

The following information is associated with Network Rail Standard:
[NR/RT/CE/S/035](#) Issue 2

Additional Content Access

Click the links below to access non PDF related content associated with this standard.

Word Document

- [RT/CE/S/035/FORM AA](#)

If you have any questions, or need assistance, please contact [IHS Support](#)

Information accessed via the links above is the property of the Copyright holder

IHS Additional Content Page

Letter of instruction

Information for users

The following document:

RT/CE/S/035 Issue 2

has had changes made to it, most recently, with effect from **09 July 2010**.

Instructions for use

It is essential that you first read and understand each letter of instruction pertaining to the standard before proceeding to use the standard. You must then apply the requirements of each letter to the standard.

NR/BS/LI/190	Issue 1	09 July 2010	Proceed to letter ►
NR/BS/LI/177	Issue 1	04 May 2010	Proceed to letter ►
RT/CE/S/035	Issue 2	07 February 2004	Proceed to standard ►

For further information, please contact:

IHS Customer Support

Please click [here](#) to proceed to the Network Rail Standards' 'Support Contacts' for their latest contact details.

www.networkrail.co.uk

Ref	NR/SP/CIV/035
Issue	2
Date	February 2004

Assessment of Structures (formerly RT/CE/S/035)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are **UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.**

This document is the property of Network Rail. It shall not be reproduced in whole or part nor disclosed to a third party without the written permission of the Standard Owner.

© Copyright 2004 Network Rail

Uncontrolled copy once printed from its electronic source.

Published & Issued by: Network Rail; 40 Melton Street, London NW1 2EE



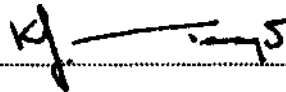
Ref	RT/CE/S/035
Issue	2
Date	February 2004

Company Specification

Assessment of Structures

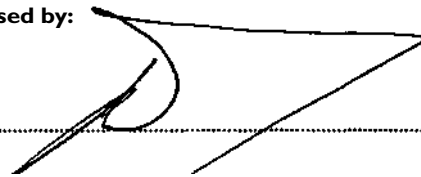
Endorsement & Authorisation

Endorsed by:



Kim Teager, Professional Head of Structures Engineering

Authorised by:



Andrew McNaughton, Chief Engineer

Accepted for issue by:



P McAleer, Head of Business Standards

This document is the property of Network Rail. It shall not be reproduced in whole or part nor disclosed to a third party without the written permission of the Standard Owner.

©Copyright 2004 Network Rail

Uncontrolled copy once printed from its electronic source.

Published & Issued by: Network Rail 40 Melton Street, London NW1 2EE



Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

Issue record

Issue	Date	Comments
2	February 2004	Amendments to accord with RT/CE/C/025 Issue 2, and to incorporate RT/CE/P/016 Issue 3. Supersedes Issue 1.
1	June 2001	New Specification incorporating and superseding RT/CE/P/010.

This Specification will be updated when necessary by distribution of a complete replacement. Changes from RT/CE/P/016 Issue 3 and RT/CE/S/035 Issue 1 have not been marked.

Implementation

The provisions of this mandatory Specification shall be applied from 3rd April 2004.

The action plan to enable all Structures not in the Steady State to have a valid Assessment shall specify that Assessments to determine the RA Numbers of underline Bridges and Culverts will be completed by April 2014, and with completion for Long Span Bridges by December 2006.

RT/CE/S/035 Issue 1 and RT/CE/P/016 Issue 3 is withdrawn from 3rd April 2004.

Compliance

This mandatory Specification shall be complied with by persons responsible for:

- the management of Assessments;
- technical approval of Assessments;
- carrying out and reporting of Assessments;
- evaluating, determining and implementing actions to be taken following Assessments;
- records of Assessments.

Disclaimer

Network Rail has used its best endeavours to ensure that the content, layout and text of this document are accurate, complete and suitable for its stated purpose. It makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems of work or operation. Network Rail, will not be liable to pay compensation in respect of the content or subsequent use of this document for any purpose other than its stated purpose or for any purpose other than that for which it was prepared except where it can be shown to have acted in bad faith or there has been wilful default.

Supply

Copies of documents are available electronically, within Network Rail's organisation. Hard copies of this document will be available to Network Rail employees on request to the Document Controller and to other organisations from Technical Indexes Ltd (01344 404409)

Published & Issued by Network Rail, 40, Melton Street, London NW1 2EE

Contents

1	Purpose	4
2	Scope	4
3	Reference documentation	5
4	Definitions	7
5	Roles and Responsibilities	11
6	Competency	13
7	Prioritisation and Programming of Assessments for Structures not in the Steady State	13
8	Scope of Assessments	16
9	Technical Approval	26
10	Reporting and Recording of Assessments	33
11	Evaluation of an Assessment and Subsequent Actions	34
12	Records of Assessment	46
13	Structures in the Steady State	47
Appendix A	Compliance with Railway Group Standards	51
Appendix B	Recommendations For Prioritisation Of Assessments	52
Appendix C	Model Forms for Technical Approval	55
Appendix D	Guidance on Assessment Check Categories	63
Appendix E	Assessed Categories For Bridges and Other Structures	64
Appendix F	List of Standards and Other Documents Relevant to the Assessment of Structures	93

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

I Purpose

The purpose of this Specification is to:

- define the requirements for Assessments, and to identify methods available for carrying out such Assessments;
- specify the actions to be taken following an Evaluation of an Assessment commensurate with the level of risk;
- enable provision of information for use in Regulatory Reporting in respect of Route Availability in accordance with RT/ARM/C3: Railtrack Asset Reporting Manual.

This Specification contains requirements supplementary to Network Rail Company Procedure RT/CE/P/032: *Managing Existing Structures*, in respect of the scope of this Specification. Compliance with this Specification, and with the Procedures and Specifications referenced herein will ensure compliance with the Railway Group Standards as listed in Appendix A in respect of the Assessment of Structures.

2 Scope

This Specification applies to the following Structure types, for which Network Rail has responsibility, either as owner of the Structure, or as a result of a specific agreement:

- Bridges;
- Culverts whose primary method of support is other than by arching action;
- Structures which both support buildings and span across operational railway lines, but excluding the supported building;
- Platform canopies;
- Train Sheds;
- Tunnels that directly support traffic loads;
- other Structures for which information in addition to that obtained from the examination process is required to confirm the safe load capacity of the Structure.

This Specification shall apply to Assessments based on current usage of Structures.

This Specification shall apply to special investigations to establish the safe load capacity in relation to proposed changes of use of Structures or a changes in Bridge traffic type (including as part of route acceptance), speed, weight, track configuration or road layout.

This Specification shall apply to an Assessment required as a consequence of a specific incident, but excludes requirements for management actions to be taken following incidents such as:

- a Bridge Strike or other accidental collision damage;
- a result of scour or flooding.

The group of Company Standards for the management of existing Structures is shown in Appendix A of RT/CE/P/032. Within this Specification, references to Specifications within the group of Standards for the management of existing Structures are made in relation to the structure category as defined in RT/CE/P/032 Appendix D i.e. EX (A) to (G) and the volume number, as well as, in the first instance, the Network Rail Company Standard number.

Requirements for the management of Bridge Strikes are given in Specification Volume EX(A) 5: *Management of Bridge Strikes from Road Vehicles and Waterborne Vessels* (RT/CE/S/076).

Requirements for the assessment of the effects of scour are given in Specification Volume EX(A) 1: *Management of Existing Bridges and Culverts* (RT/CE/S/089).

This Specification does not apply to the assessment of Earthworks.

3 Reference documentation

References are made to latest editions unless specific editions are cited.

A list of Standards and other documents not listed below relevant to the Assessment of Structures is given in Appendix F.

Railway Group Standards:

GC/RT5100	Safe Management of Structures
GE/RT8006	Interface between Rail Vehicle Weights and Underline Bridges

Network Rail Company Standards Forming the Group of Standards for Existing Structures:

RT/CE/P/032	Management of Existing Structures
-----------------------------	-----------------------------------

Section A – Specification for the Management of Bridges and Culverts

RT/CE/S/080	Volume EX(A) 1: Management of Existing Bridges and Culverts
RT/CE/S/017	Volume EX(A) 2: Examination of Bridges and Culverts
RT/CE/S/076	Volume EX(A) 5: Management of Bridge Strikes from Road Vehicles and Waterborne Vessels
RT/CE/S/047	Volume EX(A) 6: Competence Standards for Examination of Structures

Section C – Specification for the Management of Tunnels

RT/CE/S/084	Volume EX(C) 1: Management of Existing Tunnels
RT/CE/S/085	Volume EX(C) 2: Examination of Tunnels

Section E – Specification for the Management of Buildings and Station Structures

RT/CE/S/087	Volume EX(E) 1: Management of Existing Buildings and Station Structures
RT/CE/S/088	Volume EX(E) 2: Examination of Buildings and Station Structures

Other Network Rail Company Standards:

RT/ARM/C3	Railtrack Asset Reporting Manual
RT/CE/S/003	Technical Approval of Design Construction and Maintenance of Civil Engineering Works
RT/CE/C/015	The Assessment of Underbridge Capacity
RT/CE/C/025	The Structural Assessment of Underbridges
RT/CE/C/041	Structures Condition Marking Index Handbook

Eurocodes

BS EN 1991 - 3	Traffic Actions on Structures
	National Application Document to BS EN 1991 -3

British Standards

BS 153	Steel Girder Bridges, Part 3A: Loads - 1972
BS 6399	Loading for Buildings
BS 648	Schedule of Weights of Building Materials

HMSO: Design Manual for Roads and Bridges

BA 16	The Assessment of Highway Bridges and Structures
BA 79	The Management of Sub-standard Highway Bridges
BD 21	The Assessment of Highway Bridges and Structures
BD 21/93	The Assessment of Highway Bridges and Structures (superseded)
BD 37	Loads for Highway Bridges
BA 55	The Assessment of Bridge Substructures and Foundations, Retaining Walls and Buried Structures

Other Documents

Department of the Environment Memorandum (Bridges) BE 3/73: The Assessment of Highway Bridges for Construction and Use Vehicles (Superseded)

Scottish Development Department Technical Memorandum SB9/74: The Assessment of Highway Bridges for Construction and Use Vehicles

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

Ministry of Transport Technical Memorandum (Bridges) BE4/67: The Assessment of Highway Bridges for Construction and Use Vehicles (Superseded)

The Institution of Civil Engineers' National Steering Committee for the Load Testing of Bridges: Guidelines for the Supplementary Load Testing of Bridges.

The Road Vehicle (Construction and Use) Regulations 1986 (Statutory Instrument 1986 No. 1078) including subsequent amendments (HSMO).

BRE Digest 332: Loads on Roofs from Snow Drifting against Vertical Obstructions and in Valleys

BR 36840: Assessment of the Live Load Carrying Capacity of Metal Underbridges (Superseded): British Rail 1986

4 Definitions

In this Specification the following terms apply:

Approval in Principle (AIP)

A professionally competent person or body is satisfied that applicable standards and methods are proposed for the Assessment and Check.

Assessed Category

The categorisation of load capacity utilisation of the critical element of a Structure.

This term applies to Assessments carried out using limit state or permissible stress principles.

Assessment

The determination of the safe load carrying capacity of a Structure taking into account the physical condition and location of the Structure.

The term includes site inspection with site measurements and the carrying out of any calculations and checks.

Assessor

A person responsible for an Assessment, who is authorised to sign the submission for Approval in Principle on behalf of the assessing organisation, and who is independent of the Checker and Civil Engineer.

Bridge

A Structure of one or more spans greater than or equal to 1800 mm whose prime purpose is usually to carry traffic or services over an obstruction or gap.

The term includes overline Bridges, underline Bridges and footbridges, but excludes Culverts. For the purposes of this Specification, Tunnels that support traffic loads shall be considered as overline Bridges.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

Bridge Related Speed Restriction

A speed restriction less than the Permissible Speed imposed at an underline Bridge location to reduce the dynamic load effects from rail vehicles.

Bridge Strike

An incident in which a road vehicle or its load, or a waterborne vessel or its load, impacts with the fabric of a Bridge.

Check

An independent review (including the carrying out of calculations where necessary) to confirm the accuracy and completeness of an Assessment.

Checker

A person responsible for a Check, who is authorised to sign the certificate of assessment and checking (Form BA) on behalf of the checking organisation, and who is independent of the Assessor and Civil Engineer.

Civil Engineer

A person appointed by Network Rail to act on behalf of Network Rail in respect of technical approval of Assessments and who is independent of both the Assessor and Checker.

Culvert

A Structure with a span or diameter greater than 450 mm and less than 1800 mm whose prime purpose is usually, but not exclusively, to permit water or services to pass under a railway. The term excludes effluent pipelines passing under a railway.

Enhanced Permissible Speed

The permitted speed (higher than the Permissible Speed) over a section of line that applies to a specific type of train operating at cant deficiencies in excess of those permitted at the Permissible Speed as shown in the Sectional Appendix.

Evaluation

The appraisal with regard to condition, use and location of all relevant information and circumstances relating to a Structure to establish whether action is required to ensure that the level of safety and serviceability of the Structure remains acceptable.

Fatigue Assessed Category

The categorisation of the critical element of an underline Bridge in terms of endurance against fatigue.

Long Span Underline Bridge

An underline Bridge of which one or more spans exceeds 50 metres in length.

Where an underline Bridge is supported on bearings the span is measured by reference to the length of track supported between bearings. For arch underline Bridges, the span is measured between springings.

Permissible Speed

The maximum speed allowed over a section of line that applies to trains when not operating at an Enhanced Permissible Speed as shown in the Sectional Appendix.

Provisionally Sub-standard Structure

A Structure that has been initially assessed during the Assessment process to have a safe load capacity less than that required, until confirmed on completion of the Assessment that, either the safe load capacity is not less than that required or, the Structure is classified as a Sub-standard Structure.

For an underline bridge a Provisional Sub-standard structure has an RA Number less than the RA Number of the route or less than the RA Number of rail vehicles using the route, until confirmed on completion of the Assessment that, either the:

- safe load capacity in terms of RA Number is not less than the RA Number of permitted rail vehicles using the route;
- safe load capacity exceeds the applied loads due to permitted rail vehicles with an RA number in excess of the RA number of the route;
- Structure is classified as a Sub-standard Structure.

RA Number

The number derived in accordance with this Specification to express either:

- the safe load capacity of an underline Bridge or Culvert or route in terms of its ability to carry the vertical static and dynamic loads due to different types of rail vehicle;
- the static load characteristics of a rail vehicle type.

Reduced Loading Assessed Category

The assessed categorisation as determined on the basis of a reduced loading imposed as a Safety Measure.

Reviewer

A person appointed by Network Rail to review the Assessment and to confirm or otherwise that the Assessment and recommended actions are correct.

The Reviewer is independent of the Assessor and Checker.

Safety Measures

The mitigation imposed either during or on completion of an Assessment to maintain the safety of a Structure.

Steady State

The situation in which a Structure has a valid Assessment not more than 18 years old or the Structure is less than 18 years old.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

Structure

Something built to support or retain a load.

For the purposes of this Specification the term includes Bridges, viaducts, Tunnels that support traffic loads, Train Sheds, platform canopies, and structures supporting buildings spanning the operational railway.

Structure with Road Vehicle Access

Any Structure, which is wide enough to carry a road vehicle for which approach access is physically possible. The term includes public road Bridges, occupation overline Bridges, accommodation overline Bridges, side Bridges and car parks.

Sub-standard Structure

A Structure for which, following completion of an Assessment, Safety Measures to protect the safety of the Structure are required.

A Structure shall remain classified as Sub-standard until works are implemented to remove the Safety Measures, or the Safety Measures are deemed permanent.

Substructure

All elements of a Structure, including columns, piers, cross-heads, abutments and wing walls that support the Superstructure. The term also includes foundations.

Superstructure

All elements of a Structure that are supported by the Substructure.

For a Bridge with bearings, the term incorporates all elements supported above bearing plates (including the bearings) or bearing shelves, padstones etc. For an arch Bridge the term incorporates the elements of the Bridge between the springings.

Train Shed

A station or depot roof that spans across operational railway lines, including any supporting Structures and structural elements of adjacent buildings providing support to the roof.

Tunnel

A Structure provided to allow the railway or services to pass under higher land, buildings and/or water, which has been excavated without removing the surface of the land.

The term includes the bore, any associated shafts, adits, portals, inverts and drainage system within, or attached to the structure of the Tunnel. The term also applies to any other type of construction that needs to be examined as a Tunnel.

5 Roles and Responsibilities

5.1 Generally

Those appointing persons to positions with responsibilities in accordance with the roles in this Specification shall ensure that appointees are competent to carry out their duties and understand their responsibilities. Appointments shall be documented.

A person may be appointed to carry out one or more Assessments in accordance with this Specification. No person shall, however, carry out more than one of the roles of Assessor, Checker, Civil Engineer or Reviewer on any individual Assessment, except that the Civil Engineer may act as Reviewer.

5.2 Assessor

An Assessor shall be appointed for each Assessment.

The Assessor shall:

- obtain sufficient information to complete the Assessment, which shall include making the necessary arrangements to enable the inspection for Assessment to be undertaken;
- ensure that the completed submission for Approval in Principle (Form AA) is submitted to the Civil Engineer;
- ensure that the Structure is assessed in accordance with the signed Form AA;
- prepare a certificate of assessment and checking (Form BA), certify the Assessment as the Assessor, and ensure that the Check is certified by the Checker prior to issue to the Civil Engineer;
- make recommendations for work to be done or Safety Measures necessary to maintain the safety of the Structure;
- ensure that the final Assessment report is completed and issued for acceptance by the Reviewer.

5.3 Checker

A Checker shall be appointed for each Assessment.

The Checker shall carry out a review to confirm that the:

- information on which the Assessment has been carried out is correct and applicable;
- Assessment is compliant with the Form AA and has been carried out without any error or omission that affects the assessed capacity of the Structure;

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

- recommendations including any proposed Safety Measures are appropriate, and that any Safety Measures have been determined without any error or omission;
- content of the information given in Form BA accords with the result of the Assessment, and certify the Assessment as Checker using Form BA, when satisfied that the Assessment is correct.

5.4 Civil Engineer

A Civil Engineer shall be appointed for each Assessment.

The Civil Engineer shall:

- consider submissions for technical approval (taking advice as required) and when satisfied, give Approval in Principle, except when the Civil Engineer's approval is subject to endorsement by the Professional Head of Structures Engineering;
- place (or agree placement of) each Assessment into the appropriate category for the Check, according to the categories of Check specified in Clause 9.4.1;
- sign Form AA when satisfied that Approval in Principle may be given;
- resolve any points of difference that may arise between the Assessor and Checker (taking advice as required) and record the reasons for the decision;
- sign Form BA when satisfied (taking advice as required) to signify acceptance on behalf of Network Rail that the procedures for Assessment and Check in accordance with this Specification have been followed.

5.5 Reviewer

A Reviewer shall be appointed for each Assessment.

The Reviewer shall carry out a review of the completed Assessment to confirm that:

- the final Assessment report is satisfactory;
- the completed calculations are technically sufficient and take into account the condition of the Structure as detailed in the Assessment report;
- the resulting safe load capacity of an underline Bridge is applicable to the Permissible Speed, or where applicable Enhanced Permissible Speed, at the Bridge, and the maximum speed of rail vehicles using the Bridge;
- the recommended Safety Measures are reasonable and correct.

When satisfied, the Reviewer shall endorse Form BA.

6 Competency

The Assessor and Checker shall normally be a Chartered Civil or Structural Engineer with knowledge and experience in the design, Assessment and/or checking of designs or Assessments of the type of Structure to be assessed.

All other persons appointed to positions with responsibilities for Assessments or Checks in accordance with this Specification shall:

- have the skill, knowledge and experience needed to undertake their duties commensurate with the type and complexity of the Structure to be assessed;
- understand, and be able to judge when urgent or immediate action or interim controls are necessary for safety reasons.

The Civil Engineer shall be a Chartered Civil or Structural Engineer, with a minimum of 10 years knowledge and experience in the design or Assessment of Structures.

The Reviewer shall normally be a Chartered Civil or Structural Engineer with knowledge and experience in the design or Assessment of the type of Structure to be reviewed.

A person carrying out an inspection for Assessment shall be competent in accordance with Specification Volume EX(A) 6: *Standards of Competence for Examination of Structures* (RT/CE/S/047) - Unit 5 or 6 as applicable to type of Structure.

A person reviewing the results of an inspection for Assessment shall be competent in accordance with Specification Volume EX(A) 6 Unit 1 or 2, and be able to appreciate the nature and size of the risks according to the type of Structure and be able to take management action when necessary to maintain the safety of the Structure.

7 Prioritisation and Programming of Assessments for Structures not in the Steady State

7.1 Development of the Action Plan

An action plan (but not necessarily a single action plan) shall be in place to enable all Structures not in the Steady State to have a valid Assessment. The action plan shall prioritise and define the programme for carrying out the Assessments.

The action plan(s) shall include a schedule that lists, in priority order, all the Structures to receive a quantitative Assessment. The prioritisation of Assessments shall take into account:

- the type of loading to which the Structure is subjected;
- the type and form of Structure;
- the condition of the Structure;

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

- the vulnerability of the Structure to accidental damage;
- any strengthening or repairs;
- the consequence of failure of the Structure.

The prioritisation rating system in Appendix B may be used to assist in the creation of the action plan.

The priority schedule within an action plan for underline Bridges and Culverts shall include:

- Bridges with an individual effective span of 2.0 metres or more;
- Long Span Underline Bridges;
- Bridges with spans less than 2.0 metres and whose primary method of support is not by arching action;
- Culverts whose primary method of support is not by arching action;
- determination of RA Number for underline Bridges and Culverts at speeds of 60 mph, 75 mph and 90 mph.

The priority schedule within an action plan may be adjusted using engineering judgement but in such cases the adjustment shall be recorded and justified in writing.

7.2 Supplementary Requirements for Particular Structure Types

The Professional Head of Structures Engineering may from time to time issue supplementary requirements for prioritisation of Assessments of specific types of Structure to a different timescale from that specified in the action plan in accordance with Clause 7.1, or using an alternative prioritisation method from that given in Appendix B to enable a management response to be made to an identified risk particular to the Structure type. In such cases the schedule plan determined in accordance with Clause 7.1 may be adjusted or a separate action plan produced for the specific types of Structure.

7.3 Approval, Implementation and Review of the Action Plan

Network Rail's Professional Head of Structures Engineering shall approve the action plan, and any subsequent revisions.

Assessments shall be programmed on a priority basis in accordance with the Clauses 7.1 and 7.2. When Clause 7.2 applies, the programme, required time scale and supplementary prioritisation determined in accordance with Clause 7.2 for the particular type of Structure shall take precedence to the programme, time scale and prioritisation determined in accordance with the action plan in Clause 7.1.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

The priority assigned to a Structure shall be reviewed, and amended as necessary, following:

- any significant change in the factors used to determine the prioritisation listed in Clause 7.1 or Clause 7.2;
- proposals for significant changes in the type of loading to which the Structure will be subjected;
- an Evaluation of the report of a detailed or additional examination in accordance with Specification Volumes EX(A) 2: *Examination of Bridges and Culverts* (RT/CE/S/017), EX(C) 2: *Examination of Tunnels* (RT/CE/S/085) or EX(E) 2: *Examination of Buildings and Station Structures* (RT/CE/S/088) as applicable, which includes a recommendation that an Assessment be carried out.

7.4 Annual Review and Monitoring of Progress

The programme determined in accordance with Clause 7.1 and Clause 7.2 as applicable shall be subject to review annually. The review shall examine the progress against the action plan determined in accordance with Clause 7.1, the identified portfolio of Bridges, the forward programme, and consider technical problems and findings to date.

The results of the review and monitoring shall be reported annually to Network Rail's Professional Head of Structures Engineering, together with the forward programme for the following three years work. Information to be provided shall include:

- the number of Assessments that have completed each stage of the Assessment process – inspection report, Approval in Principle, assessment report, completed Assessment – since the previous report;
- details of numbers of Bridges assessed out of course as part of a project or in accordance with Clause 7.2;
- the programmed and actual cumulative number of Assessments completed at the date of the report;
- a summary of the results of the Assessments identifying the critical members and the limiting load effect;
- changes required to maintain the approved programme.

When Clause 7.2 applies, the supplementary requirements for review and monitoring of progress for the particular Structure type required by the Professional Head of Structures Engineering shall also apply.

8 Scope of Assessments

8.1 Methods of Assessments

All primary structural members and any important subsidiary members that influence the operation of the primary member (s), including parapets when contributory to the load capacity of a Bridge, or members that influence safety, such as access gantry runway beams shall be assessed quantitatively.

Quantitative methods of Assessment shall be used for:

- the Superstructures of all Bridges with an individual effective span of 2.0 metres or more;
- the Superstructure of all Bridges with an individual effective span of less than 2.0 metres whose primary method of support is other than by arching action;
- Culverts whose primary method of support is other than by arching action;
- Structures which support buildings and span across operational railway lines;
- Platform canopies;
- Train Sheds;
- Substructures of the above Structures, where the Substructure includes elements amenable to Assessment by quantitative methods (e.g. metal trestles, concrete abutment stems, columns or crossheads).

Assessment of platform canopies shall be carried out except where the safe load capacity is justified by documented criteria, which includes the following:

- knowledge exists of its condition, deterioration, repairs and problems, and there are no significant active defects;
- the aerodynamic effects of passing trains are not severe and there are no plans for the speed of passing trains to increase significantly;
- there has been no significant change in the loading on the canopy since it was built.

In addition quantitative methods shall be used for the Assessment of Substructures where:

- the Substructure is showing signs of distress to the extent that the structural integrity of the Substructure cannot be established by examination alone;
- a significant change to the loading is proposed (e.g. as a result of change of use, heavier traffic, heavier Superstructure following reconstruction);

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

- there is potential weakening to the support of the Substructure (e.g. as a result of road lowering beneath a Bridge, scour, etc).

For other Structures and Substructures, qualitative methods may be used for all or part of the Assessment unless required otherwise by the Civil Engineer.

The methods used to determine the safe load capacity for a Structure shall be technically approved in accordance with Clause 9.

8.2 Review of Existing Data and Inspection for Assessment

Sufficient up to date information shall be obtained to complete the Assessment. Where no valid Assessment exists, an inspection for assessment, generally a dimensional survey and close inspection of the Structure within touching distance, shall be carried out to record the dimensions, corrosion and any other defects and relevant parameters relating to loading and resistance needed to determine the safe load capacity of the Structure. The inspection for assessment shall include the recording of any deterioration and defects observed. When reasonably practicable, the inspection shall also provide confirmation of the information obtained from the existing drawings and records, or any variations, particularly:

- dimensions of internal sections that may not be reflected by external features;
- previous strengthening and repairs;
- reduction in strength due to services laid through, or near the Structure.

Advice on the inspection for Assessment of Bridges is given in Network Rail Company Code of Practice RT/CE/C/025: *The Structural Assessment of Underbridges* and in the Highways Agency's Design Manual for Roads and Bridges Volume 3 Section 4.

The Professional Head of Structures Engineering may from time to time issue supplementary requirements and guidance applicable for review of existing data or for inspection for the Assessment applicable to particular types of Structures. In such cases the supplementary requirements shall apply and the guidance be followed.

Requirements for the examination of Structures are given in Specification Volumes EX(A) 2, EX(C) 2 and EX(E) 2. Where relevant, Specification Volumes EX(C) 2 and EX(E) 2 may be used as guidance for the inspection for Assessment. The inspection for Assessment, whilst having similarities with a detailed examination, is an inspection specifically to enable an Assessment to be undertaken, and therefore the requirements for examination of Structures given in Specification Volumes EX(A) 2, EX(C) 2 and EX(E) 2 will not, on their own, provide a satisfactory inspection for Assessment.

When an unacceptable risk to the safety of the Structure or persons on or about the Structure is identified during the inspection for Assessment, Safety Measures to reduce the risk to as low as reasonably practicable shall be implemented urgently.

8.3 Determination of the Safe Load Capacity

Assessments to determine the safe load capacity of Structures shall be carried out using, where practicable, limit state principles.

Permissible stress principles may be used for an Assessment of an underline Bridge:

- Following a review of a valid Assessment carried out using permissible stress principles;
- when a rapid indication of safe load capacity is required following a Bridge Strike or other incident that may have affected the safe load capacity of an underline Bridge.

In determining the safe load capacity of a Structure, all relevant factors shall be considered, including, but not be limited to the following:

- the maximum loads (including appropriate dynamic effects) that could be, or are applied to the Structure, taking account of any existing Safety Measures that are in place;
- the condition of the Structure, and any effects due to settlement;
- the age and properties of the materials used in the construction of the Structure and the form in which such materials are used;
- elements and connections of a Structure which are subject to high local loading.

The determination of the safe load capacity for a Structure shall be fully documented and approved in accordance with the technical approval procedures specified in Clause 9.

8.4 Use of Existing Design, Assessment and Check Calculations

Where the original design, previous Assessment or Check calculations are available, such calculations may be used for the Assessment provided that the following conditions are met:

- the calculations are positively confirmed as being valid;
- a significant change in engineering knowledge has not occurred since the calculations were carried out;
- the physical dimensions and condition of the Structure are confirmed to be as assumed in the design, previous Assessment or Check;
- the properties of the structural materials have not deteriorated to less than those assumed in the design, previous Assessment or Check;

- the agreement to such an approach is obtained through the technical approval procedures in accordance with Clause 9.

8.5 Assessment of Superstructures

8.5.1 Assessment of Underline Bridges and Culverts

8.5.1.1 Safe Load Capacity

The safe load capacity of underline Bridges and Culverts shall be determined in terms of the RA Number at the Permissible Speed, and where applicable the Enhanced Permissible Speed, as described in RT/CE/C/025. The RA Number for the Structure shall be taken as the minimum RA Number obtained for any element.

In addition, the safe load capacity of each underline Bridge and Culvert shall be determined for:

- speeds 60 mph, 75 mph and 90 mph, where these speeds are less than the Permissible Speed and where the RA Number of the Bridge at the Permissible Speed is less than RA10;
- Bridge Related Speed Restrictions in accordance with Clause 11.3.1.1.

Methods for Assessment given in RT/CE/C/025 shall generally be adopted. More refined methods may also be used for subsequent levels of Assessment, provided that such methods are applicable and are agreed in accordance with the technical approval procedures in accordance with Clause 9.

Underline Bridges in the Steady State may have been previously assessed using RT/CE/C/015: *The Assessment of Underbridge Capacity*. In such instances, RT/CE/C/015 may be used as an alternative to RT/CE/C/025, to re-assess an element of the Bridge for the effects that any change may have on the existing safe load capacity.

8.5.1.2 Long Span Underline Bridges

The Assessed Capacity of a Long Span Underline Bridge shall either be determined:

- for elements in excess of 50 metres in terms of a train of the heaviest rail vehicle type(s) including dynamic effects permitted to cross the Long Span Underline Bridge with the rail vehicles positioned so as to give the most severe effect for the element being considered, and expressed as the RA Number of the heaviest permitted rail vehicle;
- for elements less than 50 metres in accordance with Clause 8.5.1.1.

The RA Number for the Long Span Underline Bridge shall be taken as the minimum RA Number obtained for elements in excess and less than 50 metres.

The rail vehicles to be used in the Assessment shall be identified in the submission for Approval in Principle.

Static load effects of rail vehicles may be assessed using an envelope representing the static load effects of classes or categories of rail vehicles so long as confirmation that the envelope has been validated as applicable for all relevant spans is provided with the submission for Approval in Principle. In all cases, however, the assessed capacity of the Long Span Underline Bridge shall include the dynamic load effects of the rail vehicles.

8.5.2 Assessment of Structures with Road Vehicle Access

8.5.2.1 Load Carrying Capacity

The current relevant standards (“BD” prefix) and Advice Notes (“BA” prefix) in the HMSO publication Design Manual for Roads and Bridges shall be used for the Assessment of Structures with Road Vehicle Access. A schedule of relevant standards and Advice Notes is provided in Appendix F.

The Assessment shall be in accordance with BD21: *The Assessment of Highway Bridges and Structures*. The load carrying capacity of each element supporting highway loads shall be determined for the six categories of road surface and traffic flow as defined in BD21. The results shall be reported in a tabular format unless the element is satisfactory for the most onerous category of heavy traffic and poor surface (Hp).

The load carrying capacity of carriageway and footway/verge elements shall be reported separately.

When required, an Assessment of parapet containment shall be carried out in accordance with the relevant documents listed in Appendix F.

8.5.2.2 Liability Assessment (Section 117) of Public Road Bridges

The standards referred to in Clause 8.5.2.1 specify the technical requirements for the Assessment of Structures with Road Vehicle Access. It may be necessary, however, to carry out an Assessment to ascertain if the Bridge meets Network Rail's legal liability under Section 117 of the Transport Act 1968, with regards to the load bearing capacity of a Structure carrying a public highway. This 'Section 117 Assessment' may necessitate the use of superseded standards, notably Technical Memorandum BE4/67: *The Assessment of Highway Bridges for Construction and Use Vehicles*.

The methods used to determine the Section 117 capacity for a Structure shall be documented and approved in accordance with the technical approval procedures specified in Clause 9.

Statutory Instrument 1972 No. 1705 (SI 1705), which defines the relevant load-bearing standards for Bridges subject to a 'Section 117 Assessment' applies to Bridges in England and Wales. Bridges constructed in Scotland up to 1973 shall be assessed in accordance with the Scottish equivalent of BE4, Scottish Development Department Technical Memorandum (Bridges) No. SB9/74.

8.5.2.3 Liability Assessment of Accommodation and Occupation Bridges

An Assessment to determine if an accommodation or occupation overbridge meets Network Rail's legal liability with regards to the load bearing capacity shall be based on the original Bridge as constructed when the railway at the location was constructed. This Assessment shall be carried out in accordance with Clause 8.5.2.1. The relevant Infrastructure Liability Manager shall be contacted for specific advice and guidance on the legal liabilities for a particular structure.

8.5.2.4 HB Load Assessment

When the Assessment demonstrates that the safe load capacity exceeds the Road Vehicles (Authorised Weight) Regulations (1998) loading requirements, the Assessor shall determine the number of units of HB loading that the Structure can carry, when considered co-incident with the Assessment live loading.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

If it is determined that the Structure is unable to support 45 units of HB loading when considered co-incident with the Assessment live loading, the HB capacity shall be determined assuming the HB vehicle to be the only vehicular loading on the Structure.

In general, BD37: *Loads for Highway Bridges* shall be observed in respect of load distribution and intensity of the HB loading. If applicable, any particular conditions that apply when the vehicle crosses the Structure shall be considered in the Assessment.

A qualitative Assessment of the structural integrity and load bearing capacity shall be carried out in accordance with BD21 and BA16 for all elements which are essential parts of the Structure, but which do not directly support the highway.

8.5.3 Assessment of Foot/Cycle Track and Bridleway Bridges

The loading used to assess foot/cycle track Bridges shall be as specified in BD37. Structural analysis of the Bridge shall employ the procedures adopted in BD21 (and associated standards and Advice Notes). When the applied loading exceeds the load capacity of the Structure, the magnitude of load that can safely be supported by the Structure shall be determined and reported.

The Assessment of bridleway Bridges shall also consider local hoof loads that may occur from animals using the Bridge, particularly in situations where the deck is constructed from timber.

8.5.4 Assessment of Other Bridges

Other Bridges (including pipe Bridges, aqueducts and conveyor Bridges) shall be analysed according to the principles of BD21 and other relevant standards listed in Appendix F, or the methods of analysis given in RT/CE/C/025. Careful investigation of the loads to be considered shall be made, and shall include, where possible, reference to the original design criteria. The loading to be adopted shall be specified in the Approval in Principle submission.

8.5.5 Assessment of Non Bridge Structures

Assessment of non Bridge Structures shall be carried out in accordance with applicable European Standards, British Standards, Codes of Practice or Network Rail Company Standards, which shall be documented and approved in accordance with the technical approval procedures in Clause 9.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

Generally, current design standards shall be utilised in the Assessment, although previous standards may be adopted provided that the use of such standards can be justified in the submission for Approval in Principle. In carrying out the Assessment, the Assessor shall take into account current knowledge of materials and their behaviour, such as fatigue, shear in web plates etc.

The loading to be used for the Assessment of non Bridge Structures, shall generally be as specified in British Standard BS 6399 – *Loading for Buildings*, according to the location and BS 648 – *Schedule of Weights of Building Materials*, as applicable.

For aerodynamic loadings on Structures due to the passage of trains, reference shall be made to BS EN 1991 - 3: *Traffic Actions on Structures* including the National Application Document.

Analysis shall generally be carried out using simple techniques that adopt standard structural engineering design principles. Further guidance and agreement shall be sought from the Civil Engineer, if there is doubt concerning the loading criteria or method of analysis to be adopted.

8.5.6 Assessment for Fatigue

Consideration shall be given to the likely effects of repetitive loading causing fatigue within the Structure. In many cases, particularly for non-metallic Structures, this consideration may be of a qualitative nature.

For steel and wrought iron underline Bridges with mechanical damage or fatigue-susceptible details, a quantitative Assessment for fatigue shall be carried out. The residual life, as defined in RT/CE/C/025 Appendix D, shall be determined for each detail.

For metallic underline Bridges, the methods to be used for assessing fatigue and guidance on identifying vulnerable fatigue details during the inspection for Assessment, are given in RT/CE/C/025.

Mechanical damage or fatigue susceptible details as given in RT/CE/C/025 that are found to be present during the inspection, shall be identified within the report of the inspection for Assessment and summarised in the synopsis to the Assessment report.

When fatigue related cracks are identified or suspected within any element within steel or wrought iron underline Bridges during the inspection for Assessment, Safety Measures shall be imposed urgently when the consequences of crack propagation under the repetitive loading could affect the safety of the Bridge.

8.5.7 Assessment of Particular Structure Types

The Professional Head of Structures Engineering may from time to time issue supplementary requirements for Assessments of specific types of Structure to be carried out in defined stages. In such cases these requirements shall apply in addition to the methods of Assessment specified in Clauses 8.5.1 – 8.5.6 inclusive.

8.6 Checking of Assessments

Assessments shall be checked in accordance with Clause 9.4.

8.7 Supplementary Load Testing

Supplementary load testing may be carried out to investigate and validate assumptions made in the analysis used in the Assessment. Such supplementary load testing shall be carried out in accordance with the principles and advice given in The Institution of Civil Engineers' National Steering Committee for the Load Testing of Bridges: *Guidelines for the Supplementary Load Testing of Bridges*.

The method of supplementary load testing shall be approved in accordance with the technical approval procedures identified in Clause 9.

8.8 Assessed Category of a Structure

The Assessed Category shall be determined for each assessed element of the Structure and recorded within the Assessment report. The element having the lowest Assessed Category shall determine the overall Assessed Category for the Structure.

The Assessed Category shall be determined in accordance with Appendix E Clause E1.2 or E2.2 as applicable to the Structure when the Assessment has been carried out using limit state principles.

When the Assessment has been carried out using permissible stress principles, the Assessed Category shall be derived using Appendix E Clause E1.3 or E2.3 as applicable to the Structure.

For an underline Bridge, the Assessed Category shall be determined using either:

- the number of British Standard Units corresponding to the RA Number of the route at the Permissible Speed;
- the loading due to real vehicles permitted to use the Bridge at their maximum permitted speed on Network Rail infrastructure or if less the Permissible Speed at the Bridge.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

When vehicles permitted to use the Bridge exceed the RA Number of the route, the Assessed Category shall be determined using the real vehicles permitted to use the Bridge at their maximum permitted speed on Network Rail infrastructure or if less the Permissible Speed at the Bridge.

The load used to determine the Assessed Category shall be recorded in the Assessment report.

An element shall be allocated one Assessed Category below that determined in accordance with Appendix E, unless already in Assessed Category E or F, which will remain unchanged, where any of the following conditions apply:

- the element may be subject to brittle or other sudden fracture due to the presence of notch-like defects in regions of tensile stress;
- the element shows signs of significant distress including excessive cracking, vibration or deflection.

8.9 Fatigue Assessed Category for Steel and Wrought Iron Underline Bridges

For steel and wrought iron underline Bridges with mechanical damage or fatigue-susceptible stress raising details, the Fatigue Assessed Category shall be determined and recorded within the Assessment report. The element having the lowest Fatigue Assessed Category shall determine the overall Fatigue Assessed Category for the Bridge.

The Fatigue Assessed Categories for steel and wrought iron Bridges shall be determined in accordance with Appendix E Clause E3.

Irrespective of the Fatigue Assessed Category, elements containing defects likely to cause fatigue failure shall be designated no higher than Fatigue Assessed Category Bf, and no higher than Df where fatigue cracks are discovered or suspected during the inspection for Assessment.

8.10 Assessment of Substructures

All Substructures shall be assessed either qualitatively or quantitatively in accordance with Clause 8.1.

For Bridges, guidance on the method for the Assessment of Substructures may be obtained from RT/CE/C/025, BA55: *The Assessment of Bridge Substructures and Foundations, Retaining Walls and Buried Structures* or BD21, as applicable.

For an HB load Assessment of Structures with Road Vehicle Access, a qualitative Assessment in accordance with BD21 and BA16 shall be carried out for all Substructure elements for up to 30 units of HB loading where the substructure is showing no signs of distress. When Assessment for more than 30 units of HB loading is required and there is no evidence of equivalent heavy traffic having used the structure, quantitative methods shall be used.

9 Technical Approval

9.1 Approval in Principle (AIP)

9.1.1 Submission of Form AA and Supporting Information

An AIP submission form (Form AA), together with relevant supporting information, shall be prepared and submitted to the Civil Engineer for review.

A single Form AA may be used to cover a number of generically similar Structures, if prior agreement is obtained from the Civil Engineer.

The information to be submitted to the Civil Engineer for Approval in Principle for an Assessment shall be as follows:

- Form AA providing details of the Structure and the Assessment signed by the Assessor on behalf of the organisation responsible for the Assessment;
- a general arrangement drawing or drawings (if applicable) showing the Structure, preferably on A3 size paper;
- draft inspection for Assessment report and other relevant supporting information;
- details of any other previous Assessments of the Structure.

A model Form AA is given in Appendix C. The information to be provided on Form AA will vary according to the nature of the Structure, but the model lists information to be provided for the majority of Structures, from which items should be selected as applicable. For simple Structures, many of the items may not be relevant. For complex or unusual Structures, additional information may be necessary.

Identification of Assessment standards to be used and all proposed deviations from these standards is required in all cases.

The submission for AIP shall provide details as to how the Assessment will be executed, and shall include:

- information to confirm that adequate geotechnical and other relevant investigations have been or will be undertaken, where appropriate;
- the proposed loadings;
- the proposed Assessment standards and methods of Assessment;
- information to state how any significant Assessment matters not covered by standards are adequately addressed.

When applicable, Form AA shall allow for an initial simple analysis to be followed by a more refined analysis if it is anticipated that an increase in the load capacity determined by the initial Assessment will be required. In such cases, the category of Check may be different for the two stages of analysis, and accordingly, if applicable the category of Check each shall be clearly stated on the Form AA for each stage.

The analysis to determine the safe load capacity shall not be started until AIP has been obtained.

9.1.2 Giving Approval

If the submission for Approval in Principle (AIP) is satisfactory:

- Form AA shall be signed by the Civil Engineer, dated and any comments considered applicable added to the relevant form;
- the category of Check according to the criteria given in Clause 9.4.1 shall be confirmed.

The Civil Engineer's signature and associated comments shall be deemed to constitute AIP (subject to endorsement on behalf of the Professional Head of Structures Engineering in accordance with Clause 9.1.3).

AIP shall not be given if there is reasonable cause not to be satisfied with the submission, or insufficient information has been submitted.

9.1.3 Endorsement of Approval in Principle

Form AA and supporting documentation shall be forwarded after signature by the Civil Engineer to the Professional Head of Structures Engineering for endorsement of the Approval in Principle for:

- all Assessments with a proposed Check category III;
- any departures from standards for Assessment.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

In cases of doubt as to whether the Form AA is to be submitted for endorsement by the Professional Head, the advice of the Professional Head may be obtained. In such cases, the Professional Head shall be provided with outline details of the Assessment only sufficient to enable a judgement to be made as to whether endorsement by the Professional Head is required.

A competent chartered Civil Engineer may be appointed to act on behalf of the Professional Head to consider the information and act on it as applicable in accordance with Clauses 9.1.1 and 9.1.2 inclusive.

9.1.4 Early Communication

In order to avoid delays and misunderstandings, early communication shall be established between the various parties involved in the Approval in Principle process. Where practicable, preliminary discussions shall take place before Form AA is submitted, in order to identify any special criteria and proposed departures from standards.

9.1.5 Subsequent Variations

If any variation from or addition to the Approval in Principle becomes necessary during the course of either the Assessment or the Check, including an Assessment at a subsequent level or stage, an addendum to Form AA shall be submitted detailing the required amendment. The approval of the original signatories of Form AA (or their nominees) shall be obtained and recorded.

9.1.6 Retention of Form AA

A copy of the completed Form AA and supporting documentation shall be included within the final Assessment report for the Structure.

9.2 Compliance with Approval in Principle

Assessments and Checks shall be carried out, using reasonable professional skill and care, in accordance with the information shown on Form AA (and on Form AA/I if applicable), including comments and conditions added by the signatories.

9.3 Public Road Overline Bridges

In the case of Network Rail owned public road overline Bridges, the formal agreement of the relevant Highway/Roads Authority shall be obtained regarding the scope and criteria to be adopted in carrying out the Assessment.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

To this end, in addition to Form AA, Form AA/I, as shown in Appendix C, shall be prepared by the Assessor. A copy of Form AA and Form AA/I shall be sent to the Highway/Roads Authority. The Highway/Roads Authority's agreement shall be recorded on Form AA/I and both forms shall be included in the submission of Approval in Principle submitted to the Civil Engineer.

Form AA/I is not required for Section 117 Assessments.

9.4 Checking of Assessments

9.4.1 Check Category

The following criteria relating to the form of the Structure and assessment method may be used as a guideline to determine the category of Check:

- a) Category 0 for Structures that may be assessed qualitatively. (Substructures, which are to be assessed qualitatively, may however be included and identified on the Form AA for the Structure).
- b) Category I for simple Structures which can be analysed by statical or other straightforward methods (including plane grillage analysis) in accordance with accepted industry procedures and assessed using current standards.
- c) Category II:
 - for intermediate Structures that may have significant redundant features and may contain departures from, or aspects not covered by, British Standards and Codes of Practice;
 - when standard methods identified in this Specification are used;
 - for simple Structures where more refined analysis is used following a straightforward methods of Assessment.
- d) Category III:
 - for complex Structures not in categories I or II;
 - Structures which require sophisticated analysis of highly redundant features;
 - simple or intermediate Structures which are severely corroded or degraded and require complex analysis or load testing.

In all cases, consideration shall be given to a higher category of Check if:

- the Structure shows significant signs of structural distress;

- engineering judgement is required to be used in the selection of material properties to be used in the analysis.

Professional judgement shall be used to decide each case on its own merits, taking into account both the complexity and condition of the Structure and the experience of the Assessor.

When a number of generically similar Structures are to be assessed by the same organisation, the Civil Engineer may give consideration to reducing the category of Check for such Structures after completion of the first Assessment.

Examples of Structures within each category of Check are given in Appendix D.

9.4.2 Checking Arrangements

The category of Check shall be stated on Form AA and the Assessment shall be independently checked in accordance with the category of Check, as follows:

- Category 0 no Check is required;
- Category I the Check may be carried out in the group which carried out the Assessment, but the Check shall be by different people within that group;
- Category II the Check may be carried out within the organisation that carried out the Assessment but the Check shall be by staff from a group independent of that which carried out the Assessment;
- Category III the Check shall be carried out by an organisation independent of that which carried out the Assessment.

9.4.3 Method of Checking

A statement specifying the methodology to be adopted to carry out the Check shall be provided to the Civil Engineer.

The Check statement shall:

- specify the method of analysis to be used, including any computerised methods as applicable;
- detail the programme for the Check and interfaces with the Assessor;
- describe how compliance with the requirements of this Clause will be achieved.

When the Civil Engineer identifies that the method of Assessment is novel, the method of checking shall not use the same method as for the Assessment. In such cases, where practicable, recognised methods shall be used for the Check.

When the Assessor employs a computerised programme for Assessment, the programme used for a category III Check shall not be the same programme as for the Assessment. For other categories of Check and when the computerised programme is not identified as novel by the Civil Engineer, the same programme may be used.

9.4.4 Scope of Checking

Category I Checks shall confirm or otherwise that the criteria and assumptions made in the Assessment are valid and realistic and shall include the following:

- either:
 - i. a complete arithmetical check of all calculations, or
 - ii. preparation of a complete set of independent calculations without reference to the Assessment calculations;
- a review to confirm that all information required to establish the safe load capacity of the Structure has been obtained;
- a review to confirm that the information obtained from the inspection for Assessment and available drawings have been correctly interpreted in the calculations;
- a review to confirm that the calculations comply with the standards, Codes of Practice and methods stated on Form AA (including any stated departures).

Category II Checks shall include the following:

- all the elements of the Category I Check including the preparation of independent calculations as given in (ii) above;
- a review to confirm that the principles and assumptions on which the calculations have been prepared are valid;
- ensuring that the principles adopted are applicable, by review of the structural details and form of the Structure.

Category III Checks shall include a complete independent review of all aspects of the Assessment including the preparation of calculations, without reference to the Assessment calculations or the assumptions on which the calculations are based.

9.4.5 Liaison Between Assessors and Checkers

A Check may start before the Assessment is complete, provided the independence specified in Clause 9.4.2 is maintained. Those carrying out the Assessment shall liaise with those carrying out the Check as necessary to compare their results and to resolve any points of difference that may arise. Assessment and Check calculations and assumptions may be exchanged if necessary to reach agreement.

For all categories of Check, points of difference that may arise and cannot be agreed between those carrying out the Assessment and the Check shall be referred to the Civil Engineer for resolution. The Civil Engineer shall decide the resolution (taking advice if required) and record the reasons for the decision.

9.5 Certificate of Assessment and Checking

A certificate of assessment and checking (Form BA) shall be prepared according to the model shown in Appendix C and signed as indicated on behalf of the organisations carrying out the Assessment and the Check. For Assessments with Check category 0, references to the Check in Form BA may be deleted or ignored. The signed Form BA shall be submitted for review by the Reviewer and the Civil Engineer.

Form BA shall be signed by the Civil Engineer when, so far as can reasonably be ascertained from the information submitted:

- the Assessment results and conclusions are valid;
- the procedures specified in this Specification have been followed.

Signatures on Form BA by persons from the assessing and checking organisations shall be construed as indicating that the signatories accept responsibility for the adequacy and accuracy of their respective contributions and that all reasonable skill and care has been used.

9.6 Issue of Information to External Organisations

Information concerning the results of an Assessment shall not be issued to persons or organisations outside Network Rail (other than those carrying out the Assessment and Check) unless agreed otherwise by the Professional Head of Structures Engineering.

10 Reporting and Recording of Assessments

10.1 Assessment Report

Assessments shall be reported in a clear and readable manner with all supporting information attached and clearly referenced within the report.

An Assessment report shall state:

- the identity of the Structure by unique Structure name, number and location;
- the name, address and contact details of the assessing organisation, Assessor and Checker;
- the date and results of the inspection for Assessment;
- Assessment results identifying the overall safe load capacity of the Structure and identifying the limiting elements;
- the Assessed Category, and the load used to determine the Assessed Category;
- the Fatigue Assessed Category, where applicable;
- conclusions and recommendations for subsequent actions including any Safety Measures;
- identify any means by which the safe load capacity of a Sub-standard Structure may be improved.

The Assessment report shall include a synopsis identifying the Assessment methods used, any critical assumptions adopted and the important results of the inspection and Assessment relating to the safe load capacity of the Structure. The Assessment report shall be signed by the Assessor.

Appendices to the Assessment report shall include:

- the inspection for Assessment report;
- the signed forms for Approval in Principle (Form AA) and certificate of assessment and checking (Form BA);
- Assessment calculations.

An Assessment report shall only be regarded as complete and valid when the completed and signed certificate of assessment and checking (Form BA) in accordance with Clause 9.5 is included.

10.2 Reporting of Provisionally Sub-standard Structures

When the results of an Assessment indicate a Provisionally Sub-standard Structure, the Assessor shall inform the Reviewer verbally and subsequently in writing, of the details of the deficiency.

10.3 Recording Safe Load and Assessed Capacities of Bridges

10.3.1 RA Number(s) and Associated Speeds of Underline Bridges, except Long Span Underline Bridges

The safe load capacity of an underline Bridge shall be recorded in terms of the route availability classification (RA Number).

The RA Number of each underline Bridge shall be recorded in a form (for example, in tabular form) that clearly identifies the RA Number of the route at the Permissible Speed, the Enhanced Permissible Speed where applicable, and at other speeds in accordance with Clause 8.5.1.1.

10.3.2 Assessed Capacity or Capacities and Associated Speed(s) of Long Span Underline Bridges

The assessed capacity of a Long Span Underline Bridge shall be recorded in terms of the minimum RA Number obtained for elements in excess and less than 50 metres.

For such underline Bridges, the route availability classification shall be recorded in the form "RA(LS)", where (LS) indicates that the assessed capacity has been derived in terms of rail vehicles and not in terms of the RA Number. The record shall include details of the rail vehicle type(s) and speeds, and/or rail vehicle envelope(s) and speed(s) to which the assessed capacity relates.

10.3.3 Assessed Capacity of Overline Bridges following HB Load Assessment

The assessed capacity of an overline Bridge shall be recorded in terms of the HB load and, if applicable, the magnitude of any coincident loading.

11 Evaluation of an Assessment and Subsequent Actions

11.1 General Requirements

11.1.1 Evaluation Generally

In order to establish whether action is required to ensure their continuing safety, integrity and serviceability, on completion of an Assessment, Assessments shall be evaluated by a review of Assessment reports and other available data.

Ref:	RT/CE/S/035
Issue:	2
Date:	February 2004

Evaluations shall be carried out to determine any Safety Measures in accordance with Clause 11.3 to be imposed in accordance with Specification Volumes EX(A) 1: *Management of Existing Bridges and Culverts* (RT/CE/S/080), EX(C) 1: *Management of Existing Tunnels* (RT/CE/S/084) and EX(E) 1: *Management of Existing Buildings and Station Structures* (RT/CE/S/087).

Evaluations shall confirm or otherwise the continuing structural safety, integrity and serviceability of the Structure.

11.1.2 Actions following an Evaluation of an Assessment Generally

In order to ensure the continuing safety, integrity and serviceability of a Structure, the actions necessary following an Evaluation shall be determined.

The actions to be taken following an Evaluation of an Assessment shall maintain the safety of the Structure. The procedures to be followed are illustrated in Figure 1.

The actions to be considered to maintain the safety of Structures shall include:

- Investigation and/or further analysis that may enable an improvement of the Assessment results to be obtained;
- Safety Measures in accordance with Clause 11.3;

When an unacceptable risk to the safety of the Structure or the public is identified in an Assessment, Safety Measures to reduce the risk to as low as reasonably practicable shall be implemented urgently.

The date of the programmed review of the Assessment shall be determined in accordance with Clause 13.2.

Processes shall be implemented to ensure that the necessary actions identified during an Evaluation are undertaken.