

Ref:	NR/L2/TRK/3203
Issue:	1
Date:	3 September 2011
Compliance date:	3 December 2011

Level 2

Structure gauge recording

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Published and issued by Network Rail, Kings Place, 90 York Way, London, N1 9AG.



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Issue record

Issue	Date	Comments
1	September 2011	First issue

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 3 December 2011.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

Reference documentation

NR/L2/TRK/3201, *Management of tight clearances and track position.*

GC/RT5212, *Requirements for Defining and Maintaining Clearances.*

RT/CE/S/037, *Requirements for Maintenance of Trackwork in Depots by Depot Facility Operators,*

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1 Purpose

NR/L2/TRK/3203 is a system specification that gives the minimum requirements for Gauging Surveying and the data within Network Rail's National Gauging Database (NGD). This Standard specifies detail of Network Rail compliance with GC/RT5212 Sections E and K. NR/L2/TRK/3203 is part of the suite of gauging standards which manage risk relating to gauging compatibility, structural clearances, passing clearances and calculation of stepping clearances.

2 Scope

Asset Information is responsible and accountable for undertaking work in compliance with this standard.

This Network Rail standard specifies the minimum requirements for the data within Network Rail's National Gauging Database (NGD). It specifies:

- the information contained in both the NGD and the Tight Clearance Database (TiCleD);
- structure gauging survey requirements and frequencies;
- requirements for the equipment used to measure structure clearances;
- tolerances and acceptability of structure gauging survey data;
- calibration of equipment used in measuring clearances.

It applies to the following equipment:

- Train-mounted Gauging Survey Equipment;
- Self-propelled rail vehicle Gauging Survey Equipment;
- Manual Gauging Survey Equipment.

This standard applies to all running lines and sidings maintained by Network Rail.

NOTE Particular requirements at leased depots are specified in RT/CE/S/037.

3 Definitions

For the purposes of this standard, the following terms and definitions apply.

Anomaly Clearance

clearance that is technically foul (less than or equal to zero mm, by gauge clearance analysis)

NOTE Whilst it is possible that this is the result of a rogue survey point, in most cases it reflects a very tight clearance which needs early attention.

calibration

process that compares a known standard) against an unknown (the device). During

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the calibration process, the offset between these two devices is quantified and the device is adjusted back into tolerance (if possible)

NOTE A true calibration usually contains both "as found" and "as left" data.

dynamic system accuracy

total error assigned to a train-borne measurement system, which takes account of all sources of measurement error. This includes but is not limited to optical error, rail finding error, appropriately scaled cant error and curvature errors

National Gauging Database

NGD

database, maintained on behalf of Network Rail, containing structure profiles and six-foot measurements with coverage over Network Rail Infrastructure

NOTE The data is provided on DVD-ROM every two months to Network Rail and other Railway Group members. The data is used in conjunction with vehicle profiles, within analytical software (such as ClearRoute NR) to derive swept envelopes and to determine the resulting clearances.

Reduced Clearance

clearance, less than Normal Clearance, though greater than Special Reduced Clearance

repeatability

degree of agreement between the values of successive measurements of the same parameter made under same conditions, within a short period of time, where the individual measurements are carried out on the same section of track using the same measurement and interpretation methods, subject to the following:

- a) comparable speed;
- b) same measuring direction;
- c) same machine/vehicle orientation;
- d) similar environmental conditions

slice

section of a structure contained within the National Gauging Database

NOTE This may constitute a discrete profile or a composite.

Special Reduced Clearance

clearance, less than a Reduced Clearance, though greater than zero millimetres

Tight Clearance

clearance less than "Normal" as defined in GC/RT5212

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Tight Clearance Database

TiCleD

Network Rail database of tight clearances on all routes, identified from the analysis of all vehicle types operating over those routes

NOTE This database is currently derived from an annual download of infrastructure data from the NGD.

Track ID

four-digit identifier, defined in GEOGIS, unique to a single track at any specific mileage

validation

detailed process of confirming that an instrument is installed correctly, that it is operating effectively and that it is performing within specified tolerances

4 Structure gauging surveys

4.1 Surveys

Gauging surveys shall be carried out using equipment approved by the Head of Track Engineering.

Structures near (see **4.4.2**) to any running line or siding maintained by Network Rail and open to traffic shall be surveyed.

Intervals between any running line or siding, maintained by Network Rail and open to traffic, and any other track (see **4.4.8**) shall be surveyed.

A list of running lines and sidings to be surveyed shall be maintained by the Senior Gauging Engineer and be available to stakeholders on the Network Rail Network.

Survey details shall be kept in the National Gauging Database.

The Examination Data Technician (Gauging) shall check Routes for missing or spurious structures at least every four years. Spurious and redundant structures shall be removed. The date of the check and the name of the checker shall be recorded. The date of the check recorded shall be the date of the video or other data used to complete the check.

Placeholders (see **4.4.2**) shall be added to the NGD. Surveys of missing structures shall be obtained within a year of this check or to a risk assessed timescale agreed in writing with the Senior Gauging Engineer.

NOTE: This check is normally carried out by comparing NGD records with the SGT forward facing video whilst the SGT data for that route is being processed.

4.2 Survey frequencies

A plan for compliance to this clause shall be developed with a date for completion within 14 months.

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Survey frequencies are based on the risk processes described in GC/RT5212, particularly the clearance and the consequence of a strike.

Surveys shall be undertaken at the intervals shown in Table 1 and within the maximum intervals shown in Table 2.

The maximum intervals between surveys shown in Table 2 are applicable when an individual survey has been missed. Surveys shall be planned at the frequencies shown in Table 1.

The frequencies in Tables 1 and 2 may be multiplied by the reduction factors in Table 3, where the conditions and categories shown apply to the structure in question. Where two conditions or more apply, only one reduction factor may be used.

The application of Reduction Factors for a particular site shall be agreed between the Examination Data Specialist (Gauging) and the Senior Gauging Engineer. A record of the application of Reduction factors shall be made.

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Structure type	Running lines	Sidings
Footbridges with Anomaly Clearances	Annual	4 years
Footbridges with Special Reduced Clearances	2 years	4 years
Pipe bridges with Anomaly Clearances	Annual	4 years
Pipe bridges with Special Reduced Clearances	2 years	4 years
Overbridges and tubular bridges with Anomaly Clearances to cast iron structural members	Annual	4 years
Overbridges and tubular bridges with Special Reduced Clearances to cast iron structural members	2 years	4 years
Signal Gantries with Anomaly Clearances	Annual	4 years
Signal Gantries with Special Reduced Clearances	2 years	4 years
Tunnels or Other Overbridges and tubular bridges with Anomaly or Special Reduced Clearances	2 years	4 years
Major Structures with less than normal upper sector clearances to the published freight gauge on tracks carrying container traffic, car transporter traffic or regular OOG loads ^(a) , except where the published gauge includes all the freight gauges	2 years	4 years
Platforms (including disused through platforms) with Anomaly or Special Reduced Clearances	2 years	N/A
Parcels platforms, loading docks with Anomaly or Special Reduced Clearances	4 years	4 years
Structures marked as SGT Clear or with clearances of over 2.5 times Normal clearance	8 years	16 years
Track Intervals with Anomaly or Special Reduced Clearances	2 years	N/A
All other major structures	4 years	8 years
All other minor structures	4 years	8 years
All other Track Intervals	4 years	N/A
^(a) A list of routes detailing ELR, Track ID and mileages carrying container traffic, car transporter traffic or regular OOG loads shall be maintained by the Senior Gauging Engineer.		

Table 1 – Surveying frequencies

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Structure type	Running lines	Sidings
Footbridges with Anomaly Clearances	2 years	6 years
Footbridges with Special Reduced Clearances	3 years	6 years
Pipe bridges with Anomaly Clearances	2 years	6 years
Pipe bridges with Special Reduced Clearances	3 years	6 years
Overbridges and tubular bridges with Anomaly Clearances to cast iron structural members	2 years	6 years
Overbridges and tubular bridges with Special Reduced Clearances to cast iron structural members	3 years	6 years
Signal Gantries with Anomaly Clearances	2 years	6 years
Signal Gantries with Special Reduced Clearances	3 years	6 years
Tunnels or Other Overbridges and tubular bridges with Anomaly or Special Reduced Clearances	3 years	6 years
Major Structures with less than Normal upper sector clearances to the published freight gauge on tracks carrying container traffic, car transporter traffic or regular OOG loads ^(a) except where the published gauge includes all the freight gauges	3 years	6 years
Platforms (including disused through platforms) with Anomaly or Special Reduced Clearances	3 years	N/A
Parcels platforms, loading docks with Anomaly or Special Reduced Clearances	5 years	6 years
Structures marked as Clear Major or Clear Minor or with clearances of over 2.5 times Normal clearance to all applicable rolling stock.	12 years	20 years
Track Intervals with Anomaly or Special Reduced Clearances	3 years	N/A
All other major structures	5 years	10 years
All other minor structures	5 years	10 years
Track Intervals	5 years	N/A
^(a) A list of routes detailing ELR, Track ID and mileages carrying container traffic, car transporter traffic or regular OOG loads shall be maintained by the Senior Gauging Engineer.		

Table 2 – Maximum surveying intervals

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Condition	Factor See notes (a) and (b)	Applicable categories
Track with Longitudinal Timbers in good condition.	1.5	Normal, Reduced and Special Reduced.
Track being maintained to an absolute track geometry design	1.5	Normal, Reduced and Special Reduced.
Vipa baseplates or slab track in good condition.	2	Normal, Reduced and Special Reduced.
Loading and parcel docks, platforms with coping stones removed	2	Normal, Reduced and Special Reduced.
Negligible movement over 2 years of surveys	Up to 2	Normal, Reduced and Special Reduced.
NOTES (a) The maximum full platform survey interval shall be 208 weeks. (b) Where the structure is on the inside of curves less than 350 m radius or with >50 mm cant then the factor shall be 1. (c) Ballast Gluing does not provide a reduction factor.		

Table 3 – Reduction factors

4.3 Survey equipment

Survey equipment (including software used to process survey data collected by that equipment) used to maintain the records in the NGD or used to check clearances in track or structure designs shall be approved by the Head of Track Engineering, or their delegate, and the Director of Asset Information where applicable, or their delegate, for that purpose.

Gauging survey equipment shall relate measurements to the rail running edge of the surveyed track, ideally by touching the rail running surface and edge at the gauge point of both rails. The gauge point shall be as defined in BS EN 13848-1.

Non-contact methods of measuring to rail and interpolating the gauge point shall be able to capture both rail gauge corners in all typical UK railway scenarios (i.e. switches and crossings (S&C), check rails, level crossings, foot crossings, cant/curvature combinations, and on new and worn rails, including heavily lipped rails) accurate to ± 1 mm.

NOTE The reference to the rail may be via the wheels of a vehicle or trolley on which the measuring equipment is mounted or by direct contact with the measuring equipment. Measuring to the rail directly using laser equipment, such as Theodolite, Lasersweep or Routescan is not acceptable, unless a trolley mounted prism is used.

Gauging survey equipment shall be calibrated annually and validated at least once every 30 days.

Where possible, gauging survey equipment shall provide swept profiles representing the worst clearance over five metres of track. Accuracy of survey equipment shall be

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calculated to consider the effect of point measurement, cant and curvature accuracies and surface roughness. See Appendices A and B.

NOTE Due to variations in surface roughness, discrete survey systems are not suitable for use at structures of rock and rough masonry construction.

Gauging survey equipment shall be classified as a Survey Method within the NGD.

Details of survey methods, the gauging survey equipment they encompass and the accuracy of the method shall be maintained by the Senior Gauging Engineer. Their suitability for use at platforms shall also be detailed. See Appendix E.

Changes or additions to the list of survey methods, the associated gauging survey equipment, accuracies and their suitability for use at platforms shall be agreed in writing by the Senior Gauging Engineer.

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4.4 Survey requirements

4.4.1 General

Structures shall be classified by type and sub-type in the NGD as shown in Table 4, or as agreed by the Senior Gauging Engineer.

Type	Structure type	Structure Sub-type	Notes
Minor	Crossing	Authorised Walking Route	
Minor	Crossing	Crossing	
Minor	Crossing	Level Crossing	
Minor	Crossing	Level Crossing Barrier	
Minor	Crossing	Miscellaneous	
Minor	Lineside Furniture	Miscellaneous	
Minor	Lineside Furniture	Sign Equipment	
Major	Overbridge	Abutments/Piers	Only used when no bridge deck
Major	Overbridge	Aqueduct	
Major	Overbridge	Arched Overbridge	
Major	Overbridge	Flat Deck Overbridge	
Major	Overbridge	Footbridge	
Major	Overbridge	Intersection	
Major	Overbridge	Overbridge	
Major	Overbridge	Pipe bridge	
Major	Overbridge	Cable Bridge	
Major	Platform	Platform Back	Rear of a Platform
Major	Platform	Awning	
Major	Platform	Disused	Disused over the whole length of the platform
Major	Platform	Loading Dock	
Major	Platform	Platform	Includes any disused portions
Minor	S&T	Buffer Stop	Buffer stops on an adjacent track only, where the recorded track continues past the buffer stop.
Minor	S&T	Miscellaneous	
Minor	S&T	Points Equipment	Clamp lock or pneumatic power packs only
Minor	S&T	Poles & Posts	

Table 4a) – Structure types

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Type	Structure type	Structure Sub-type	Notes
Minor	S&T	S&T Boxes	
Minor	S&T	Sign Equipment	
Minor	S&T	Stanchion	OHL Stanchions < 1470 mm from nearest Running Edge
Minor	S&T	Telephone	Trackside telephones mounted on their own post.
Major	Signal	Ground Signal	Includes stencils
Major	Signal	Signal Post	Includes ladder and any bracket
Major	Signal	Signal Box	Includes Signal boxes and brick-built relay rooms
Major	Signal	Signal Gantry	Includes Cantilever signals which span multiple tracks
Minor	Signal	Signal Hut	Includes modular relay rooms
Major	Tunnel	Tunnel	
Major	Underbridge	Centre Girder Underbridge	
Major	Underbridge	Culvert	Only Culverts with parapets visible from the track shall be included.
Major	Underbridge	Intersection	
Major	Underbridge	Subway	
Major	Underbridge	Tubular Bridge	Tubular bridges are treated similarly to the Overbridge. Tubular bridges are underbridges with members above rail level which span the four foot.
Major	Underbridge	Underbridge	
Major	Viaduct	Centre Girder Viaduct	
Major	Viaduct	Viaduct	Includes any parapet wall present and any attached OHL stanchions.
Minor	Wall	Fence	Concrete or Steel fencing shall be treated as a retaining wall. Parapet walls or fencing entered as Underbridge or Viaduct, etc.
Major	Wall	Chipping Bunker	
Major	Wall	Gabions	
Major	Wall	Lineside Building	
Minor	Wall	Railing Fences	
Major	Wall	Retaining Wall	
Major	Wall	Rock Face	
Major	Wall	Wall (Free Standing)	Parapet walls or fencing entered as Underbridge or Viaduct, etc.
Major	Wall	Wing Wall	

Table 4b) – Structure types (concluded)

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All surveys shall include:

- a) co-ordinates of points on the structure, with the Y axis points related to a line in the plane of the both rail top surfaces and the X axis points related to the gauge point on the cess rail. Co-ordinates are positive above and to the cess side of the cess rail;
- b) co-ordinates of the rails for the track being surveyed;
- c) attributes (See Table 8);
- d) actual or design curvature of the surveyed track;
- e) actual or design cross level of the surveyed track;
- f) GEOGIS ELR;
- g) GEOGIS Track ID;
- h) Structure Number/Identifier.

Where a structure spans multiple Track IDs or ELRs, separate records for each section of the structure shall be created.

Longitudinal positioning of a profile or swept profile shall be provided in terms of Miles and yards, to within a metre. The position of adjacent profile or swept profiles shall be provided within 100 mm.

Any manual amendment of captured structure profiles shall be undertaken by competent staff, with reference to visual representations of the structure.

Any manual editing of discrete manual survey data undertaken shall be completed prior to any decimation process.

All structure and platform surveys shall contain a set of 2D co-ordinates which, when plotted, provide a reasonable correlation to the visual representation of the structure or platform the survey captured.

Any decimation undertaken shall be pure decimation, retaining those captured points closest to a radial point and not be undertaken to a Standard Deviation.

4.4.2 Types of structures to be surveyed

All the structure types in Table 4 shall be surveyed and recorded in the NGD.

Clearances to the structure types listed above shall be considered to applicable static freight gauges, during processing. Where clearances fall within 100 mm in the upper sector or within 50 mm in the lower sector to the applicable freight gauge(s), the relevant gauging Engineer shall be informed, in writing, within five working days.