

Ref:	NR/L2/TRK/030
Issue:	4
Date:	05 March 2016
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Level 2

Specification: Concrete Sleepers and Bearers

Endorsement and Authorisation

Endorsed by:



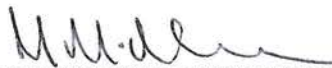
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User information

This Network Rail standard contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – no variations permitted

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – variations permitted subject to approved risk analysis and mitigation

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national non-compliance process.
- Non-approved variations will be investigated and corrective actions enforced.

Green guidance – to be used unless alternative solutions are followed

Guidance should be followed unless an alternative solution produces a better result.

Guidance is presented with a dotted green sidebar.

Guidance is not monitored for compliance.

Alternative solutions should be documented to demonstrate effective control.

Amendment marks

- First document amendments are presented with a single black line to the right of the affected text.
- Second document amendments are presented with a double black line to the right of the affected text.

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Issue record

Issue	Date	Comments
1	Dec. 1996	Superseded BR1212. Complete document, incorporating requirements of draft EN
2	Aug. 2003	To be read alongside EN 13230
3	Dec. 2015	Up-issue to incorporate various changes throughout document
4	Mar. 2016	Re-issue for clarification and incorporation of changes following subsequent industry review

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 05 March 2016.

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

This document shall be read in conjunction with EN 13230. At the beginning of each section the reader is referred to EN 13230, except for any clauses which differ from, or are additional to, EN 13230; these clauses are then written out using the same numbering as in EN 13230.

The specification is intended to be used with the EN standards:

EN 13230-1: General requirements

EN 13230-2: Prestressed monoblock sleepers

EN 13230-4: Prestressed concrete bearers for switches and crossings

EN 13230-5: Special elements

Changes or additions to EN 13230 are explained in the text.

Concrete sleepers and bearers are safety-critical components for railway applications. They are not covered by any other standards.

Guidance documents for handling, cutting, drilling, demoulding and repairing have been produced to complement this standard and are available on request from Network Rail.

References to the purchaser in EN 13230 shall be read as references to Network Rail.

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Normative references

This specification incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 13230-1 to 5	Concrete Sleepers and Bearers
EN 13481-1	Railway applications/Track: Performance requirements for fastening systems Part 1: Definitions
EN 13481-2	Railway applications/Track: Performance requirements for fastening systems Part 2: Fastening systems for concrete sleepers
EN 13146-4	Railway applications/Track: Test methods for fastening systems Part 4: Effect of repeated loading
EN 13146-5	Railway applications/Track: Test methods for fastening systems Part 5: Determination of electrical resistance
EN 196	Methods of testing cement
EN 197-1	Cement-Composition, specifications and conformity criteria Part 1: Common elements
BS EN 10080	Concrete reinforcing steels
BS prEN 10138 & BS EN 5896	Prestressing steels
BS EN 206	Concrete – Performance, production and conformity
BS EN ISO 9001	Quality management systems
BS 4449	Steel for the reinforcement of concrete
BS EN 933	Testing aggregates
BS EN 12620 & PD 6682	Aggregates from natural sources for concrete
BS EN 12390-4	Testing hardened concrete. Compressive strength. Specification for testing machines
BS EN 450	Fly ash for concrete
BS EN 15167	Ground granulated blast furnace slag for use in concrete, mortar and grout
BS EN 934-2	Concrete admixtures
BS 8110	Structural use of concrete
BS 8500	Complementary British Standard to BS EN 206
BS EN 1008	Mixing water for concrete
BRE Digest 330	Alkali silica reaction in concrete
NR/L2/TRK/4100	Serviceable concrete sleepers for use in running lines and sidings

In general, the EN reference is given in the text, followed by the equivalent BS. It is envisaged that as the BS documents are withdrawn, all references will be to

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European Standards. In the current changeover period, the supplier may use the BS or EN standard, but must declare which is the appropriate design, specification or quality documentation, all as approved by Network Rail.

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1 Purpose

The purpose of this product specification is to define Network Rail's requirements for the supply of concrete sleepers and bearers.

2 Scope

This specification gives technical requirements to be met by newly-manufactured concrete sleepers, bearers and related items procured for use in Network Rail's infrastructure. The specification should be read in association with the appropriate Network Rail standard drawings (RE/PW/XXX) for the particular sleeper or bearer design or with the manufacturer's accepted alternative designs.

This specification applies to the supply of new concrete sleepers and bearers for use as:

- a) sleepers for plain line;
- b) bearers in switch and crossing layouts;

This specification applies to all personnel who are responsible for supplying, purchasing, constructing, renewing or maintaining Network Rail's infrastructure.

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3 PART 1 - General Requirements

Refer to EN 13230-1 except for the following clauses which either replace or augment the similarly-titled clauses in EN 13230-1.

3.1 General (this clause augments clause 4.1 in EN 13230-1)

Only fastening systems approved by Network Rail shall be used.

3.2 Positive bending moment at rail seat (M_{dr}) (this clause augments clause 4.3.2.1 in EN 13230-1)

Use the values of M_{dr} , k_1 and k_2 given in Annex H of this specification.

3.3 Negative bending moment at rail seat (M_{dr_n}) (this clause augments clause 4.3.2.2 in EN 13230-1)

Use the value of M_{dr_n} given in Annex H of this specification.

3.4 Negative bending moment at the centre part (M_{dc_n}) (this clause augments clause 4.3.3.2 in EN 13230-1)

Use the value of M_{dc_n} given in Annex H of this specification.

3.5 Data supplied by Network Rail (this clause augments clause 4.4.2 in EN 13230-1)

The data elements listed in clause 4.4.2 of EN 13230-1 are supplied by Network Rail, some of which are also specified in Annex H of this specification.

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3.6 Concrete (This clause replaces clause 5.6 in EN 13230-1)

The concrete shall comply with BS EN 206 / BS 8500 plus the following requirements:

Minimum compressive strength shall be class C50/60.

The water/cement ratio shall be less than 0,45.

Transfer strength shall be declared by the manufacturer.

Cementitious replacement alternatives:

Pulverised Fuel Ash(PFA);

Network Rail is prepared to accept cementitious replacement of up to 30% which may include a combination of Fly Ash or Ground Granulated Blast Furnace Slag (GGBFS) - material compliant with BS EN 450-1 for Fly Ash and BS EN 15167 for GGBFS, provided that the product quality and performance is proven to meet the product's performance requirements and that any additives are compliant with EN 934-2 and are declared by name and chemical content.

Alternative mix values outside the constraints stipulated above may be considered by the Head of Track (Network Rail) provided that the proposer can scientifically prove beyond reasonable doubt the integrity and performance of the new product. The proposer shall support such an application with independently verified test results and indefinitely indemnify Network Rail or successors concerning failure. The proposer shall also provide a failure mode and effects analysis to verify the robustness of the product, to deliver a beneficial (or at least equivalent) performance of a sleeper with alternative mix values outside the constraints stipulated in the paragraph above.

Other replacement materials;

Alternative cement replacement materials may be considered by the Head of Track when supported by the appropriate design, development and test regime results.

Consolidation of the concrete shall be sufficient to minimise water penetration; see sub-clause 7.6.c of EN 13230-1.

Heat treatment may be used; see sub-clause 6.2 which contains provisions which ensure that Delayed Ettringite Formation (DEF) is prevented.

The maximum chloride ion content of the concrete shall not exceed 0.1% by weight when calculated in accordance with BS EN 196-2.

The maximum acid soluble sulphate content of the concrete shall not exceed 4.0% by weight when calculated in accordance with BS EN 196-2.

The manufacturer shall submit to the purchaser the proposed mix design with the following concrete technical data:

- a) a description of the constituent materials, additives and admixtures by name and chemical composition including origin, shape and size;
- b) a full description of the production process for the concrete including cold weather working, and the storage and measurement of materials;

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c) a technical report on the following requirements:

- Alkali content
 - Resistance to Alkali Silica Reaction (ASR) of the proposed concrete design
 - Expansion properties of the proposed concrete design. This shall be determined by tests conducted on concrete cured under the same conditions as the approved manufacturing process for the sleepers or bearers. Repeated on any raw materials that could result in ASR.
- References:

- BS 8500-2: 2002 *Concrete - Complementary British Standard to BS EN 206-1 - Part 2: Specification for constituent materials and concrete* Clause 5.2
- BRE Digest 330 *Alkali silica reaction in concrete: 2004*

- Design test on the concrete according to sub-clause 7.4 of EN 13230-1;
- The following tests:

- Abrasion resistance, see Annex A (informative) of EN 13230-1
- Freeze-thaw resistance, see Annex B (informative) of EN 13230-1
- Water absorption, see Annex C (informative) of EN 13230-1

No change shall be made to the materials and processes used without prior approval from the Head of Track (Network Rail).

3.7 Prestressing tendons (This clause augments clause 5.7.1 in EN 13230-1)

Prestressing tendons shall consist of wires, strands or bars according to series prEN 10138 or BS EN 5896 and it is the suppliers responsibility to ensure that the strand is compliant to the associated standard's Certificate of Conformity (CofC).

3.8 Reinforcing steel (This clause replaces clause 5.7.2 in EN 13230-1)

Reinforcing steel shall comply with BS 4449 and may be smooth, indented or deformed and shall be of weldable quality where required for reinforcement assembly. Welds shall only be used to aid assembly and shall not affect the fatigue performance of the sleeper.

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3.9 Design (This clause augments clause 6.1 in EN 13230-1)

Table 2: Maximum tolerances and Minimum frequencies (replaces Table 1 in EN 13230-1)

Maximum tolerances (the specified maximum tolerance must not be exceeded)

Minimum frequency (the specified minimum frequency can be increased but not decreased)

To be read in conjunction with Figures 1, 2 and 3 of clause 6.1 in EN 13230-1.

Dimensions	Description	Maximum Tolerances	Minimum Frequency of Checking (each unit)
L	Overall length of the concrete element.	± 10 mm	1:50
b ₁ , b ₂	Top and bottom width of the concrete element.	± 5 mm	All new/modified moulds
	Top and bottom width of the concrete element throughout the length of the shear plate area in modular bearers.	± 3 mm	All new/modified moulds
hr	Depth at any position along the total length of the reinforced concrete element measured in accordance with the quality plan.	+ 5 / - 3 mm	
hp	Depth at any position along the total length of the prestressed concrete element measured in accordance with the quality plan.	+ 5 / - 3 mm	1:50
L ₁	Distance between the rail fastening and the gauge points.	+ 2 / - 1 mm	1:50
L ₂	Position of the rail fastening gauge point with regard to the end of the concrete element.	± 8 mm	All new/modified moulds
L ₃	Total length of the reinforced concrete block.	± 8 mm	
I	Inclination of the rail seat.	$\pm 0,25^\circ$	1:50
	Verticality of Dowels or other cast-in components (unless otherwise specified)	$\pm 2.0^\circ$	1:50
	Position of Dowel relative to concrete surface	+ 0 / - 2 mm	1:50
	Position of Dowels used for Modular Bearer joint (shroud)	± 1 mm	1:50
	Position of Reinforcement links (Bearers) to be checked and recorded on Pre-pour inspection.	± 10 mm	All
	Position of Reinforcement links used in modular bearer production around the dowels used for the joint	± 10 mm	All
	Other cast-in components (unless otherwise specified)	± 2.0	1:50
F	Flatness of each rail seat area: with regard to 2 points 150 mm apart (monoblock and twinblock sleepers only).	1 mm	1:50
T	Relative twist between rail seats (monoblock). Using gauge according to Annex D.	0,7 mm	1:50
T	Relative twist between rail seats (Bearer). Using gauge according to Annex D.	2.5 mm	1:50
M	Weight of the sleeper (variation with regard to absolute).	± 5 %	
	Note: The manufacturer shall indicate if all or part of the fastening system is included in the mass of the concrete element. Fastening height relative to rail seat	± 1 mm or as provided by fastening system manufacturer	1:50

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Rail seat gauge (gauge between adjacent fastenings)	As shown on approved drawings	1:50
The centroid of prestress (measured from the top of the unit)	± 3 mm	1:50

The basic values of the different dimensions and the time period in which they shall be measured shall be in accordance with the manufacturer's approved drawings.

The maximum tolerances specified in Table 2 apply to ballasted track and can be varied by Network Rail in the case of special requirements such as dedicated concrete elements for ballastless track or use of a sleeper laying machine, etc.

The design, dimensions and tolerances of the Network Rail agreed fastening shall be provided by the manufacturer of the fastening system.

Network Rail shall specify the minimum clearances between rail fastening component and reinforcement according to the fastening system to be used.

Any clearance should make allowance for fastening repair-replacement so as the existing fastening could be cored out and replaced (like-for-like) without encroachment of the agreed minimum clearance.

Unless otherwise agreed by Network Rail, the minimum cover for prestressing tendons shall be 30 mm from the bottom surface and 20 mm from other surfaces except for ends.

The minimum cover for reinforcing steels shall be 25 mm from the bottom surface and 15 mm for the rail seat area and 20 mm from other surfaces.

The manufacturer's quality system shall clearly define the mechanism used to increase the gauging frequency when defects are identified. The minimum actions to be taken in the case of defects being found shall ensure the unit produced in the next cast is re-checked for compliance.

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3.10 Surface finish (This clause replaces clause 6.3 in EN 13230-1)

Requirements for surface finish of the concrete element should take into account what may affect durability, and the behaviour of the element and what affects the general appearance of the element.

The general appearance of the concrete sleeper surface finish relates to the manufacturing process: the instant demoulding process gives a rough concrete surface, and the late demoulding process, a smooth surface.

The quality level for the rail seat area surface finish is independent of the manufacturing process: instant demoulding or late demoulding.

Cement and aggregates give colour variation according to the source of materials. The surface of the sleeper may be stained due to salt appearance. Such variations have no influence on the behaviour of the sleeper.

Regarding the general appearance, defects which do not affect the durability of the sleeper do not need to be repaired except when requested by the purchaser.

The specific requirements can be different according to the area involved. For example, special surface finish may be specified:

- a) for the rail seat area in connection with the rail pad or base plate geometry and stiffness;
- b) for the sleeper bottom surface where roughness may be needed;
- c) for the sides of the sleeper.

3.10.1 Surface finish of the rail seat

The surface finish shall be checked visually as part of the quality control procedure and as assessed in accordance with the following criteria;

- The surface of the rail seats shall have a smooth ex-mould finish and be free of significant holes or blemishes except as follows (noting that air holes of less than 5 mm in length should be ignored).
 - No individual air hole or blemish greater than 20 mm in length or 5 mm in depth are permitted
 - No more than 3 air holes or blemishes can be greater than 10 mm in length
 - A maximum of 10 air holes or blemishes between 5 mm and 20 mm in length and less than 5 mm in depth are permitted in each rail seat
 - The permissible number of air holes or blemishes as above may be increased proportionally for sleepers with a rail seat width above 160 mm
 - Holes or blemishes can be filled with an approved repair material with permission of the purchaser. The supplier will need to provide evidence of the effectiveness and durability of the repair process as part of any application to the sleeper

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3.10.2 Surface finish of all other surfaces

All other surfaces shall exhibit an ex-mould finish except for remedial work areas as described in Annex F - F.5 of EN 13230-1.

3.10.3 Detailed procedure for remedial work

Remedial work on a concrete element after demoulding, including spalling of bottom edges and ends, which does not affect the performance of the product shall only be carried out if detailed procedures have been included within the description of the manufacturing process, as part of the quality plan and approved by the purchaser.

3.11 Electrical insulation (This is in addition to clause 7.5 in EN 13230-1)

Track signalling systems and electric traction systems require a minimum electrical impedance from one rail to the other. This impedance must exceed 10 k-ohms when tested according to EN 13146-5.

- Electrical insulation is only carried out at the request of Network Rail and does not form part of routine testing.

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3.12 Quality Control (This clause replaces clause 8 in EN 13230-1)

The supplier shall operate an independently approved and audited, comprehensive Quality Assurance System in accordance with BS EN ISO 9000 and BS EN ISO 9001.

The supplier shall operate a quality system, which is defined and maintained in a quality manual. The Quality Manuals shall address all actions, functions and resources, procedures and practices concerned with achieving, and providing documentary evidence that, the quality of the delivered concrete elements and services that the supplier provides are to the agreed requirements. The Quality Manuals shall include a Quality Plan for concrete elements which will define and detail:

- a) the organisation, structure and responsibilities;
- b) all the materials, processes and procedures for manufacturing, storing and transportation of the concrete elements as described in Parts 2 or 3 or 4 of EN 13230-1;
- c) all testing requirements;
- d) all other quality control procedures to ensure and verify that the concrete elements and service provided are to the agreed requirements.

The manufacturer shall submit documentation to the purchaser clearly defining the above criteria. Any changes in the process must be approved by the Head of Track (Network Rail).

The purchaser shall have access to the quality manual at the premises of the supplier.

All documentation (Quality Records) shall be maintained for the design life of the sleeper or bearer.

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Annex H (This annex provides data supplied by Network Rail described in clause 4.4.1 of EN 13230-1)
Table of design values of Network Rail standard sleepers

Type	Gauge	Rail Profile	Fastening Type	Length	Depth at rail seat	Nomimal Max Weight	Bending Moments (Strength at 28 days)			Static Test		Dynamic Test		Test Load
							Rail Seat		Centre					
							Positive	Negative	Negative					
							Mdr	Mdr _n	Mdc _n	k1 _s	k2 _s	k1 _d	k2 _d	
	mm						mm	mm	kg	kNm	kNm	kNm	kN	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
G44	1438	CEN60E2	Fastclip	2500	200	312	27.8	12.5	15.0	1.7	2.1	1.4	1.85	223
	1436	CEN56E1 (BS113A)												
G45	1438	CEN60E2	Vossloh	2500	200	312	27.8	12.5	15.0	1.7	2.1	1.4	1.85	223
	1436	CEN56E1 (BS113A)												
EG47	1438	CEN60E2	Fastclip	2580	165	273	29.5	12.5	15.0	1.7	2.1	1.4	1.85	236
	1436	CEN56E1 (BS113A)												
EG48	1438	CEN60E2	Vossloh	2580	165	273	29.5	12.5	15.0	1.7	2.1	1.4	1.85	236
	1436	CEN56E1 (BS113A)												
EG49	1438	CEN60E2	e plus	2580	165	270	29.5	12.5	15.0	1.7	2.1	1.4	1.85	236
G55	1438	CEN60E2	Fastclip	2500	200	379	23.6	12.5	15.0	1.7	2.1	1.4	1.85	189
	1436	CEN56E1 (BS113A)												
EG53	1438	CEN60E2	Fastclip	2580	165	330	25.8	12.5	15.0	1.7	2.1	1.4	1.85	206
	1436	CEN56E1 (BS113A)												
														Lr 600

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- Sleepers with provision for conductor rail are designated with (3R) or (4R) after the name, e.g. EG49(3R).
- Sleepers with provision for accommodated cables are designated with D after the name, e.g. EG47D(4R).
- The G55 sleeper is a bespoke cable management sleeper type, designed specifically to accommodate cables.
- The weights for sleepers with Fastclip or Vossloh fastenings include 3kg for the fastening components.

The initial reference loads F_{ro} , shown in column 14 shall be less than F_{rr} when applied as shown in Figure 1, Part 2 of EN 13230-2 for the value of $L_r = 600$.

Concrete Bearers

Type	Depth mm	Nominal Weight kg/m	Bending Moment kNm	Static Test kb	Fatigue Test kbB	Test Load Fbo Kn	Test Load Fbo Kn	Remarks
D	205	136	34.5	1.7	2.1	300	100/	
R	186	144	31.0	1.7	2.1	300	100	Lengths up to 4.5m
R	186	144	34.5	1.7	2.1	300	100	Lengths greater than 4.5m
S	160	124	27.8	1.7	2.1	300	100	
						$L_r = 600\text{mm}$	$L_r = 1.5\text{m}$	

The nominal weights include no allowance for any part of the fastening system.

Bearers can be tested at either 600 mm or 1.5 m.

Original Table @ $L_r 600\text{mm}$

Type	Depth mm	Nominal Weight kg/m	Bending Moment kNm	Static Test kb	Fatigue Test kbB	Test Load Fbo	Remarks
D	205	136	34.5	1.7	2.1	99	
R	186	144	31.0	1.7	2.1	89	Lengths up to 4.5m
R	186	144	34.5	1.7	2.1	99	Lengths greater than 4.5m
S	160	124	27.8	1.7	2.1	79	

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4 PART 2 - PRESTRESSED MONOBLOCK SLEEPERS

Refer to EN 13230-2 except for the following clauses which either replace or augment the similarly-titled clauses in EN 13230-2, or are additional to EN 13230-2.

4.1 Normative references (This clause replaces clause 2 in EN 13230-2)

Normative references are listed in the issue record of this specification.

4.2 Routine tests (This clause augments clause 4.6 in EN 13230-2)

Positive static load testing shall be applied to one sleeper in 60 or one sleeper in each line, whichever is the lesser.

Line: refers to sleepers/bearers end to end, each line being one sleeper/bearer wide but the mould might comprise several adjacent lines.

4.3 Rejected (New) or Used Sleepers (This clause is additional to EN 13230-2)

New but rejected sleepers shall be classified as 'Non Prime' Sleepers subject to their compliance with the acceptance criteria detailed in **Table 3** below and applies to concrete sleeper types as follows:

G44 (and designations), EG47, EG49 and 5F40 Types.

Sleepers shall be classified as Non Prime in accordance with the criteria below:

Table 3: Acceptance Criteria for Non Prime Sleepers

To be read in conjunction with Table 2 of this specification, 6.1 and 6.3 in EN 13230-1, and Annex H of this specification

Non Prime Code	Existing clause number	Attribute	Description	Revision to tolerance	New absolute tolerance values
A	Annex H	Housing Height	The height of the shoulder relative to the rail seat (concrete)	Additional tolerance of $\pm 0.3\text{mm}$	Standard tolerance $\pm 0.3\text{mm}$
B	3.9 Table 2 (L ₂)	Rail Seat	The dimension between the pairs of fastening	Additional tolerance of $\pm 0.1\text{mm}$ 167.5 \rightarrow 169.5	Standard tolerance + 1.1mm/ -1.1mm
C	3.9 Table 2 (F)	Convexed or Concaved	The flatness of the rail seat in both directions 1mm over 150mm	Additional tolerance of $\pm 0.2\text{mm}$	$\pm 1.2\text{mm}$ over 150mm
D	3.9 Table 2 (L ₁)	Track	The dimension between the two outer housings	No change	Note NR/L2/TRK/030 to read ~ Distance between the rail fastening gauge points: + 2.0mm/ - 1.0mm
E	3.9 Table 2 (I)	Inclination	The relative inclination of the rail seats	Additional tolerance of $\pm 0.275\text{mm}$	Total Angle of $\pm 3.025^\circ$ mm
F	3.9 Table 2 (T)	Twist	The twist between each rail seat	Additional tolerance of $\pm 0.5\text{mm}$	+ 1.2mm/ - 1.2mm
G	Annex H	Depth	The dimension from the	Additional tolerance	+ 5.5mm/ - 3.5mm

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			centre of the rail seat to the underside (soffit) of the sleeper.	of $\pm 0.5\text{mm}$	
K	3.10	Broken	Chipping to the concrete	Chipping to concrete surface which cannot be repaired under NR/L2/TRK/030 but meets the serviceable specification as defined in NR/L2/TRK/4100	No Change
L	Annex H	Length	Dimension from one end to the other	Rejection due to end plate issues on the mould. These will be $<5\text{mm}$ above the specified limit	$\pm 15\text{mm}$
P	3.9	Strand Position	The dimension from the top surface of the concrete to the position of the prestressing strand	No change from NR/L2/TRK/030	$\pm 3\text{mm}$ No change
V	3.10	Void	Holes in the concrete	<i>Small holes larger than those permitted in the NR Specification but will not affect long term durability or performance.</i>	No Change

Sleepers to be clearly marked with the above Non Prime Code in column 1 of Table 3 above.

The above creates a new category of Non Prime sleepers (not bearers) which can then be released for use in particular categories of track for renewal and maintenance.

Non Prime sleepers are permitted for use in Cat 2 to 6 track subject to the approval of the Route Asset Manager [Track].

The person responsible for the sleeper installation shall satisfy themselves that the Non Prime sleepers are fit for their intended use.

Used sleepers which have dimensional or surface finish defects non-compliant with EN 13230-1, but which are otherwise fully compliant with EN 13230-1 and EN 13230-2, may be used as 'Serviceable Sleepers' subject to their compliance with NR/L2/TRK/4100 being demonstrated.

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4.4 Fixings (This clause is additional to EN 13230-2)

Drilled fixings shall be made into sleepers as follows:

- not within 200 mm of the centreline (parallel to the rail) of the rail seat
- not within 35 mm of the longitudinal top edge
- not within 100 mm of the ends

Methods of drilling for fixings can be found in guidance documents produced by the CSMA and can be supplied by the sleeper/bearer manufacturer.

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5 PART 4 - PRESTRESSED BEARERS FOR S&C

Refer to EN 13230-4 except for the following clauses which either replace or augment the similarly-titled clauses in EN 13230-4, or are additional to EN 13230-4.

5.1 Normative references (This clause replaces clause 2 in EN 13230-4)

Normative references are listed in the issue record of this specification.

5.2 Tolerances (This clause augments clause 4.3.1 in EN 13230-4)

If measurement is taken earlier, allowance for further shortening to 48 hours shall be made.

5.3 Tolerances of positioning (This clause replaces clause 4.3.3 in EN 13230-4)

The tolerances of the cast-in components' positioning shall be measured in accordance with Figure 1 of EN 13230-4.

For Figure 1 refer to EN 13230-4, sub clause 3.3.2

Tolerance on dimensions A and D $\pm 1,0$ mm (on the same support area)

Tolerance on dimensions B and C $\leq 2,0$ mm $\pm 1,5$ mm, $\geq 2,0$ mm $\pm 2,5$ mm
(between two separate support areas)

Tolerance between the last cast-in component and the end of the bearer (E)
 ± 10 mm

The tolerances specified above may be varied by the purchaser in the case of special requirements and shall be defined on the drawings submitted by the purchaser.

5.4 Distance from the end of the bearer to the nearest cast-in component, *excluding modular bearer design* (This clause replaces clause 4.4 in EN 13230-4)

In general, the dimension from the running face of the outer rail to the end of a bearer shall not be less than 410 mm.

In isolated cases, individual short bearer ends in a layout can have a reduced dimension of 350 mm, provided that:

- the risk of cracking is controlled by the introduction of steel reinforcement
- no cast-in or glued in fixing for the rail fastening shall be less than 150 mm from the end of the bearer
- short bearers shall only be placed either singly or in pairs within a layout
- there shall be a minimum of two full bearers between short bearers within a layout

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5.5 Modular bearers (This clause is additional to EN 13230-4)

Where modular bearers are specified the following conditions apply;

- modular bearers shall be manufactured to comply with the requirements of the relevant Network Rail RE/PW drawings for the modular joint
- the width of the bearer throughout the length of the shear plate area shall be within the tolerance range stated in Table 2
- the shear plate used within the modular joint shall be manufactured in accordance with the relevant Network Rail RE/PW drawings
- the modular joint shroud shall be manufactured in accordance with the relevant Network Rail RE/PW drawings

5.6 Changes to the modular joint design (This clause is additional to EN 13230-4)

Any change to or deviation from the modular joint RE/PW drawings or modular joint assembly must be agreed with the Head of Track (Network Rail) prior to being implemented.

5.7 Modular joint testing (This clause is additional to EN 13230-4)

Any change to the modular joint may require additional load testing to be carried out by the manufacturer as specified by Network Rail.

Any new bearer manufacturer contracted to supply modular bearers to Network Rail may be required to carry out load testing of the modular joint as specified by Network Rail.

5.8 Symbols (This clause replaces clause 5.2 in EN 13230-4)

The following symbols are used:

M	positive design bending moment
Fb_0	positive initial reference test load
Fb_r	test load which produces first crack at the bottom of the bearer
$Fb_{0,05}$	test load for which a crack width of 0,05 mm persists at the bottom of the bearer after removal of the load
Fb_B	test load which cannot be increased when the bottom of the bearer is cracked
Fb_u	lower test load for the fatigue test: $Fb_u = 0,25 \times Fb_0$
k_b	impact coefficient for positive static test
k_{bB}	impact coefficient for fatigue test

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5.9 Test arrangements (This clause replaces clause 5.3 in EN 13230-4)

For Figure 3 refer to EN 13230-4, sub clause 4.2 and remove F_{b_n}

5.10 Test loads (This clause replaces clause 5.4.1 in EN 13230-4)

F_{b_0} is calculated from the geometry given in Figure 3

$F_{b_0} = M/0,35$ where F_{b_0} is in kN and M is in kNm

5.11 Static test (This clause replaces clause 5.4.2 in EN 13230-4)

The static test procedure is shown in Figures 3 and 4 for the positive bending moments.

The maximum load applied is $F_{b_{0,05}}$ or F_{b_B} whichever is reached first.

For Figure 4 refer to EN 13230-4 sub clause 5.5.2 and remove the words Positive and Negative and the information in the column under the heading Negative.

5.12 Static test (This clause replaces clause 5.5.2 in EN 13230-4)

The acceptance criteria for the design and routine static tests are shown as follows:

- $F_{b_r} > F_{b_0}$
- $(F_{b_B} \text{ or } F_{b_{0,05}}) > k_b \times F_{b_0}$

The coefficient k_b is given in Part 1, Annex H.

5.13 Fatigue test (This clause replaces clause 5.5.3 in EN 13230-4)

The acceptance criteria for the fatigue test are shown as follows. After 2 million cycles:

- crack width = 0,1 mm when loaded at F_{b_0}
- crack width = 0,05 mm when unloaded

The load is continuously increased at a rate of 120kN/min from the unloaded condition until failure F_{b_B} .

$F_{b_B} > k_{b_B} \times F_{b_0}$

The coefficient k_{b_B} is given in Part 1, Annex H.

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6 PART 5 - SPECIAL ELEMENTS

- Refer to EN 13230-5 except for the following clause which replaces the similarly-titled clause in EN 13230-5.

6.1 Normative references (This clause replaces clause 2 in EN 13230-5)

- Normative references are listed in the issue record of this specification.

Standards Briefing Note

Ref: NR/L2/TRK/030		Issue: 4					
Title: Concrete Sleepers and Bearers							
Publication Date: 05/03/2016		Compliance Date: 05/03/2016					
Standard Owner: Chief Track & Lineside Engineer							
Non-Compliance rep (NRNC): N/A							
Further information contact: Guy Simpson		Tel: 07801841285					
Purpose: The purpose of this product specification is to define Network Rail's requirements for the supply of concrete sleepers and bearers.		Scope: This specification gives technical requirements to be met by newly-manufactured concrete sleepers, bearers and related items procured for use in Network Rail's infrastructure. The specification should be read in association with the appropriate Network Rail standard drawings (RE/PW/XXX) for the particular sleeper or bearer design or with the manufacturer's accepted alternative designs. This specification applies to the supply of new concrete sleepers and bearers for use as: <ul style="list-style-type: none">sleepers for plain line;bearers in switch and crossing layouts; This specification applies to all personnel who are responsible for supplying, purchasing, constructing, renewing or maintaining Network Rail's infrastructure.					
What's New/ What's Changed and Why: <ol style="list-style-type: none">Clarification of test values/factors for determining Network Rail standard sleeper strengths provided by Network Rail in Annex H of NR/L2/TRK/030 issue 3 – positive/negative bending moments.Correction required in Annex H of NR/L2/TRK/030 issue 3; <i>Static Test heading</i>.Phraseology – Clause 3.6c and 3.10.Two additional clauses which further clarify pre-existing requirements for prestress tendons and steel respectively.							
Affected documents: <table><tr><td>Reference</td><td>Impact</td></tr><tr><td>NR/L2/TRK/030 ISSUE 3</td><td>Superseded</td></tr></table>				Reference	Impact	NR/L2/TRK/030 ISSUE 3	Superseded
Reference	Impact						
NR/L2/TRK/030 ISSUE 3	Superseded						
Briefing requirements: <i>Where Technical briefing (T) is required, the specific Post title is indicated. These posts have specific responsibilities within this standard and receive briefing as part of the Implementation Programme. For Awareness briefing (A) the Post title is not mandatory.</i> <i>Please see http://ccms2.hiav.networkrail.co.uk/webtop/drl/objectId/09013b5b804504da for guidance.</i>							
Briefing (A-Awareness/ T-Technical)	Post	Team	Function				
A	Chief Track & Lineside Engineer	STE Track & Lineside	Safety Technical & Engineering				
A	Head of Track	STE Track & Lineside	Safety Technical & Engineering				
A	Director of Materials & Logistics	Materials & Logistics	National Supply Chain				
A	Business Manager [S&C, Rail]	Materials & Logistics	National Supply Chain				
A	Business Manager [ASMR]	Materials & Logistics	National Supply Chain				
A	Route Asset Manager (Track)	Route	Network Operations				
A	Senior Asset Engineer (Track)	Route	Network Operations				
A	Discipline Manager	Track	Infrastructure Projects				
A	Works Delivery Manager	Route	Network Operations				
A	Track Maintenance Engineer	Route	Network Operations				

*NOTE: Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedure