how to set one up	E	P
C3.4	Recording Inspection Findings		
	• Demonstrate understanding of the importance of recording defects accurately in terms of type, location, extent, severity and cause	E	P
	• Outline different methods used for recording defects	E	P
	• Demonstrate knowledge of the prerequisites of a data capture and inspection proforma	E	P
	• Be able to explain the importance of 'signing off' an inspection	E	P
	• Demonstrate knowledge of the principals of an element condition rating process	E	P
	• Explain the level of detail to be recorded depending upon the type of inspection	E	P
	• Understand how the accuracy of reporting can affect overall structure condition performance indicators, as well as element condition rating	K	E
C3.5	Interpreting Inspection Findings		
	• Demonstrate knowledge of factors which affect whether a structure is safe for use and/or fit for purpose	K	E
	• Be able to identify possible safety critical defects and report them within the prescribed timescales	K	E
	• Understanding of the need to utilise existing records to help interpret defects	E	E
	• Demonstrate knowledge of the range of maintenance works which are commonly recommended following an inspection	E	E
	• Demonstrate an awareness of how defects are managed to identify future maintenance works, based on priority and cost	K	E
C3.6	Maintenance Planning Process		
	• Demonstrate understanding of how the data captured from inspections complements other information held for a structure	K	E
	• Explain the importance of up-to-date and comprehensive data on the condition of a structure with respect to its input to maintenance planning	K	E
	• Demonstrate an overview of the process for obtaining funding for future maintenance works and how it is value managed	K	E
	• Demonstrate knowledge of a bridge management system	K	E

Ref.	Outcome/Skill	I	SI
C3.7	Obligations of Current Health and Safety & Environment Legislation		
	• Demonstrate understanding of the need to minimise health and safety risks to the public and others who may be affected by the work activities	E	P
	• Demonstrate understanding of the need to minimise health and safety risks to those actually carrying out the works	E	P
	• Demonstrate understanding of the need and breadth of personal protective equipment (PPE) utilised for undertaking inspections for safe working	E	P
	• Demonstrate understanding and practical experience of managing and applying safe systems of work	E	P
	• Demonstrate knowledge of relevant legislation and sources of guidance	E	P
	• Demonstrate understanding of the need to minimise the impact on the environment, seeking expert advice if necessary to identify and implement appropriate working practices and/or mitigation measures	E	P
	• Experience of having dealt with: – utilising access equipment; moving on foot alongside live carriageways; accessing and exiting from traffic management; working at height; working in, on or adjacent to water, railways etc; toxic substances, e.g. lead in paint; lone working; night work; confined spaces	E	P
C3.8	Other Skills		
	• Demonstrate basic knowledge of traffic management practices and relevant reference material, e.g. Chapter 8 of Traffic Signs Manual	K	K

9.5.4 Defects Descriptions and Causes

This skill set outlines the importance and requirements for describing and categorising defects. Emphasis is placed on principal defects that are likely to be encountered in concrete structures, steel and steel/concrete composite structures, masonry structures and structures built of other materials.

Ref.	Outcome/Skill	I	SI
C4.1	Understanding Principal Defects		
	• Demonstrate understanding of the principal causes of defects, including: inadequate structural capacity; substandard clearance etc; naturally occurring damage e.g. scour; accidental or deliberate damage; structural materials deterioration; structural elements functionality e.g. bearings, drainage, expansion joints etc.; failure of water management systems; adequacy and function of parapets & vehicle restraint systems	E	P
	• Demonstrate understanding of the implications of deterioration	E	P
	• Demonstrate understanding of issues that cause collapses or structure closures, for example, erosion, scour, bridge strikes etc.	K	K
	• Demonstrate knowledge of bridge specific defects	E	P
	• Demonstrate knowledge of culvert specific defects	E	P
	• Demonstrate knowledge of retaining wall specific defects	E	P
	• Demonstrate knowledge of sign/signal gantry and mast specific defects	K	E

Ref.	Outcome/Skill	I	SI
C4.2	Concrete Defects		
	• Demonstrate knowledge of defects caused by structural distress	E	P
	• Demonstrate knowledge of defects arising due to material nature	E	P
	• Demonstrate knowledge of defects caused by external agents e.g. reinforcement corrosion, thaumasite sulphate attack (TSA) etc.	E	P
	• Demonstrate knowledge of defects caused by accidental or deliberate damage	E	P
	• Demonstrate knowledge of defects due to construction or detailing errors	E	P
	• Demonstrate knowledge of defects associated with protective coatings and repair systems	E	P
	• Demonstrate knowledge of minor defects e.g. defects which generally only affect the visual appearance of the concrete	E	P
	• Demonstrate knowledge of defects that can occur in prestressed concrete	E	P
	• Demonstrate knowledge of defects that can occur in post-tensioning systems	K	E
C4.3	Steel Defects		
	• Demonstrate knowledge of defects caused by structural distress	E	P
	• Demonstrate knowledge of defects arising due to material nature	E	P
	• Demonstrate knowledge of defects instigated by external agents e.g. bimetallic corrosion	E	P
	• Demonstrate knowledge of defects caused by accidental or deliberate damage	E	P
	• Demonstrate knowledge of defects arising due to fabrication errors e.g. poor welds	E	P
	• Demonstrate knowledge of defects associated with protective systems	E	P
	• Demonstrate knowledge of defects associated with closed members	E	P
	• Demonstrate knowledge of defects associated with corrugated steel buried structures	E	P
	• Demonstrate knowledge of defects which affect the whole system, for example, beams with jack arches	E	P
C4.4	Masonry Defects		
	• Demonstrate knowledge of defects caused by structural distress	E	P
	• Demonstrate knowledge of defects arising due to material nature	E	P
	• Demonstrate knowledge of defects instigated by external agents e.g. frost, vegetation	E	P
	• Demonstrate knowledge of defects caused by accidental or deliberate damage	E	P
	• Demonstrate knowledge of defects arising due to alterations to masonry structures e.g. concrete saddle etc	E	P
C4.5	Defects in Miscellaneous Materials		
	• Demonstrate appropriate level of awareness of defects which can occur in other materials: cast iron; wrought iron; aluminium; timber; advanced composites; wire rope	K	K

9.5.5 Investigation and Testing

This skill set outlines the background to the range of different testing techniques available. A candidate is required to understand the purpose of undertaking testing, what it involves, the outputs and any other relevant considerations.

Ref.	Outcome/Skill	I	SI
C5.1	The Testing Process		
	• Demonstrate an understanding of the need and purpose of testing, and when it is appropriate	K	K
	• Demonstrate an understanding of the different investigations and testing to examine:	K	K
	– structural arrangement and hidden defects; distortion and movement; material properties; deterioration activity; deterioration rate; deterioration cause or potential		
	• Explain what is required in developing an effective testing programme.	A	K
	– setting objectives of testing; identification of testing options; appraisal of testing options; monitor and supervise testing; evaluate results and make recommendations for corrective action		
	• Demonstrate knowledge of investigation processes, for example, trial holes etc.	K	K
	• Demonstrate awareness of the procurement processes for engaging specialist services	A	K
C5.2	Common Testing Techniques		
	• Demonstrate knowledge of common testing techniques, such as: delamination survey; cover surveys; half-cell potential surveys; strain gauges; carbonation test; chloride / sulfate / alkali content; ultrasonic testing; coring; paint film thickness measurements	K	K
	• Demonstrate knowledge of limitations of investigations and tests	A	K

9.5.6 Repair Techniques

This skill set outlines the importance of understanding the range of repair techniques available.

Ref.	Outcome/Skill	I	SI
C6.1	Repair techniques for concrete structures		
	• Demonstrate knowledge of the principal repair techniques for concrete structures. Knowledge to include (but not limited to): materials used for repairs (e.g. sprayed concrete, hand-applied cementitious mortars, epoxy resins etc); methods for inhibiting corrosion (e.g. cathodic protection, impregnation, surface treatments etc); strengthening methods (e.g. plate bonding, composite column wrapping etc)	K	K
C6.2	Repair techniques for metal structures		
	• Demonstrate knowledge of the principal repair techniques for metal structures. Knowledge to include (but not limited to): repairs by plating; member replacement; protective coatings and paints, such as epoxy resins and polyurethane; heat straightening	K	K

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Ref.	Outcome/Skill	I	SI
C6.3	Repair techniques for masonry structures		
	• Demonstrate knowledge of the principal repair techniques for masonry structures. Knowledge to include (but not limited to): repointing/brickwork repairs; sprayed concrete; retrofitting of reinforcement; anchors; concrete saddle / relieving slabs; stitching	K	K
C6.4	Repair techniques for 'other' structures e.g. timber		
	• Demonstrate knowledge of the principal repair techniques for 'other' materials	K	K
C6.5	Importance of Routine Maintenance		
	• Demonstrate knowledge of the importance of undertaking Routine Maintenance	K	K
	• Demonstrate an understanding of the importance of balancing essential preventative maintenance works	K	K
C6.6	Recommending appropriate repairs		
	• Demonstrate experience of recommending repairs appropriate to the identified defects	E	P

9.5.7 General Aptitude

This skill set outlines the general aptitude skills required by an inspector.

Ref.	Outcome/Skill	I	SI
C7.1	Practical Aptitude		
	• Be able to demonstrate ability to make sound and prudent judgements	P	P
	• Demonstrate excellent attention to detail.	P	P
	• Be able to work to deadlines	P	P
	• Be able to appreciate one's own capability and scope of knowledge	P	P
C7.2	Working with people		
	• Demonstrate experience of having worked successfully in a team	P	P
	• Demonstrate experience of having engaged successfully with 3rd parties and public	P	P
C7.3	Communication skills		
	• Be able to interpret drawings and reports	P	P
	• Be able to draw clear sketches	P	P
	• Be able to write reports	P	P
	• Be able to communicate verbally in a clear and comprehensive way.	P	P
	• Be able to demonstrate proficiency in communicating findings from an inspection	P	P
	• Demonstrate range of IT skills	E	P
C7.4	Personal skills		
	• Demonstrate self-motivation	P	P
	• Be able to decide and set priorities.	P	P
	• Be able to take decisions and have confidence to challenge a situation/decision if necessary.	P	P
	• Demonstrate understanding of knowing one's limitations	P	P

Ref.	Outcome/Skill	I	SI
C7.5	Obligations of Current Health and Safety Legislation		
	• Demonstrate knowledge and understanding of current health and safety legislation obligations.	P	P
	• Demonstrate a positive attitude towards health and safety	P	P
	• Demonstrate ability to develop working practices that promote safety and secure the compliance of subordinates.	P	P
	• Demonstrate knowledge and understanding of the importance of method statements and risk assessments	P	P
C7.6	Management / Supervision		
	• Demonstrate ability to manage and motivate teams.	K	P
	• Demonstrate ability to advise and present recommendations to others.	K	P
	• Identify resources required for an inspection	E	P
	• Ensure that inspection activity complies with the appropriate contractual and legal requirements.	K	P

10. HEALTH AND SAFETY

10.1 Introduction

10.1.1 Inspections of highway structures, including any testing, must be managed to comply with general statutory and other relevant health and safety requirements and any associated Regulations and Approved Codes of Practice and guidance documents that amplify these requirements. Agents must comply with these requirements and the Overseeing Organisation's internal safety procedures when planning and undertaking inspections of highway structures.

10.2 Health and safety plans and records

10.2.1 Agents must develop written plans and retain records in order to demonstrate compliance with health and safety legislation while planning and carrying out inspections of highway structures.

10.3 Legislation

10.3.1 The following is a rudimentary list of legislation that covers some activities and hazards likely to be encountered during the inspection of highway structures at the time of publication. It is not exhaustive nor is it intended to cover every situation:

- Health and Safety at Work Act 1974 (HSWA 1974). Lays down provisions for employers and employees to control hazards encountered during the course of activities undertaken at work.
- The Management of Health and Safety at Work Regulations 1999 (MHSWR 1999). A set of regulations for the management of health and safety at work. See also Working alone, Health and safety guidance on the risks of lone working (HSE INDG73).
- Workplace (Health, Safety and Welfare) Regulations 1992 (WHSWR 1992) – See also Workplace health, safety and welfare, Approved Code of Practice and guidance (HSE L24) The regulations cover a wide range of basic health, safety and welfare issues and apply to most workplaces.
- Working At Height Regulations 2005 (WAHR 2005) – See Also 'Working at height, A brief guide (HSE INDG401)' and the 'Work At Height, Access equipment Information Toolkit (WAIT)' available online. Provides guidance to eliminate and control work at height including the selection of appropriate access equipment.
- The Confined Spaces Regulations 1997 (CSR 1997). – See Also 'Safe work in confined spaces, Approved Code of Practice and Guidance (HSE L101)'. Written for those who work or control work in confined spaces. It explains the definition of a confined space in the Regulations and gives examples. It will help you assess the risk of working within a particular confined space and put precautions in place for work to be carried out safely.
- The Diving at Work Regulations 1997 (DAWR 1997). – See Also 'Commercial diving projects inland/ inshore, Approved Code of Practice and guidance (HSE L104)'. Provides practical advice and sets out what you have to do to comply with the requirements of the Diving at Work Regulations 1997. It applies to all diving projects conducted in support of civil engineering or marine-related projects inland in Great Britain including in docks, harbours, rivers, culverts, canals, lakes, ponds, reservoirs and tanks.

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- Control of Asbestos Regulations 2012 (CAR 2012) – See also 'Asbestos essentials, A task manual for building, maintenance and allied trades of non-licensed asbestos work, Advice on non-licensed work with asbestos (HSG 210, A0)'.

- Traffic Signs Manual, Chapter 8, Traffic Safety Measures and Signs for Road Works and Temporary Situations. – Chapter 8 is intended to provide a standard of good practice for the signing and marking of obstructions as well as for the temporary traffic control necessitated by such obstructions of the highway. The standard described is a minimum, which should always be achieved. At difficult sites, i.e. sites where the on-site risk assessment has shown that the level of risk is above normal, further signs and other equipment will be necessary.

- The DfT publication 'Safety at Street Works and Road Works' dated October 2013 is a concise guide for traffic management arrangements on single carriageways or dual carriageways where the traffic speed is below 50mph.

10.4 Inspection Hazards

10.4.1 A site specific risk assessment must be prepared, and agreed by the Supervising Engineer, before commissioning and undertaking inspections which feature the following safety hazards:

- Work at height
- Work over water
- Diving
- Confined spaces
- Asbestos*
- Traffic management
- Work near/on railway property
- Lone working*

* Generic/task based risk assessments may be suitable provided site specific risk assessments are carried out when required.

These hazards are defined in accordance with relevant health and safety legislation and any approved code of practice (See subsection 10.3). The risk assessment must evaluate whether the hazard can be eliminated eg by an alternative access route, use of remotely operated vehicles or unmanned underwater vehicles.

10.4.2 While these hazards have been identified as occurring most frequently, other hazards must also be subject to appropriate management and risk assessment, and Inspectors and Supervising Engineers and Agents must manage them appropriately in accordance with subsection 10.2.

10.4.3 Where the role of the Inspection Organisation is carried out by other parties and where any one or more of the hazards in paragraph 10.4.1 becomes apparent, an outline risk assessment must be prepared, and agreed by the Supervising Engineer, before commissioning and undertaking the inspection. The Agent must provide the outline risk assessment to the Inspection Organisation and receive an operational risk assessment and method statement from them prior to any inspection operation.

10.4.4 Encountering mould. Wherever mould growth is encountered in a box girder, it should be regarded as 'toxic'. A review of previous reports may alert the inspector/supervising engineer of its presence. As a precaution personal protection equipment should be available for protection against toxic mould, for use during a confined space operation so that it is readily available during the inspection if required.

10.4.5 The Inspection Organisation must follow GD 5 for Overseeing Organisation requirements covering the management of asbestos.

10.4.6 Traffic management – In areas where the structure cannot be accessed from off the main highway network and there isn't a hard shoulder, verge, refuge area or maintenance area in the vicinity of a structure then traffic management may be required in order to undertake General Inspections in a safe manner. Guidance on the requirements for short duration stops is available in the Traffic Signs Manual.

10.4.7 Working near/on railways – inspections near or on railways must be arranged with, and carried out in full accordance with the requirements of the relevant railway body.

11. REFERENCES

NORMATIVE REFERENCES

Design Manual for Roads and Bridges

GD 1 Introduction to the Design Manual for Roads and Bridges (DMRB 0.1.2)

GD 2 Quality Management Systems for Highway Design (DMRB 0.2.1)

GD 4 Standard for Safety Risk Assessment on the Strategic Road Network (DMRB 0.2.3)

GD 5 Asbestos Management in Trunk Road Assets (DMRB 0.2.4)

BD 2 Technical Approval of Highway Structures, (DMRB 1.1.1)

BD 21 The Assessment of Highway Bridges and Structures (DMRB 3.4.3)

BD 53 Inspection and Records for Road Tunnels (DMRB 3.1.6)

BD 62 As Built, Operational and Maintenance Records for Highway Structures (DMRB 3.2.1)

BD 79 The Management of Sub-Standard Highway Structures (DMRB 3.4.18)

BA 35 Inspection and Repair of Concrete Structures (DMRB 3.3.2)

BA 50 Post-tensioned Concrete Bridges: Planning, Organisation and Methods for Carrying Out Special Inspections (DMRB 3.1.3)

BA 74 Assessment of Scour at Highway Bridges (DMRB 3.4.21

BD 97 The Assessment of Scour and Other Hydraulic Actions at Highway Structures (DMRB 3.4.21)

Other Publications

Management of Highway Structures, A Code of Practice, UK Roads Liaison Group, 2013

BS ISO 55001:2015, Asset management, Management systems, Requirements

Inspection Manual for Highway Structures, UK Bridges Board, 2007*

Institution Guide: The Operation and Maintenance of Bridges Access Gantries and Runways, The Institution of Structural Engineers, 2007

* Caution is advised on the use of the Inspection Manual for Highway Structures as it appears to be out of date with regard to advice on Health and Safety procedures and legislation.

12. APPROVAL

Approval of this document for publication is given by:

Highways England Temple Quay House The Square Temple Quay Bristol BS1 6HA	M WILSON Chief Highways Engineer
Transport Scotland 8th Floor, Buchanan House 58 Port Dundas Road Glasgow G4 0HF	R BRANNEN Chief Executive
Welsh Government Transport Cardiff CF10 3NQ	S HAGUE Deputy Director Network Management Division
Department for Infrastructure Clarence Court 10-18 Adelaide Street Belfast BT2 8GB	P B DOHERTY Director of Engineering

All technical enquiries or comments on this Document should be sent to
DMRB_ Enquiries@highwaysengland.co.uk

ANNEX A SPECIAL REQUIREMENTS: ENGLAND

A1 Programme Requirements

A1.1 A programme of principal inspections shall be developed to demonstrate effective planning of resources and that sufficient consideration has been given to achieving the scope, allowing the Overseeing Organisation to discuss progress with the Agent at suitable intervals.

A1.2 The programme shall be submitted at the start of the contract and then at the start of each financial year until the end of the contract period. It shall give the year and month for all principal inspections planned in the current and next financial year. Additionally, it shall show all inspections involving access to railway property for the whole contract period, and up to 21 months into the following contract period.

A2 Inspection Schedules

A2.1 The required frequency of inspection and/or initiating event is described in Table A2.1.

Table A2.1 Schedule of Inspections

Structure Type	First PI (4)	First GI (3)	Subsequent PI's
Bridge, buried structure, subway underpass, culvert and any other similar structure	For spans between 0.9m and 1.8m, PI's are not required except for corrugated steel culverts	Year 2	For spans between 0.9m and 1.8m, PI's are not required except for corrugated steel culverts
	Year 6		6 years interval (1)
Earth retaining structure	Year 6	Year 2	6 years interval (1)
Reinforced/strengthened soil/fill structure with hard facings	Year 6	Year 2	6 years interval (1)
Sign and/or signal gantry (see paragraph 2.3.2 and Chapter 6)	Year 2	Year 4	8 years interval (1)
Mast (see paragraph 2.3.2)	Year 8 (1)	Year 2	8 years interval (1)
Access gantry (see paragraph 2.3.4)	Inspection prior to use in accordance with the Institution of Structural Engineers publication 'The Operation and Maintenance of Bridge Access gantries and Runways'.		
Tunnels	Year 6	Year 2	6 years interval
Other structures	None (2)	Year 2	None (2)
Third Party structures	None (2)	Year 2	None (2)

Notes:

(1) Interval can be varied up to a maximum of 12 years subject to a risk assessment (see Chapter 8).

(2) Where structures are close to the carriageway and/or pose a particular risk to users if failure should occur then PI's may be appropriate.

(3) Interval for GI's is 2 years, between PI's only. See paragraph 3.5.4.

(4) Does not include Pre Opening Inspection. See subsection 5.3.

A3 Principal Inspection Interval Risk Assessment, From Chapter 8

A3.1 Principal Inspection Interval Risk Assessment Forms and Procedures

A3.1.1 The risk assessment spreadsheet forms for England are available at the same web page as this standard.

A3.1.2 The spreadsheet contains different forms for various structure types. Each form contains a set of categories and criteria that are used to assess risk. Optional attributes for the various criteria have an associated score. Scores for all criteria are then combined to give an overall risk score for a structure. This score is then used to determine the overall risk rating and recommended Principal Inspection interval (see tables in subsection A3.7).

A3.1.3 Separate risk assessment forms have been developed for each of the following structure types.

- Bridges and Large Culverts
- Small Span Structures
- Retaining Walls
- Masts and Mast Schemes
- Sign/Signal Gantries
- Service Crossings and Other Structures

A3.1.4 For multi-span bridges a single risk assessment may be carried out using a combination of the worst criteria across all spans. This, however, is likely to result in a conservative score. Alternatively, each individual span may be assessed separately, with the lowest scoring span (most conservative) being used to determine the most appropriate Principal Inspection interval for the structure.

A3.1.5 Tables Showing Risk Rating and the Correlation with Recommended Principal Inspection Interval

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 65$	High	6 years
$65 \leq x < 75$	Medium	8 years
$75 \leq x < 85$	Low	10 years
$85 \leq x \leq 100$	Very Low	12 years

Table A3.1.1 – Risk Ratings and Recommended Principal Inspection Intervals for Bridges and Large Culverts

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 50$	High	6 years
$50 \leq x < 60$	Medium	8 years
$60 \leq x < 70$	Low	10 years
$70 \leq x \leq 100$	Very Low	12 years

Table A3.1.2 – Risk Ratings and Recommended Principal Inspection Intervals for Small Span Structures

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
0 ≤ x < 55	High	6 years
55 ≤ x < 65	Medium	8 years
65 ≤ x < 75	Low	10 years
75 ≤ x ≤ 100	Very Low	12 years

TableA3.1.3– Risk Ratings and Recommended Principal Inspection Intervals for Retaining Walls

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
0 ≤ x < 50	High	6 years
50 ≤ x < 60	Medium	8 years
60 ≤ x < 70	Low	10 years
70 ≤ x ≤ 100	Very Low	12 years

Table A3.1.4 – Risk Ratings and Recommended Principal Inspection Intervals for Masts and Mast Schemes

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
0 ≤ x < 50	High	6 years
50 ≤ x < 60	Medium	8 years
60 ≤ x < 70	Low	10 years
70 ≤ x ≤ 100	Very Low	12 years

Table A3.1.5 – Risk Ratings and Recommended Principal Inspection Intervals for Sign/Signal Gantries

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
0 ≤ x < 50	High	6 years
50 ≤ x < 60	Medium	8 years
60 ≤ x < 70	Low	10 years
70 ≤ x ≤ 100	Very Low	12 years

Table A3.1.6 – Risk Ratings and Recommended Principal Inspection Intervals for Service Crossings and Other Structures

A3.2 Assessment Criteria

A3.2.1 The risk assessment uses five categories to cover the attributes used to ascertain the risk score. These categories are:

- Structure Type
- Environment

- Inspection/Assessment
- Condition
- Consequences

A3.2.2 Within each category are the specific assessment criteria which vary depending on the structure type and situation. Table A3.3 describes these criteria and gives the assumptions and the principles behind their selection and how they affect the scoring. Whilst it is accepted that these assumptions may not fit every situation, they should nevertheless produce a good indication of the overall level of risk exposure. Engineering judgement should then be used to determine an acceptable interval between Principal Inspections.

A3.3 Source of information

A3.3.1 The risk assessment has been designed such that all the input data to complete the risk assessment is readily available and accessible within the Overseeing Organisation's records management system. Table A3.3 suggests sources of information. The key sources are:

Table A3.3 – Sources of Information

ASSESSMENT CRITERIA	COMMENTARY	SOURCE OF INFORMATION
Structure Type		
Form	Different structural forms can be expected to experience varying degrees of deterioration and have each been rated accordingly to consider this.	(a) Inventory (b) Structure File
Material	The primary constituent material will have an impact on the likelihood of deterioration. Historical performance has been evaluated for different construction materials and is reflected in the scoring.	(a) Inventory (b) Structure File
Age	The age of a structure will usually affect the likelihood and rate of deterioration. In general, it would be expected that an older structure approaching the end of its design life will encounter more maintenance issues and hence be more prone to deterioration. Newer structures may encounter initial teething problems before they are considered to be performing optimally.	(a) Inventory (b) Structure File
Span / Height / Headroom / Length	Although every structure has different design requirements, probabilistic analysis shows that bridges with longer spans and retaining walls with greater retained heights, tend to be at a higher risk of failure. Not only is the likelihood increased but also the associated consequence of failure.	(a) Inventory (b) Structure File

Table A3.3 – Sources of Information

ASSESSMENT CRITERIA	COMMENTARY	SOURCE OF INFORMATION
Environment		
Flooding	Structures in areas susceptible to flooding should be assessed as having increased risk.	(a) Qualitative assessment of the available information that would inform the likelihood of flooding (b) Environment Agency records
Inspection / Assessment		
Visual Access	Limited visual accessibility to critical elements will reduce the reliability of the General Inspections undertaken between Principal Inspections.	(a) Qualitative assessment of the available information on visual accessibility.
Latent defects	Some structure types are more susceptible to containing defects that are not evident during a Principal Inspection for example, post-tensioned concrete bridges with internal grouted tendons.	(a) Inventory (b) Structure File
Assessments	Where an assessment has been carried out on a structure, a greater degree of confidence can be achieved with regard to the structure's ability to carry load. The findings of the assessment report should give a clear indication of any current load restrictions and any recommended condition factors. Any current load restrictions in place indicate that the current condition of the bridge is below design standard, resulting in a higher potential risk of deterioration. Where definitive records are not available engineering judgement shall be used considering the age of the structure and its performance under current loading regimes.	(a) Load Management Records (b) Assessment reports (c) Interim Measures Records

Table A3.3 – Sources of Information

ASSESSMENT CRITERIA	COMMENTARY	SOURCE OF INFORMATION
Condition		
Inspector's Condition Rating	Condition is to be assessed using two criteria. The first is the Inspector's subjective condition rating of the structure (ie. Good, Fair or Poor), which should give a good overview of the condition of the structure.	(a) Inspection records
Condition Performance Indicators	Secondly, Condition Performance Indicators, where available, are to be taken into account. These are an objective measure of the physical condition of the highway structures stock, calculated using the Severity/Extent condition rating system. They are reported for each structure on a scale of 0 to 100, where 0 represents the worst possible condition and 100 represents the best possible condition. 1. Average Condition PI Score, PIAv (based on all elements) 2. Critical Condition PI Score, PICrit (based on the most critical elements only)	(a) Condition Performance Indicator Reports
Concrete Deterioration	Any deterioration of concrete including that due to Thaumasite Sulphate Attack, Alkali Aggregate Reaction, Alkali Silica Reaction and Alkali Carbonate Reaction should be scored	(a) Inventory (b) Structure File (c) Inspection records

Table A3.3 – Sources of Information

ASSESSMENT CRITERIA	COMMENTARY	SOURCE OF INFORMATION
Consequences		
Load Type	Load type may not have an impact on the likelihood of general deterioration but increased stress ranges in materials during repeated loading cycles increase the probability of fatigue failure. Load type will also have a bearing on the overall consequence of any potential collapse.	(a) Load Management Records (b) Assessment reports (c) Interim Measures Records (d) Inspection Records
Route supported and obstacle crossed	These attributes are intended to reflect the importance of the structure within the overall road network in the event of a structural collapse.	Inventory
Failure Mode	Brittle failure modes can result in collapse without warning and high consequences whereas ductile modes typically give warning of structural distress.	(a) Inventory (b) Assessment reports

A3.4 Scoring System

A3.4.1 The scoring system is used to determine an indicator of relative risk to support decisions on appropriate intervals between Principal Inspections.

A3.4.2 The risk assessment calculations have been automated in a spreadsheet with the five categories (Table A3.3) each containing a number of criteria for which there are several attribute options with an associated score based on the level of risk. The categories are weighted according to the relative importance.

A3.4.3 The spreadsheet sums the score for each category, then applies the weightings to calculate an overall score of between 0 and 100. A lower score indicates higher risk, whilst a higher score indicates lower risk.

A3.4.4 In all cases where data are unknown or unobtainable, a conservative approach should be taken by applying the lowest score available. Hence, for a structure with many unknown variables, it is likely that the recommended Principal Inspection interval will remain at 6 years.

A3.5 Risk Rating

A3.5.1 Once the risk score has been derived, it can be used to determine the Risk Rating for the structure (High, Medium, Low or Very Low).

A3.5.2 The Risk Rating is then used to determine a recommended Principal Inspection Interval (see Tables A3.7.1 to A3.7.6).

A3.6 Final assessment and decision

A3.6.1 The recommended Principal Inspection interval is then used to assist the informed decision on the most appropriate inspection interval, based on all the information available. It does not replace engineering judgement.

A3.6.2 The final decision on the most appropriate Principal Inspection interval shall be recorded on the spreadsheet which should be signed by the person responsible for preparing the risk assessment, and the Supervising Engineer (see subsection 8.5).

A3.7 Tables Showing Risk Rating and the Correlation with Recommended Principal Inspection Interval

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 65$	High	6 years
$65 \leq x < 75$	Medium	8 years
$75 \leq x < 85$	Low	10 years
$85 \leq x \leq 100$	Very Low	12 years

Table A3.7.1 – Risk Ratings and Recommended Principal Inspection Intervals for Bridges and Large Culverts

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 50$	High	6 years
$50 \leq x < 60$	Medium	8 years
$60 \leq x < 70$	Low	10 years
$70 \leq x \leq 100$	Very Low	12 years

Table A3.7.2 – Risk Ratings and Recommended Principal Inspection Intervals for Small Span Structures

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 55$	High	6 years
$55 \leq x < 65$	Medium	8 years
$65 \leq x < 75$	Low	10 years
$75 \leq x \leq 100$	Very Low	12 years

Table A3.7.3– Risk Ratings and Recommended Principal Inspection Intervals for Retaining Walls

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 50$	High	6 years
$50 \leq x < 60$	Medium	8 years
$60 \leq x < 70$	Low	10 years
$70 \leq x \leq 100$	Very Low	12 years

Table A3.7.4 – Risk Ratings and Recommended Principal Inspection Intervals for Masts and Mast Schemes

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 50$	High	6 years
$50 \leq x < 60$	Medium	8 years
$60 \leq x < 70$	Low	10 years
$70 \leq x \leq 100$	Very Low	12 years

Table A3.7.5 – Risk Ratings and Recommended Principal Inspection Intervals for Sign/Signal Gantries

Total Risk Score	Risk Rating	Recommended Principal Inspection Time Interval
$0 \leq x < 50$	High	6 years
$50 \leq x < 60$	Medium	8 years
$60 \leq x < 70$	Low	10 years
$70 \leq x \leq 100$	Very Low	12 years

Table A3.7.6 – Risk Ratings and Recommended Principal Inspection Intervals for Service Crossings and Other Structures

ANNEX B SPECIAL REQUIREMENTS: SCOTLAND

INTRODUCTION

B.1 The requirements in this Annex only relate to highway structures on motorways and trunk roads in Scotland. These requirements are in addition to those contained in the main body (Sections 1 to 6) of this standard.

B.2 Note that GD 1 sets out definitions for trunk roads and roads in Scotland with reference to the Roads (Scotland) Act 1984.

B.3 The appropriate contact, in Scotland, with regard to this standard is:

Bridges Section
Trunk Road Network Management Division
Transport Scotland
Buchanan House
58 Port Dundas Road
Glasgow, G4 0HF
Tel: 0141 272 7100
Website: www.transport.gov.scot

SCOPE

B.4 The scope of structures to be inspected by Agents to Transport Scotland is as described in Table 2.1 subject to the amendments shown in Table B1.

MANAGEMENT ARRANGEMENTS

B.5 With reference to paragraph 1.10.1, generally the inspection regime is defined in the O&M manual for special structures. Otherwise the Agent shall agree the appropriate inspection regime with Bridges Section.

Table B1 Scope of Inspections

Structure Type	Scope of Structures to be Inspected
Bridge, buried structure, subway underpass, culvert and any other similar structure	• All structures greater than or equal to 3 meters spans • Culverts 2 to 3 meters span, or multi- cell culverts where the cumulative span is greater than or equal to 5 meters • Corrugated metal culverts 0.9 metres or more in span • Pedestrian subways
Earth retaining structure	As per Table 2.1 but greater than 1.5m
Reinforced/strengthened soil/fill structure with hard facings	As per Table 2.1 but greater than 1.5m
Sign and/or signal gantry	Structural aspects of large sign/signal gantries and large Variable Matrix Signs (VMS) signs
Masts	As per Table 2.1
Access gantry	As per Table 2.1
Tunnels	As per Table 2.1
Other structures	As per Table 2.1
Third Party structures	As per Table 2.1

MAINTENANCE INSPECTIONS

B.6 Safety, General and Principal Inspections shall include the inspection of all approach and departure safety fences, transitions and connections.

SAFETY INSPECTIONS

B.7 Safety Inspections shall be carried out in accordance with contract requirements.

B.8 In accordance with paragraph 3.3.1, any instances of structural deterioration or behaviours likely to indicate a reduction in carrying capacity or safety shall be reported to Bridges Section.

B.9 Safety Inspections also include reactive scour inspections.

PRINCIPAL INSPECTION

B.10 Principal Inspections shall be carried out in accordance with Transport Scotland Inspection Manual: Principal Inspections of Trunk Road Structures and Location System.

B.11 In reference to paragraph 3.6.4, Agents shall undertake thickness testing of metal parapets at representative sample locations (eg post bases and rail connections) at a rate not less than one per parapet. If results from the sample show they have significantly deteriorated, testing should be undertaken for each post and alternate rail connection with each post. A drawing indicating test locations shall be included in the Principal Inspection report.

B.12 In reference to paragraph 3.6.11, Principal inspection frequencies for Transport Scotland shall not be increased. Chapter 8 is not applicable for use in inspections for Transport Scotland.

B.13 Probing for scour is required at each Principal Inspection

B.14 The scope of a Principal Inspection shall be extended to include concrete investigations where this is recommended by the Agent and agreed with the Overseeing Organisation.

B.15 Where they exist for a structure, the records described in BD 62/07 (DMRB 3.2.1) are a relevant consideration that shall be referred to prior to carrying out a Principal Inspection.

B.16 When carrying out a Principal Inspection the Agent shall check, amend and update the information held in the Transport Scotland Structures Management System (SMS).

B.17 Assistance with this task is provided within the SMS by the provision of a facility to view and/or print a full inventory report of any structure. These reports should be called up and studied prior to and during Principal Inspections so that errors and omissions can be spotted and rectified. Confidence in the SMS relies on full and accurate data and responsibility for achieving this rests with personnel carrying out the Principal Inspections.

B.18 Bridges Section have developed procedures for Principal Inspections which allow Agents to use the SMS to report defects in structures by description and location, and give severity ratings with recommendations and estimates of repair costs. See also B.23.

B.19 Input of missing data and correction or errors in the SMS shall be carried out as per contractual timescales.

SPECIAL INSPECTIONS

B.20 The extent of the detailed investigations, the methods to be used and reporting requirements shall be agreed with the Bridges Section.

INSPECTION RECORDS

ALL INSPECTIONS

B.21 Where defects are to be prioritised for inclusion in a maintenance programme the costs shall be included in the inspection records. This will include element defect priority 3 and 4 rankings as a minimum. Refer to Transport Scotland Inspection Manual: Principal Inspections of Trunk Road Structures and Location System for further guidance.

B.22 Records shall include comments on defects reported in the previous General or Principal Inspection report and any works carried out since the last inspection.

B.23 The TS Inspection Manual sets out which priority defect records require 'work required' and 'costs' to be entered.

SAFETY INSPECTIONS

B.24 Safety Inspections shall be recorded in accordance with contract requirements.

GENERAL INSPECTIONS

B.25 General Inspections shall be recorded on forms as generated in SMS.

B.26 The Agent shall ensure that the date of the last General Inspection is recorded in SMS.

PRINCIPAL INSPECTION

B.27 The findings of concrete investigations (paragraph B.14) shall be submitted with Principal Inspection records to the Bridges Section. The year of an initial concrete investigation or the year of the most recent concrete monitoring investigation shall be recorded in the SMS by the Agent when the Principal Inspections are carried out.

B.28 Information, in addition to paragraph 4.1.2, which shall be recorded during a Principal Inspection, includes a current General Arrangement (GA) drawing showing the location of the photographs and the headroom measurements and date measured. The GA should include a plan, elevation and cross section.

B.29 The Agent shall ensure the date of the last Principal Inspection is recorded in the SMS.

B.30 The Agent shall record any hidden features or areas which cannot be inspected and why. The Agent shall provide details of the work required to access the hidden features or areas and the associated costs.

PROGRAMMING INSPECTIONS

B.31 The two year and six year cyclic programme for General and Principal Inspections are held in the SMS. The Agent shall enter the proposed and actual date of the General and Principal Inspections.

B.32 The SMS provides reports on annual programmes, showing any backlog from previous years.

ACCEPTANCE INSPECTIONS

B.33 Issues relating to Acceptance Inspections should be referred to Bridges Section. The Joint Inspection at the end of the Defect Liability Period (or any such defect rectification period as defined in the contract) shall constitute the equivalent of an initial Principal Inspection and shall be reported using the SMS Principal Inspection form.

STRUCTURES INSPECTORS COMPETENCIES AND CERTIFICATION

B.34 With reference to paragraph 3.2.1, Transport Scotland inspector competence requirements are given in TS IA 46.

B.35 Chapter 9 is not applicable to work for Transport Scotland unless specifically applied by contract.

HEALTH AND SAFETY

B.36 The appropriate Health and Safety Executive in Scotland is:

Scotland East Area
Belford House
59 Belford Road
Edinburgh
EH4 3UE

Scotland West Area
1st Floor Mercantile Chambers
3 Bothwell Street
Glasgow
G2 6TS

ANNEX C SPECIAL REQUIREMENTS: WALES

GENERAL

C1 The specific requirements for highway structures on motorways and trunk roads in Wales with respect to this standard are set down in the Welsh Government Structures Inspection Manual. These requirements are in addition to those contained in this Annex and in the main body (Sections 1 to 9) of this standard.

C2 Agents, Designers and Contractors shall follow the requirements set down in the Welsh Government Structures Inspection Manual and shall check that they are working to the latest version.

SPECIFIC AMENDMENTS

C3 In reference to paragraph 8.1.4, The Welsh Government will consider proposals for risk assessments to increase the interval between Principal Inspections for structures with the listed criteria, with the prior approval of the TAA.

C4 In reference to paragraph 8.7.1, The Welsh Government's Principal Inspection risk assessment guidance can be obtained using the contact details provided in clause C5.

C5 The appropriate contact, in Wales, with regard to this standard and the Welsh Government Structures Inspection Manual is:

Head of Structures
Network Management Division
Welsh Government
Cathays Park
Cardiff, CF10 3NQ

ANNEX D SPECIAL REQUIREMENTS: NORTHERN IRELAND

INTRODUCTION

D.1 The requirements in this Annex relates to all roads in Northern Ireland. These requirements are in addition to those contained in the main body (Sections 1 to 10) of this standard.

D.2 The appropriate contact, in Northern Ireland, with regard to this standard is:

The Director of Engineering
Department for Infrastructure
Clarence Court
10 to 18 Adelaide Street
Belfast, BT2 8GB

D.3 References in this standard to organisations, and legislation etc. will be deemed to refer to the Northern Ireland equivalent where appropriate.

SCOPE

D.4 The scope of structures to be inspected by Agents of the Department is as described in Table 2.1 subject to the amendments shown in Table D1.

Table D1 Scope of Inspections

Structure Type	Scope of structures to be inspected
Bridge, buried structure, subway underpass, culvert and any other similar structure	1. All structures of span 3 metres and greater 2. Bridges/Culverts 1.8 to 3 metres span if cover to road surface is less than 1 metre 3. Multi-span Bridges/Culverts where the cumulative span is greater than or equal to 5 metres, if cover to road surface is less than 1 metre 4. Corrugated metal culverts 0.9 metres or more in span 5. Pedestrian subways
Earth retaining structure	As per Table 2.1 but greater than 1.5m
Reinforced/strengthened soil/fill structure with hard facings	As per Table 2.1 but greater than 1.5m
Sign and/or signal gantry	As per Table 2.1
Masts (see Note 1)	As per Table 2.1
Access gantry	As per Table 2.1
Tunnels	As per Table 2.1
Other structures	As per Table 2.1
Third Party structures	As per Table 2.1

Notes:

1. For third party masts for camera, radio, speed camera and telecommunication transmission equipment etc. refer to Third Party structures and paragraph 2.3.3.

MAINTENANCE INSPECTIONS

Safety Inspections

D.5 Safety Inspections are undertaken as part of the highway safety inspection regime.

General Inspections

D.6 The inspection procedures defined in this standard and the Inspection Manual for Highway Structures shall be used.

D.7 General Inspections shall include approach/departure safety fences and connections.

Principal Inspections

D.8 The inspection procedures defined in this standard and the Inspection Manual for Highway Structures shall be used.

D.9 Previous General and Principal Inspection records shall be reviewed before the forthcoming inspection to identify any long standing issues.

D.10 Principal Inspections shall include approach/departure safety fences and connections.

Inspection Records

D.11 Where a longer Principal Inspection interval has been agreed in accordance with paragraph D.20 the relevant information shall be recorded on the Department's Structures Management System-Roads (SMS-R).

D.12 Inspections shall be recorded in accordance with procedures described in the Inspection Manual for Highway Structures.

Safety Inspections

D.13 No formal documentation required.

D.14 In accordance with paragraph 3.4.7, any instances of structural deterioration or behaviours likely to indicate a reduction in carrying capacity or safety shall be reported to the Department's Divisional Office.

General Inspections

D.15 The current reporting format for General Inspections can be obtained from the Overseeing Organisation.

Principal Inspection

D.16 Where they exist for a structure, the records described in the Structure/Maintenance Manual or as described in BD 62 are a relevant consideration that shall be referred to prior to carrying out a Principal Inspection.

D.17 When carrying out a Principal Inspection the Agent shall check the information held in the SMS-R. The Agent shall ensure the SMS-R is updated for errors identified and/or missing data following the inspection.

D.18 Additional information that shall be recorded during a Principal Inspection includes any significant change or deterioration since the last Principal Inspection.

D.19 The current reporting format for Principal Inspections can be obtained from the Overseeing Organisation.

D.20 The interval between Principal Inspections may be increased in accordance with the Departments policy.

Acceptance Inspections

D.21 Issues relating to Acceptance Inspections should be referred to the contact provided in paragraph D.2.

Structures Inspectors Competencies & Certification

D.22 The competence and certification requirements of BD63 apply in full to all inspectors except those Department staff who have otherwise been deemed competent in accordance with Department policy.

HEALTH AND SAFETY

D.23 The appropriate Health and Safety Executive in Northern Ireland is:

Health and Safety Executive (NI)
83 Ladas Drive Belfast
BT6 9FR
Tel: 028 9024 3249
Fax: 028 9023 5383