

Appendix C 1. RAIL CONNECTIONS.

AMERICA.

INDIA. AUSTRALIA.

QUESTIONS.	CHESAPEAKE AND OHIO.	CHICAGO, BURLINGTON, AND QUINCY.	ILLINOIS CENTRAL.	LAKE SHORE AND MICHIGAN SOUTHERN.	NEW YORK CENTRAL AND HUDSON RIVER.	PENNSYLVANIA.	EAST INDIAN.	NEW SOUTH WALES GOVERNMENT RAILWAYS.
Is the Joint suspended or supported in a Joint Chair or on Sleepers?	Suspended.	Supported on sleepers. The Rails are laid with broken joints, i.e. joints on one line of rails are opposite the centre of the rail of the other line. A splice bar five inches long (of same section as fish plates) is bolted to the centre of each rail opposite the joint on the other line of rail. These splices are bolted to the rail with one $\frac{1}{2}$ inch bolt and spiked to the tie with one spike on each side.	Supported.	Supported.	Supported on three sleepers, the centre one centrally under the joint. The Rails are laid with Broken Joints, i.e., Joints on one Line of Rails are opposite the centre of the Rail of the other Line.	Suspended.	Suspended.	Suspended.
Fish Plate :—								FOR 80 lb. FLAT BOTTOMED RAILS. FOR 80 lb. BULLHEADED RAILS.
(a) Length	34 inches.	38 inches.	20 inches.	24 inches.	86 inches.	34 inches.	22 inches.	18 inches. 20 inches.
(b) Depth	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches to 4 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	4 $\frac{1}{2}$ inches.	3 inches. 3 $\frac{1}{2}$ inches.
(c) Thickness	$\frac{3}{8}$ inches.	$\frac{3}{8}$ inch.	$\frac{3}{8}$ inch.	$\frac{3}{8}$ inch.	$\frac{3}{8}$ inch Steel, $\frac{3}{8}$ inch Iron.	Varies from $\frac{3}{8}$ inch to 1 $\frac{1}{2}$ inch.	$\frac{3}{8}$ inch.	$\frac{1}{2}$ inch. $\frac{1}{2}$ inch.
(d) Weight	29 lbs.	32.3 lbs.	19 lbs.	20 $\frac{1}{2}$ lbs.	Rails 65lbs., 70lbs., 75 lbs., 80lbs., 100lbs. per yard. Fish Plates, 54lbs., 58lbs., 64 $\frac{1}{2}$ lbs., 64 $\frac{1}{2}$ lbs., 80lbs. per pair.	28 $\frac{1}{10}$ lbs. in Steel.	28 $\frac{1}{2}$ lbs.	10 $\frac{1}{2}$ lbs. 16 $\frac{1}{2}$ lbs.
Fish Bolts :—								
(a) Number	Six.	Six.	Four.	Four.	Six.	Six.	Four.	Four.
(b) Size	3 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	4 inches by $\frac{3}{8}$ inch.	4 inches by $\frac{3}{8}$ inch.	3 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	4 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch diameter.	4 $\frac{1}{2}$ inch by $\frac{3}{8}$ inch.	4 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	4 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.
(c) Weight	1.30 lbs.	1 $\frac{1}{2}$ lbs.	1 lb. each.	82 lbs.	1 lb. 1 $\frac{1}{2}$ oz.	$\frac{3}{16}$ of a lb.	1.58 lbs.	1.28 lb. 1.47 lb.
Description of Fish Bolt	Cap Headed with Oval Shoulder at head end.	Square Head, shape of Fish Plates, prevents head turning when bolt is being screwed.	Cap Headed, with Oval Shoulder at head end.	Cup Headed with Oval Shoulder at head end.	Cup Headed with Square Shoulder at the head end.	Cup Headed with Oval Shoulder at head end.	Square Headed, shape of Fish Plate prevents head turning when bolt is being screwed.	Cap Headed with Oval shaped Shoulder at head end. Square Headed, shape of Fish Plates prevents head turning when bolt is screwed up.
Description of Nut (and Washer if any)	Hexagonal Nut with Washer.	Hexagonal Nut.	Square Nut, "Verona" Lock Nut.	No Washer used. Differential Thread on bolt.	Square Nut, no Washer used.	Square Nut and Washer, $\frac{1}{2}$ inch Section Split Ring.	Hexagonal Head with Washer, $\frac{1}{2}$ inch.	Hexagonal Nut. Washers not used till fastenings are worn, when Grover's Washers are used. Square Nut.
Are holes in Fish Plates square or circular, punched or drilled?	Inside Plate, round. Outside "oval. Punched.	Round.	Circular in one plate and oval in the other. Punched.	Inside Plate Oval; Outside Plate Circular.	Square in one and Round in the other. Punched.	Oval. Punched.	Circular.	Oval. Punched. Circular. Punched.
Does the form of Joint used give satisfaction?	Yes	Yes	Yes	Not in all respects.	Gives great satisfaction.	Not universally.	As good as any other.	Yes Yes
If not, in what respect is improvement required with a view to securing uniform strength of road throughout?	.....	.....	.....	A Joint Fastening which is as strong as the Rail is required.	Only by discarding all so-called Joints altogether and adopting some form of compound continuous Rail.	Shorten the Splices.	.....	.....
How are Rails secured to Sleepers?	.....	.....	.....	.....	.....	.....	Yes	Yes
(a) Wood Sleepers with Chairs	.....	.....	.....	.....	.....	.....	.....	.....
(b) Wood ditto without Chairs	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Weight of Chair	.....	.....	.....	.....	.....	.....	30 lbs.	45 lbs.
Base of Chair (area in square inches)	.....	.....	.....	.....	.....	.....	86 Square inches.	167.80 square inches.
Is Felt or other material placed between Chair and Sleeper?	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No	No
Are the Chairs on each side of the Joint of the same pattern as the rest? If not, give particulars	.....	.....	.....	.....	.....	.....	Yes	Yes
Full particulars of mode of attachment of Chair to Sleeper	.....	.....	.....	.....	.....	.....	Two Spikes, 6 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	Four holes are provided in each chair, but only two spikes are used, and these are placed diagonally.
Full particulars of attachment of each flat bottomed Rail to Sleeper	By two Spikes, 5 $\frac{1}{2}$ inch by $\frac{3}{8}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch.	Four Clips and Screws to the Sleeper on each side of Joint. Intermediate fastenings, two 5 inch by $\frac{3}{8}$ inch screws.	By two Spikes 5 $\frac{1}{2}$ inch by $\frac{3}{8}$ inch.	.....	By two $\frac{3}{8}$ inch Spikes.
Bearing area of flat-bottomed Rail on Sleeper in square inches	41 $\frac{1}{2}$ inches.	38 $\frac{1}{2}$ inches.	75 lb. rail, 38 $\frac{1}{2}$ inches. 70 lb. rail 37 inches.	38 inches.	Rails. 65 lbs., 70 lbs., 75 lbs., 80 lbs., 100 lbs. Area, 40 $\frac{1}{2}$ ins., 41 $\frac{1}{2}$ ins., 42 $\frac{1}{2}$ ins., 45 ins., 49 $\frac{1}{2}$ ins.	36 inches.	50 inches.

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QUESTIONS.	CHESAPEAKE AND OHIO.	CHICAGO, BURLINGTON, AND QUINCY.	ILLINOIS CENTRAL.	LAKE SHORE AND MICHIGAN SOUTHERN.	NEW YORK CENTRAL AND HUDSON RIVER.	PENNS.
Is the Joint suspended or supported in a Joint Chair or on Sleepers?	Suspended.	Supported on sleepers. The Rails are laid with broken joints, i.e. joints on one line of rails are opposite the centre of the rail of the other line. A splice bar five inches long (of same section as fish plates) is bolted to the centre of each rail opposite the joint on the other line of rail. These splices are bolted to the rail with one $\frac{7}{8}$ inch bolt and spiked to the tie with one spike on each side.	Supported.	Supported.	Supported on three sleepers, the centre one centrally under the joint. The Rails are laid with Broken Joints, i.e., Joints on one Line of Rails are opposite the centre of the Rail of the other Line.	Supported on three sleepers, the centre one centrally under the joint. The Rails are laid with Broken Joints, i.e., Joints on one Line of Rails are opposite the centre of the Rail of the other Line.
Fish Plate:—						
(a) Length.....	31 inches.	38 inches.	20 inches.	24 inches.	36 inches.	36 inches.
(b) Depth	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches to 4 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches to 4 $\frac{1}{2}$ inches.
(c) Thickness	$\frac{3}{4}$ inches.	$\frac{5}{8}$ inch.	$\frac{7}{8}$ inch.	$\frac{3}{4}$ inch.	$\frac{3}{16}$ inch Steel, $\frac{3}{8}$ inch Iron.	Varies from $\frac{3}{16}$ to $\frac{3}{8}$ inch.
(d) Weight.....	29 lbs.	32.8 lbs.	19 lbs.	20 $\frac{1}{2}$ lbs.	Rails .....65lbs., 70lbs., 75 lbs., 80lbs., 100lbs. per yard. Fish Plates, 54lbs., 58lbs., 64 $\frac{1}{2}$ lbs., 64 $\frac{1}{2}$ lbs., 80lbs. per pair.	28 $\frac{1}{2}$ lbs.
Fish Bolts:—						
(a) Number	Six.	Six.	Four.	Four.	Six.	Six.
(b) Size.....	3 $\frac{7}{8}$ inches by $\frac{3}{4}$ inch.	4 inches by $\frac{7}{8}$ inch.	4 inches by $\frac{3}{4}$ inch.	3 $\frac{3}{4}$ inches by $\frac{3}{4}$ inch.	4 $\frac{1}{2}$ inches by $\frac{3}{4}$ inch diameter.	4 $\frac{1}{2}$ inches by $\frac{3}{4}$ inch diameter.
(c) Weight.....	1-30 lbs.	1 $\frac{1}{2}$ lbs.	1 lb. each.	82 lbs.	1 lb. 1 $\frac{1}{4}$ oz.	1 lb. 1 $\frac{1}{4}$ oz.
Description of Fish Bolt.....	Cup Headed with Oval Shoulder at head end.	Square Head, shape of Fish Plates, prevents head turning when bolt is being screwed.	Cup Headed, with Oval Shoulder at head end.	Cup Headed with Oval Shoulder at head end.	Cup Headed with Square Shoulder at the head end.	Cup Headed with Square Shoulder at the head end.
Description of Nut (and Washer if any)	Hexagonal Nut with Washer.	Hexagonal Nut.	Square Nut, "Verona" Lock Nut.	No Washer used. Differential Thread on bolt.	Square Nut, no Washer used.	Square Nut, no Washer used.
Are holes in Fish Plates square or circular, punched or drilled?	Inside Plate, round. Outside " oval. Punched.	Round.	Circular in one plate and oval in the other. Punched.	Inside Plate Oval; Outside Plate Circular.	Square in one and Round in the other. Punched.	Oval.
Does the form of Joint used give satisfaction?	Yes	Yes	Yes	Not in all respects.	Gives great satisfaction.	Not in all respects.
If not, in what respect is improvement required with a view to securing uniform strength of road throughout?	.....	.....	.....	A Joint Fastening which is as strong as the Rail is required.	Only by discarding all so-called Joints altogether and adopting some form of compound continuous Rail.	Shorter
How are Rails secured to Sleepers?						
(a) Wood Sleepers with Chairs .....	.....	.....	.....	.....	.....	.....
(b) Wood ditto without Chairs	Yes	Yes	Yes	Yes	Yes	Yes
Weight of Chair						
Base of Chair (area in square inches)	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.
Is Felt or other material placed between Chair and Sleeper?	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.
Are the Chairs on each side of the Joint of the same pattern as the rest? If not, give particulars.....	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.
Full particulars of mode of attachment of Chair to Sleeper	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.	No Chairs used.
Full particulars of attachment of each flat-bottomed Rail to Sleeper	By two Spikes, 5 $\frac{1}{2}$ inch by $\frac{9}{16}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{9}{16}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{9}{16}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{9}{16}$ inch.	Four Clips and Screws to the Sleeper on each side of Joint. Intermediate fastenings, two 5 inch by $\frac{3}{4}$ inch screws.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{9}{16}$ inch.
Bearing area of flat-bottomed Rail on Sleeper in square inches	41 $\frac{1}{2}$ inches.	38 $\frac{1}{2}$ inches.	75 lb. rail, 38 $\frac{1}{2}$ inches. 70 lb. rail 37 inches.	38 inches.	Rails, 65 lbs., 70 lbs., 75 lbs., 80 lbs., 100 lbs. Area, 40 $\frac{1}{2}$ ins., 41 $\frac{1}{2}$ ins., 42 $\frac{1}{2}$ ins., 45 ins., 49 $\frac{1}{2}$ ins.	36 inches.

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ILLINOIS CENTRAL.	LAKE SHORE AND MICHIGAN SOUTHERN.	NEW YORK CENTRAL AND HUDSON RIVER.	PENNSYLVANIA.	EAST INDIAN.	NEW SOUTH WALES GOVERNMENT RAILWAYS.	
Supported.	Supported.	Supported on three sleepers, the centre one centrally under the joint. The Rails are laid with Broken Joints, i.e., Joints on one Line of Rails are opposite the centre of the Rail of the other Line.	Suspended.	Suspended.	Suspended.	
20 inches.	24 inches.	36 inches.	34 inches.	22 inches.	FOR 80 LB. FLAT BOTTOMED RAILS. FOR 80 LB. BULLHEADED RAILS.	
3 $\frac{1}{2}$ inches.	3 $\frac{1}{2}$ inches.	3 $\frac{3}{4}$ inches to 4 $\frac{1}{4}$ inches.	3 $\frac{1}{2}$ inches.	4 $\frac{1}{2}$ inches.	18 inches.	20 inches.
$\frac{7}{8}$ inch.	$\frac{3}{4}$ inch.	$\frac{9}{16}$ inch Steel, $\frac{5}{8}$ inch Iron.	Varies from $\frac{3}{4}$ inch to 1 $\frac{1}{16}$ inch.	$\frac{11}{16}$ inch.	3 inches.	3 $\frac{3}{8}$ inches.
19 lbs.	20 $\frac{1}{2}$ lbs.	Rails 65lbs., 70lbs., 75 lbs., 80lbs., 100lbs. per yard. Fish Plates, 54lbs., 58lbs., 64 $\frac{1}{2}$ lbs., 64 $\frac{1}{2}$ lbs., 80lbs. per pair.	28 $\frac{1}{16}$ lbs. in Steel.	28 $\frac{1}{2}$ lbs.	$\frac{1}{2}$ inch.	$\frac{1}{2}$ inch.
					10 $\frac{1}{2}$ lbs.	16 $\frac{1}{2}$ lbs.
Four.	Four.	Six.	Six.	Four.	Four.	Four.
4 inches by $\frac{3}{4}$ inch.	3 $\frac{3}{4}$ inches by $\frac{3}{4}$ inch.	4 $\frac{1}{8}$ inches by $\frac{3}{4}$ inch diameter.	4 $\frac{1}{2}$ inch by $\frac{3}{4}$ inch.	4 $\frac{3}{4}$ inches by $\frac{7}{8}$ inch.	4 $\frac{1}{8}$ inches by $\frac{7}{8}$ inch.	4 $\frac{1}{8}$ inches by $\frac{7}{8}$ inch.
1 lb. each.	82 lbs.	1 lb. 1 $\frac{3}{4}$ oz.	$\frac{9}{16}$ of a lb.	1-58 lbs.	1-28 lb.	1-47 lb.
Cup Headed, with Oval Shoulder at head end.	Cup Headed with Oval Shoulder at head end.	Cup Headed with Square Shoulder at the head end.	Cup Headed with Oval Shoulder at head end.	Square Headed, shape of Fish Plate prevents head turning when bolt is being screwed.	Cup Headed with Oval shaped Shoulder at head end.	Square Headed, shape of Fish Plates prevents head turning when bolt is screwed up.
Square Nut, "Verona" Lock Nut.	No Washer used. Differential Thread on bolt.	Square Nut, no Washer used.	Square Nut and Washer, $\frac{1}{4}$ inch Section Split Ring.	Hexagonal Head with Washer, $\frac{1}{2}$ inch.	Hexagonal Nut. Washers not used till fastenings are worn, when Grover's Washers are used.	Square Nut.
Circular in one plate and oval in the other. Punched.	Inside Plate Oval; Outside Plate Circular.	Square in one and Round in the other. Punched.	Oval. Punched.	Circular.	Oval. Punched.	Circular. Punched.
Yes	Not in all respects.	Gives great satisfaction.	Not universally.	As good as any other.	Yes	Yes
.....	A Joint Fastening which is as strong as the Rail is required.	Only by discarding all so-called Joints altogether and adopting some form of compound continuous Rail.	Shorten the Splices.	.....	.....	.....
.....	.....	.....	.....	Yes	.....	Yes
Yes	Yes	Yes	Yes	.....	Yes	.....
No Chairs used.	No Chairs used.	No Chairs used	No Chairs used.	30 lbs.	.....	45 lbs.
				86 Square inches.	.....	167 89 square inches.
				No	.....	No
				Yes	.....	Yes
				Two Spikes, 6 $\frac{7}{8}$ inches by $\frac{3}{4}$ inch.	.....	Four holes are provided in each chair, but only two spikes are used, and these are placed diagonally.
By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{9}{16}$ inch.	By two Spikes, 5 $\frac{1}{2}$ inches by $\frac{9}{16}$ inch.	Four Clips and Screws to the Sleeper on each side of Joint. Intermediate fastenings, two 5 inch by $\frac{5}{8}$ inch screws.	By two Spikes 5 $\frac{1}{2}$ inch by $\frac{9}{16}$ inch.	.....	By two $\frac{7}{8}$ inch Spikes.	.....
75 lb. rail, 38 $\frac{1}{2}$ inches. 70 lb. rail 37 inches.	38 inches.	Rails, 65 lbs., 70 lbs., 75 lbs., 80 lbs., 100 lbs. Area, 40 $\frac{1}{2}$ ins., 41 $\frac{1}{2}$ ins., 42 $\frac{3}{4}$ ins., 45 ins., 49 $\frac{1}{2}$ ins.	36 inches.	50 inches.	.....	.....