

Specification for

Railway turnouts for private users —

Part 3: Medium grade turnouts for axle
loads not exceeding 25 tons —

Section 3.1: Turnouts using bull head
rail

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Foreword

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee. It is one of a series of specifications, of which the full list is as follows:

BS 4521, *Railway turnouts for private users.*

- *Part 1: Turnouts over which British Railways locomotives operate.*
- *Section 1.1 Turnouts using bull head rails.*
- *Section 1.2 Turnouts using flat bottom rails.*
- *Part 2: Light grade turnouts, for axle loads not exceeding 10 tons using flat bottom rails.*
- *Part 3: Medium grade turnouts for axle loads not exceeding 25 tons.*
- *Section 3.1 Turnouts using bull head rails.*
- *Section 3.2 Turnouts using flat bottom rails.*
- *Part 4: Heavy grade turnouts, for axle loads which may exceed 25 tons using flat bottom rails.*

This Section of this British Standard relates exclusively to turnouts produced from new rails complying with the requirements of BS 9 “*Bull head railway rails*”. It is recognized that second quality and partly worn rails are used for the manufacture of turnouts, but it should be clearly understood that their use is subject to agreement between the purchaser and the supplier. The recommended minimum acceptance requirements for partly worn rails are given in Appendix A. Turnouts from curved track have been omitted from this standard as they would complicate the tables and diagrams, but when they are used, the minimum radius should be maintained, although the crossing angles obtained may be outside the range shown.

Special requirements such as insulation for track-circuiting have not been included.

Nomenclature is given in Table 1, with cross references to layout and component diagrams for identification of parts for standard turnouts.

Materials and dimensions are specified.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 34, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Section 3.1 of this British Standard specifies requirements for medium grade turnouts over which British Railways locomotives do not operate, for axle loads not exceeding 25 tons, from straight track 4 ft 8½ in gauge manufactured from new bull head rails as specified in BS 9-95R.

The angles of crossing are 1 in 4½, 1 in 5, 1 in 5½, 1 in 6, 1 in 6½, 1 in 7, 1 in 7½ and 1 in 8.

NOTE The titles of the British Standards referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Section of this British Standard the following definitions apply:

railway turnout

a complete unit consisting of curved track diverging from straight track as illustrated in the layout diagrams of this standard

hand of turnout

the direction in which the curved track leaves the straight track

3 Inspection

The purchaser or his representative shall have access at all reasonable times to those parts of the works engaged on the contract or order. He shall be at liberty to witness the manufacture at any stage.

4 Identification marking

Each complete turnout shall be marked by stamping, with 1 inch letters and figures on the web of the wing rails at the check ends, the number of this Section of this British Standard, i.e. BS 4521-3.1.

When rail components are supplied separately they shall be stamped on the end of the rail with the number of this British Standard and the item number as shown in the nomenclature tables.

All chairs, baseplates and blocks shall be marked with identification letters, rail section, the manufacturer's initials and the month and year of manufacture.

5 General requirements

The design of medium grade turnouts is based on the centre line radius.

The minimum radius shall be 190 ft 8½ in measured to the centre line of track.

The switches shall be straight cut with joggled stock rails and operated by a spring type lever box. They shall be either heel or spring type as specified by the purchaser.

The shaping of the rails shall be carried out by machining, sawing and pressing. The holes shall be drilled.

The turnouts shall be supported on timbers of cross section 12 in by 6 in.

Bolts shall be threaded BSF (BS 84) free class, with nut threads normal class, except where otherwise stated.

6 Nomenclature

The nomenclature and numerical reference numbers for components are given in Table 1 which refers to item numbers shown in Figure 1 to Figure 32.

Component details are given in Figure 8 to Figure 32 as a further aid to identification.

7 Materials

Materials shall be in accordance with the requirements given in Table 2.

8 Dimensions

The leading dimensions shall be in accordance with the details shown in Figure 1 and Figure 3 for heel switches Figure 2, Figure 4 and Figure 5 for spring switches, and the tables associated with these figures.

The rail shall comply with the requirements of BS 9-95R.

The fishplates shall comply with the requirements of BS 47 and the fishbolts and nuts shall comply with BS 64, except that the length of the bolts shall be 4½ in instead of 4⅝ in.

Appendix A Partly worn rail

Partly worn bull head rail used for the construction of turnouts should have a minimum depth, measured on the vertical axis, of $5\frac{7}{16}$ in, or a minimum weight of 88 lb/yd.

It should be free from excessive side wear, chair gall and corrosion.

As a guide to the purchaser, it is recommended that bull head rail should be renewed when the depth reaches $5\frac{1}{8}$ in. The precise figure will depend on the following conditions:

- condition of sleepers and timbers;
- spacing of sleepers and timbers;
- condition of ballast;
- presence of side cutting.

Table 1 — Nomenclature for components

Item no.	Description	Figure no. Heel switch	Figure no. Spring switch
401	Stock rail, LH for LH turnout	Figure 1, Figure 6	Figure 2, Figure 7
402	Stock rail, RH for LH turnout	Figure 1, Figure 6	Figure 2, Figure 7
403	Stock rail, LH for RH turnout	Figure 1, Figure 6	Figure 2, Figure 7
404	Stock rail, RH for RH turnout	Figure 1, Figure 6	Figure 2, Figure 7
405	Switch tongue rail, LH for LH turnout	Figure 1, Figure 6	Figure 2, Figure 7
406	Switch tongue rail, RH for LH turnout	Figure 1, Figure 6	Figure 2, Figure 7
407	Switch tongue rail, LH for RH turnout	Figure 1, Figure 6	Figure 2, Figure 7
408	Switch tongue rail, RH for RH turnout	Figure 1, Figure 6	Figure 2, Figure 7
409	Straight running rail	Figure 1, Figure 16	Figure 2, Figure 16
410	Straight closure rail	Figure 1	Figure 2
411	Curved running rail	Figure 1	Figure 2
412	Curved closure rail	Figure 1	Figure 2
7	Rail joint, fishplated	Figure 1, Figure 25	Figure 2, Figure 25
414	Wing rail, RH, 12 ft 3 in long	Figure 1, Figure 16, Figure 17, Figure 19, Figure 20, Figure 21	Figure 2, Figure 16, Figure 19, Figure 20, Figure 21
415	Wing rail, LH, 12 ft 3 in long	Figure 1, Figure 16, Figure 17, Figure 19, Figure 20, Figure 21	Figure 2, Figure 16, Figure 19, Figure 20, Figure 21
416	Check rail	Figure 1, Figure 16, Figure 17, Figure 19, Figure 20, Figure 21	Figure 2, Figure 14, Figure 18, Figure 19, Figure 20, Figure 21
417	Point rail	Figure 1, Figure 16	Figure 2, Figure 16
418	Splice rail	Figure 1, Figure 16	Figure 2, Figure 16
419	Bolted heel chair	Figure 1, Figure 6, Figure 13	—
20	Common chair	Figure 1, Figure 6, Figure 16, Figure 26	Figure 2, Figure 7, Figure 16, Figure 26
421	Switch slide chair	Figure 1, Figure 6, Figure 12	Figure 2, Figure 7, Figure 12
422	Back heel chairs	Figure 1, Figure 6, Figure 14	Figure 2, Figure 7, Figure 14
23	Short base common chair	Figure 1, Figure 6, Figure 16, Figure 27	Figure 2, Figure 7, Figure 16, Figure 27
24	End check chairs, left and right hand	Figure 1, Figure 16, Figure 29	Figure 2, Figure 16, Figure 29
25	Check chair	Figure 1, Figure 16, Figure 29	Figure 2, Figure 16, Figure 29
26	Crossing chairs	Figure 1, Figure 16, Figure 28, Figure 29	Figure 2, Figure 16, Figure 28, Figure 29
427	Crossing nose chair	Figure 1, Figure 16, Figure 22	Figure 2, Figure 16, Figure 22
428	Block slide chairs for spring switches	—	Figure 2, Figure 7, Figure 30
429	Switch blocks for spring switch	—	Figure 24
430	Crossing blocks	Figure 1, Figure 16, Figure 24	Figure 2, Figure 16, Figure 24
32	First stretcher bar	Figure 1, Figure 6, Figure 15	Figure 2, Figure 7, Figure 15
33	Second stretcher bar	—	Figure 2, Figure 7, Figure 15
34	Connecting rod (adjustable)	Figure 1, Figure 6	Figure 2, Figure 7
436	Ferrule type distance pieces (for bolted heel chair)	Figure 13	—

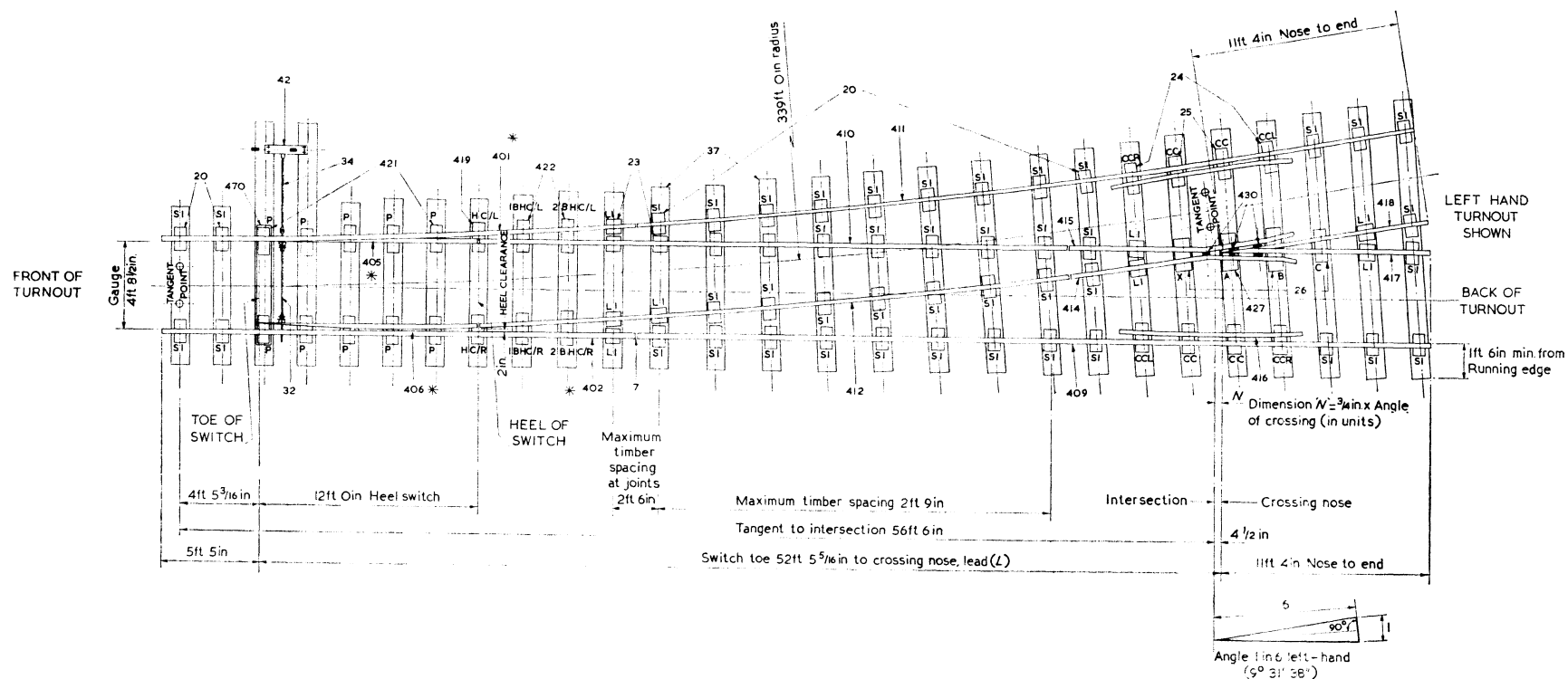
Table 1 — Nomenclature for components

Item no.	Description	Figure no. Heel switch	Figure no. Spring switch
37	Timbers	Figure 1, Figure 6, Figure 16	Figure 2, Figure 7, Figure 16
38	Coach screw or fang bolt	Figure 31	Figure 31
39	Ferrule	Figure 31	Figure 31
40	Key	Figure 31	Figure 31
41	Switch and crossing bolts	Figure 23	Figure 23
42	Lever box (spring operated)	Figure 1, Figure 6	Figure 2, Figure 7
443	Heel switch, 9 ft	Figure 8	—
444	Crossing 1 in $4\frac{1}{2}$ for heel switch turnout	Figure 17	—
445	Crossing 1 in 5 for heel switch turnout	Figure 17	—
446	Crossing 1 in $5\frac{1}{2}$	Figure 19	Figure 19
447	Heel switch, 12 ft	Figure 9	—
448	Crossing 1 in 6	Figure 19	Figure 19
449	Crossing 1 in $6\frac{1}{2}$	Figure 20	Figure 20
450	Crossing 1 in 7	Figure 21	Figure 21
451	Crossing 1 in $7\frac{1}{2}$	Figure 21	Figure 21
452	Crossing 1 in 8	Figure 21	Figure 21
453	Crossing 1 in $4\frac{1}{2}$ for spring switch turnout	—	Figure 18
454	Crossing 1 in 5 for spring switch turnout	—	Figure 18
455	Spring switch, 20 ft	—	Figure 10, Figure 11
456	Wing rail RH for spring switch turnout 1 in $4\frac{1}{2}$, 1 in 5	—	Figure 2, Figure 16, Figure 18
457	Wing rail LH for spring switch turnout 1 in $4\frac{1}{2}$, 1 in 5	—	Figure 2, Figure 16, Figure 18
470	Soleplate	Figure 1, Figure 6, Figure 15	Figure 2, Figure 7, Figure 15
71	Switch anchor	—	Figure 2, Figure 7, Figure 32
72	Cast iron washers	—	Figure 32
73	Spring washers	Figure 23	Figure 23

NOTE Item numbers not in the 400 series are common to other Parts of this standard.

Table 2 — Materials for components

Part	Material	BS reference
Bull head rail	Steel	BS 9
Stretcher bars	Steel	BS 24-3A:Grade 8
Stretcher bar brackets	Steel	BS 24-6:Grade 621
Connecting rod (adjustable)	Steel	BS 24-6:Grade 621
Soleplate	Steel	BS 24-6:Grade 621
Chairs	Cast Iron	BS 1452:Grade 12
Keys	Hardwood or steel	—
Coach screws	Steel	BS 970-1, steel 080 M40, galvanized to BS 729-1
Ferrules	Hardwood or approved plastics material	—
Fang bolts and shoes	Steel	BS 64
Switch and crossing blocks and washers	Cast Iron	BS 1452:Grade 12
Fishplates	Steel	BS 47:Class B
Fishbolts and nuts	Steel	BS 64
Switch and crossing bolts and nuts	Steel	BS 64
Spring washers	Steel	BS 1802
Switch anchors	Steel	BS 24-6:Grade 621
Timbers	Douglas fir or of similar quality, incised and pressure creosoted where possible	BS 913

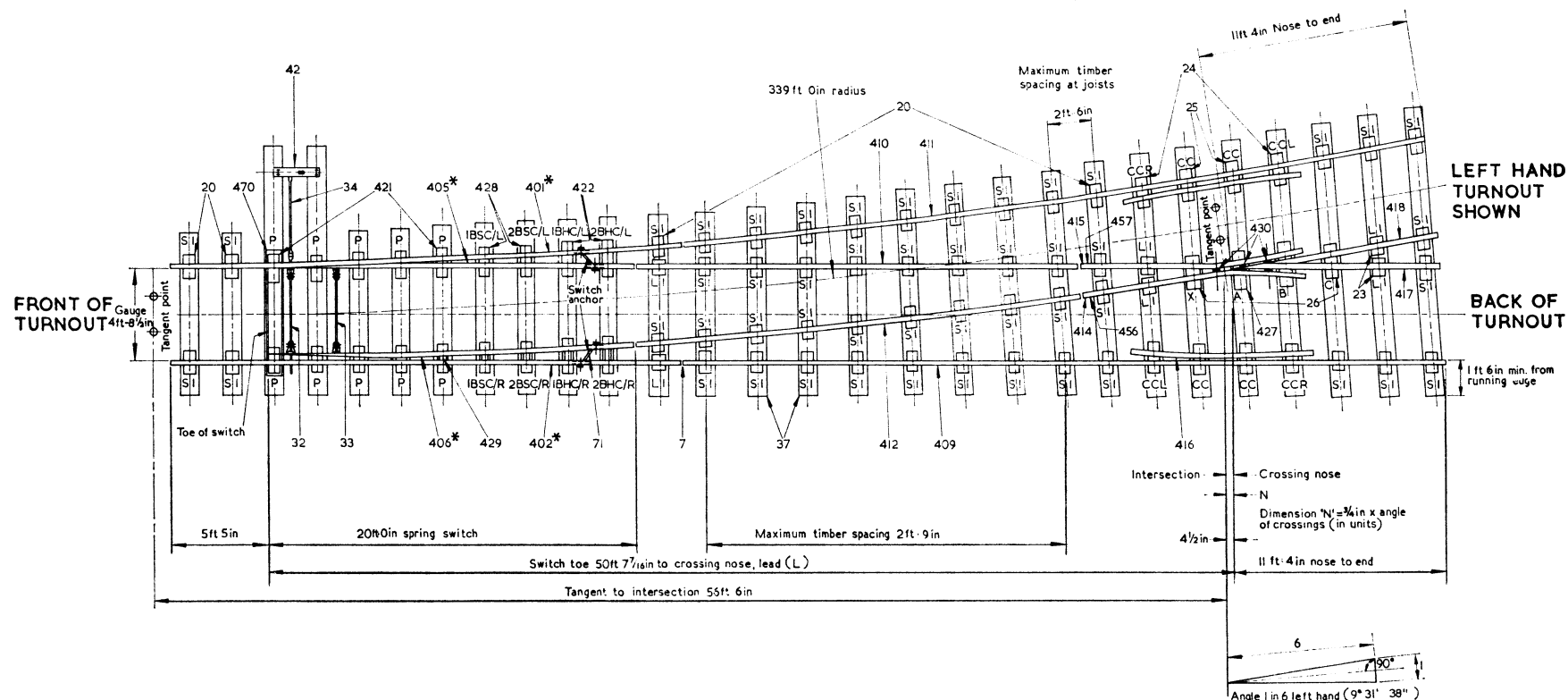


NOTE For leading dimensions, see Figure 3 and Table 3.
For description of numbered items, see Table 1.

Figure 1 — Layout diagram for heel switch turnouts

BS 9-95R bull head rail
(1 in 6 left-hand turnout shown)

* For right-hand turnouts, items no.,
401 to read 403
402 to read 404
405 to read 407
406 to read 408



NOTE For leading dimensions see Figure 4, Figure 5 and Table 4
For description of numbered items see Table 1

Figure 2 — Layout diagram for spring switch turnouts

BS 9-95R bull head rail
(1 in 6 left-hand turnout shown)

* For right-hand turnouts, items no., 401 to read 403
402 to read 404
405 to read 407
406 to read 408

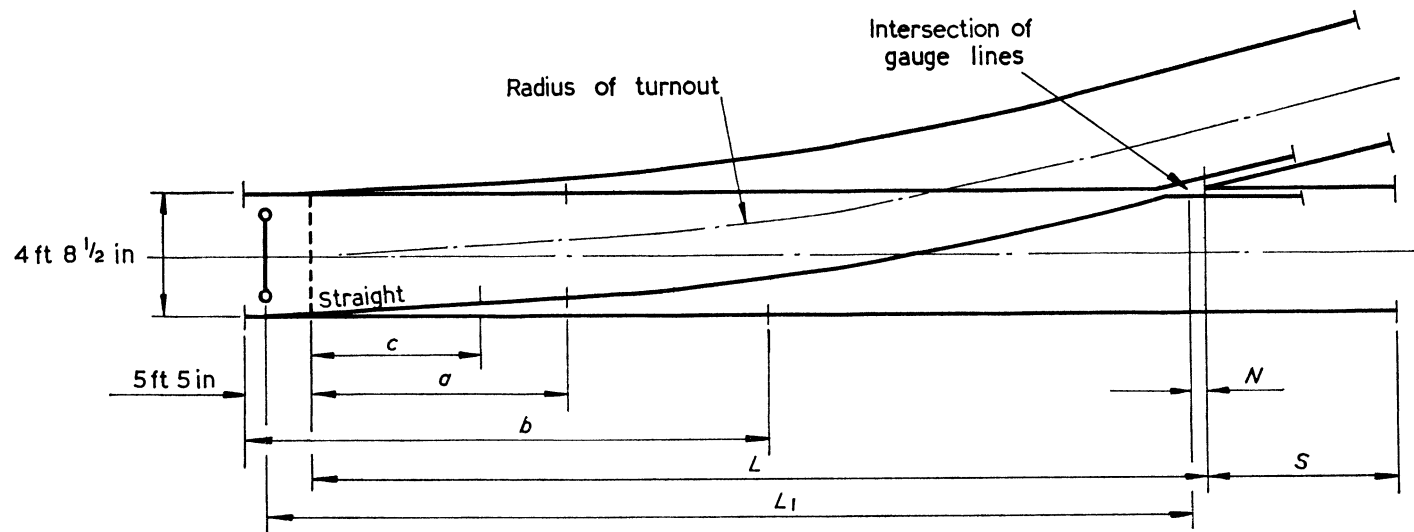
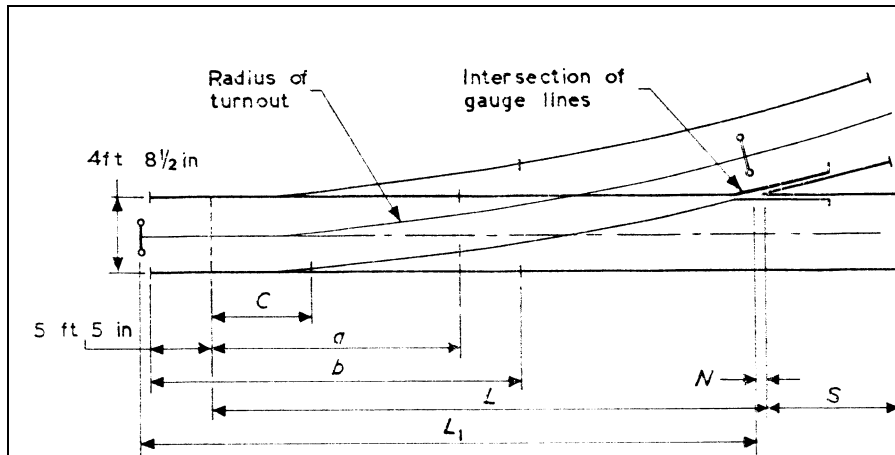


Figure 3 — Leading dimensions of heel switch turnouts, 1 in $4\frac{1}{2}$, 1 in 5, 1 in $5\frac{1}{2}$, 1 in 6, 1 in $6\frac{1}{2}$, 1 in 7, 1 in $7\frac{1}{2}$ and 1 in 8

BS 9-95R bull head rail

Table 3 — Leading dimensions of heel switch turnouts in Figure 1 and Figure 3

Type of switch	Length of switch a	Length of switch planing c	Angle of crossing	Turnout radius centre line	Length of stock rail b	Switch toe to crossing nose L	Tangent point to intersection point L_1	Crossing nose to intersection point N	Crossing nose to end of vee S	Type of turnout
Heel	9 0	5 2 $\frac{1}{2}$	1 in $4\frac{1}{2}$	190 8 $\frac{1}{4}$	23 0	39 3 $\frac{5}{16}$	42 4 $\frac{1}{2}$	3 $\frac{3}{8}$	11 4	Figure 3
			1 in 5	235 5		42 9	47 1	3 $\frac{3}{4}$		
			1 in $5\frac{1}{2}$	284 10 $\frac{1}{4}$		46 0 $\frac{3}{4}$	51 9 $\frac{1}{2}$	4 $\frac{1}{8}$		
	12 0	6 11 $\frac{3}{8}$	1 in 6	339 0	26 0	52 5 $\frac{5}{16}$	56 6	4 $\frac{1}{2}$		
			1 in $6\frac{1}{2}$	397 10 $\frac{1}{4}$		54 9 $\frac{7}{8}$	61 2 $\frac{1}{2}$	4 $\frac{7}{8}$		
			1 in 7	461 5		59 2 $\frac{3}{8}$	65 11	5 $\frac{1}{4}$		
			1 in $7\frac{1}{2}$	529 8 $\frac{1}{4}$		62 6 $\frac{7}{8}$	70 7 $\frac{1}{2}$	5 $\frac{5}{8}$		
			1 in 8	602 8		65 11 $\frac{7}{16}$	75 4	6		



NOTE Extended wing rails (No closure rails)

Figure 4 — Leading dimensions of spring switch turnouts, 1 in $4\frac{1}{2}$ and 1 in 5

BS 9-95R bull head rail

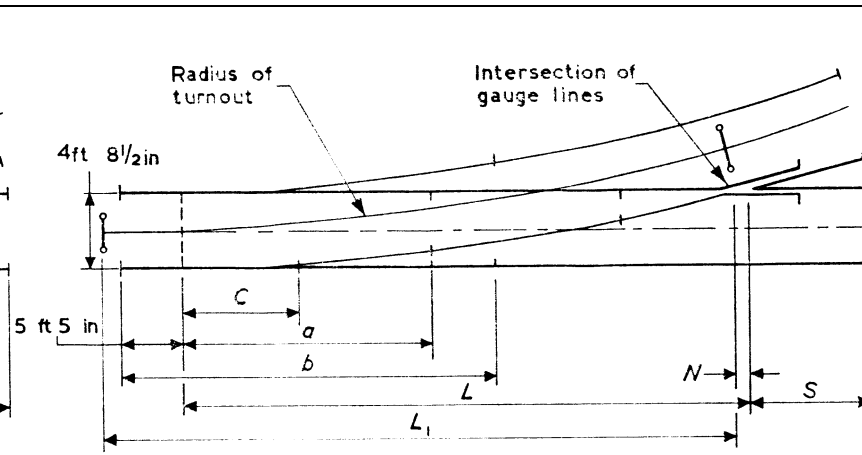


Figure 5 — Leading dimensions of spring switch turnouts, 1 in $5\frac{1}{2}$, 1 in 6, 1 in $6\frac{1}{2}$, 1 in 7, 1 in $7\frac{1}{2}$ and 1 in 8

BS 9-95R Bull head rail

Table 4 — Leading dimensions of spring switch turnouts in Figure 2, Figure 4 and Figure 5

Type of switch	Length of switch a		Length of switch planing c		Angle of crossing	Turnout radius centre line		Length of stock rail b		Switch toe to crossing nose L		Tangent point to intersection point L_1		Crossing nose to intersection point N	Crossing nose to end of vee S		Type of turnout
	ft	in	ft	in		ft	in	ft	in	ft	in	ft	in	in	ft	in	
Spring	20	0	4	$8\frac{7}{8}$	1 in $4\frac{1}{2}$	190	$8\frac{1}{4}$	27	9	37	$11\frac{7}{8}$	42	$4\frac{1}{2}$	$3\frac{3}{8}$	11	4	Figure 4
			5	$2\frac{5}{8}$	1 in 5	235	5			42	$2\frac{1}{8}$	47	1	$3\frac{3}{4}$			
			5	$8\frac{7}{8}$	1 in $5\frac{1}{2}$	284	$10\frac{1}{4}$			46	$4\frac{1}{4}$	51	$9\frac{1}{2}$	$4\frac{1}{8}$			
			6	$3\frac{1}{16}$	1 in 6	339	0			50	$7\frac{7}{16}$	56	6	$4\frac{1}{2}$			
			6	$9\frac{1}{4}$	1 in $6\frac{1}{2}$	397	$10\frac{1}{4}$			54	$10\frac{1}{8}$	61	$2\frac{1}{2}$	$4\frac{7}{8}$			
			7	$3\frac{1}{2}$	1 in 7	461	5			59	$0\frac{3}{4}$	65	11	$5\frac{1}{4}$			Figure 5
			7	$9\frac{11}{16}$	1 in $7\frac{1}{2}$	529	$8\frac{1}{4}$			63	$3\frac{7}{16}$	70	$7\frac{1}{2}$	$5\frac{5}{8}$			
			8	$3\frac{15}{16}$	1 in 8	602	8			67	$6\frac{1}{16}$	75	4	6			



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