R K
Secto.

Please note that original Ep. No. 1494 R dtd. Oct 90 has been put up for C. No. 10265.

Dtd. 29/10

Noted
29/10

Public Works (1890) Department.

RAILWAY BRANCH.

G.O., No. 1503 Rys

DATED 11th October

[Despatch Abstract.]

Rules for the Inspection of Railways prior to opening. — Twenty Copies of the —, forwarded to the Consulting Engineer for Railways.

[P. W. Ry. 500—8-5-00.]

Indexed.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
	1316	Ry.	4-9-90				

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

No. 1201

South Indian Railway,

AGENT'S OFFICE,

Cuddapah / ~~NEGAPATAM~~, 23rd August 1890.

From

The AGENT,

SOUTH INDIAN RAILWAY

To

The CONSULTING ENGINEER FOR RAILWAYS,

MADRAS.

Sir,

I shall be obliged if you will kindly supply for the use of officers on the S. I. State Railway, 15 Copies of Govt. of India circular No 1045R dated 28-9-83 "Rules for the inspection of railways prior to opening."

Yours obedt Servant

Walter J. Hoofer

for Agent.

+ Embodied in G.O. No 2 dated 30/9/83

Ry 4-9-90 1316

G 333

1157

RECD
No 1212
FILED
No

Rly Bd 558/90

FORM No. 1.

PUBLIC WORKS DEPARTMENT.

OFFICE OF CONSULTING ENGINEER FOR RAILWAYS,

Madras. 26th August 1890.

Letter from the Agent, South Indian Railway, No. 1201, dated 23rd August 1890.

No. 573

SUBMITTED _____ to _____ Government,

with the request that the Government of India may be asked to supply 20 additional copies of Circular No. 19. Railway dated 30th August 1883.

(G.O. No. 1045-R 28th September 1883)

× not published by Local Office

Subject.—

A.D.G. Shelley Captain R.E.
for Offg: Consulting Engr for Rys.

FROM

THE AGENT,

South Indian Railway,

Negapatam.

To

THE CONSULTING ENGINEER FOR RAILWAYS,

Madras.

Dated

Received 24.8.90 } 189

No. Revd

ENCLOSURE

Return of Barrels

Form No. 3.

B. No. 1316 R dt. Sept/90.

Lt. J 1/9/90

Ordered to be for-
warded to the Govt. of India
for favor of compliance.

A.E. No 1317 R dt. Sept. Augt. 1890

Forwarded

Info. despts to India
4/9/90.

P. W. Cons: 8058

From

THE CONSULTING ENGINEER
FOR RAILWAYS,
MADRAS,

No. 573

Dated 26th
Received 26th } August 1890.

No. of Enclosures.

Subject.

Submitting the application from the Agent, S. I. Ry:, for supply of additional copies of 4th of I. Govt. No. 19, Ry:, dt 30th Augt: 83, re. rules for inspection of railways prior to opening.

B.
No. 1316-17 R dt 4th Sept/90.

GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
RAILWAY CONSTRUCTION.

To

Circular No. 19 Railway.
Dated August 30, 1883.
Received

Rules for the Inspection of Railways prior to opening for passenger traffic.

G. I. C. P. O.—No. 329 P. W. D.—11-12-86—100.

[*General Distribution.*]

Circular No. 19 Railway.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

RAILWAY CONSTRUCTION.

Simla, August 30, 1883.

Rules for the Inspection of Railways prior to opening for passenger traffic.

Read again—

Public Works Department Circular No. 23 Railway, dated 11th November 1875.
" " " " " 1 Railway, dated 15th January 1878.
" " " " " 16 Railway, dated 19th June 1878.
" " " " " XVII Railway, dated 16th February 1881.
" " " letter " 325 R.C., dated 29th April 1881, to the Consulting Engineer for Guaranteed Railways, Calcutta.

Read also —

Letter No. 243G., dated 31st January 1883, from the Consulting Engineer for Guaranteed Railways, Lahore.

OBSERVATIONS.—Under Section 5 of Act IV of 1883, no railway, nor portion or extension of, nor addition to, a railway, can be opened for the public conveyance of passengers until the Railway Administration has given to the Governor General in Council notice in writing of the intention of opening the same, nor until the Governor General in Council has, by order, sanctioned the opening of the same.

And, under Section 5B, a necessary preliminary to this sanction is the report, to the Governor General in Council, by an Inspecting Officer duly appointed under the Act, that the opening of the line would not, in the opinion of the Inspecting Officer, be attended with danger to the public using it.

RESOLUTION.—With a view to carrying out the above provisions, the Governor General in Council is pleased to direct that notice of intention to open for passenger traffic a section of railway shall be communicated to the Government of India, through the usual channel, at least one month previous to the date approximately fixed for such opening.

2. After this notice has been given, the Railway Administration may call upon the officer appointed for the purpose to carry out the inspection of the line, supplying him with all necessary information regarding the section to be inspected, as provided in the annexed Rules. The Inspecting Officer will then make arrangements for the inspection in communication with the Agent, Manager or Engineer-in-Chief, who is in direct charge of the line.

3. The inspection should be carried out in accordance with the rules herewith circulated for the guidance of all concerned, and the Inspecting Officer should submit his report for the orders of the Governor General in Council as

soon as possible after the completion of the inspection. The details of construction and other information, prescribed in Section III of the Rules, which are required for purposes of record by the Government of India, should accompany his report.

4. The Inspecting Officers appointed under the Act, and their circles of inspection, as at present constituted, are detailed in Public Works Department Circular No. X Railway, dated 4th May 1883.

5. The Agent, Manager or Engineer-in-Chief will be held responsible for seeing that the Inspecting Officer is not called upon to undertake the inspection before the section of the line to be inspected is complete in all essential particulars. As a rule certificates by the Engineer-in-Chief to the effect that the works considered necessary for the safe working of the line will be completed, or be in working order, on some future date, will not be accepted, and the opening of the line will not be authorised unless such works are completed to the satisfaction of the Inspecting Officer at the time of his inspection.

ORDER.—Ordered, that this Resolution, and the Rules referred to, be communicated to the Governments, Administrations, and Officers named in the margin for information and guidance, in supersession of all previous orders on the subject.

The Governments of Madras, Bombay, Bengal, the North-Western Provinces and Oudh, and the Punjab.
The Chief Commissioners of the Central Provinces, Assam, and British Burma.
The Residents, Hyderabad and Mysore.
The Agents to the Governor General for Rajputana, Central India, and Biluchistan.
The Consulting Engineers to the Government of India for Guaranteed Railways.
The Director General of Railways.

Also to the Accountant General, Public Works Department, for information.

By order,

R. A. SARGEAUNT, Major, R.E.,

Offg. Under Secretary

Documents accompanying.

Rules for Inspection of Railways prior to opening for passenger traffic, and Appendices A and B.

Enclosure to Public Works Department Circular No. 19 Railway, dated 30th August 1883.

Rules for the Inspection of Railways by an independent officer prior to the opening of any Section or Sections for passenger traffic.

I.—Duties of Inspecting Officer.
II.—Rules for Manager.
III.—Information to be furnished.
IV.—Certificates by Manager.
V.—Points for observation.
VI.—Tests.
VII.—Forms.

Throughout these rules the term "Manager" means the responsible officer in charge of the Railway at the time of the inspection, whether Agent, General Manager, Engineer-in-Chief or other officer.

Section I.—Duties of the Inspecting Officer.

1. As these inspections are made for the particular object of assuring the Government of the condition of the line, it is desirable that the Inspecting Officer should confine his report to points directly affecting the safety and welfare of the travelling public and of the railway servants, and should not introduce into his report any irrelevant matter.

2. He should be as concise as possible in his recommendations, stating briefly, but clearly, the grounds on which they are made. It will be assumed that any points on which he has made no remark do not, in his opinion, affect the safety or welfare of the travelling public or railway servants.

3. He may recommend that the railway be opened either unconditionally, or subject to certain restrictions, or he may recommend a postponement of the opening.

4. The Inspecting Officer should investigate all questions affecting the safety of the public, but his attention is particularly directed to the following points :—

(1) To the general formation of the line, and the necessity for increasing widths, flattening slopes, or preventing slips.

(2) To the existence of sharp curves or gradients in dangerous positions.

(3) To the general character and condition of the rails and fastenings, sleepers and ballast.

(4) To the strength and quality of all structures above ground.

(5) To the waterways of the bridges and culverts, so far as to ascertain that they have been fully investigated by the proper officers.

(6) To the provision of parapets or hand-rails, where necessary, on bridges and viaducts.

(7) To the means of escape of railway servants in long viaducts or tunnels.

(8) To any infringement of the standard dimensions of fixed structures.

(9) To the protection of bridge platforms from fire.

(10) To the character and condition of the fencing.

(11) To the proper arrangements for level-crossings.

(12) To the provision of proper gradient posts and mile marks.

(13) To the character and condition of the points and crossings.

(14) To arrangements for preventing the escape of vehicles from sidings in stations, either by gravity on an incline, or by force of the wind.

(15) To the character, condition and position of the signals.

(16) To the width of the platforms, and their proper ramping at the ends.

(17) To the sufficiency of the accommodation for passengers at stations especially with regard to latrine arrangements.

(18) To the weight and dimensions of the rolling stock, and its limitation to the standards prescribed.

(19) To the provision of cow-catchers on an unfenced line.

(20) To the sufficiency of space and ventilation in the passenger carriages.

(21) To the provision of some proper and efficient arrangement for turning engines at the terminus of the section about to be opened.

(22) To the establishment of a proper and sufficient block system, or other approved mode of working the traffic.

5. The character of the tests of iron bridges is given in Section No. VI.

6. The Inspecting Officer should furnish to the Government of India a record of the deflection and oscillation of all girder bridges of large span, and of at least one of each type of small spans, under the test loads. Spans of about 40 feet and over are to be considered "large spans."

7. The Inspecting Officer should during his inspection intimate, as far as practicable, to the "Manager" the general tenor of the recommendations he intends to make, in order to afford that officer the opportunity of discussing with him the various points raised. He may furnish the officer in question with a copy of his report, or extracts therefrom, making it clear at the same time that the line cannot be opened without proper sanction in accordance with the terms of the Railway Acts.

8. The report of the Inspecting Officer, with his recommendation, and the information required under Section III, is to be sent to the Government of India, who will issue such instructions thereon as may appear to be desirable.

Section II.—"Rules for the Manager."

1. As soon as the "Manager" can fix approximately the date for opening the railway, he will give notice of the intention to open through the usual channel to the Government of India.

2. After this notice has been given he may call upon the Government Inspector, within whose circle the railway lies, to inspect the line, sending to him, at the same time, the details of construction prescribed in Section III of these rules.

In the case of State lines, with the permission of the Controlling Administration.

3. These particulars should reach the Inspecting Officer at least one month before the date proposed for opening, to enable him to make himself acquainted with the circumstances of the line before his visit of inspection.

4. The Inspecting Officer will then fix a date for the inspection, and arrange the character of the tests required and other necessary details in communication with the "Manager."

5. The "Manager" of the Railway, or such officer as he may delegate for the purpose, must accompany the Inspecting Officer in his inspections, afford him all information and assistance, and provide all instruments and arrangements necessary for applying such tests as he may require. The Manager should be accompanied during the inspection by the Engineer-in-Chief, or in his unavoidable absence, by an Engineer of the Railway, who can afford to the Inspecting Officer such technical information as he may require.

6. The Manager will give to the Inspecting Officer, in writing, certificates that he will comply with any restriction that may be imposed by the Inspecting Officer. Should the Manager demur to any restriction so imposed, he may refer the question to the Government of India, but pending final decision the restriction must be observed. The responsibility of any infringement of the certified conditions will rest on the Manager.

Section III.—Information to be furnished.

The following information and details of construction should be supplied by the Manager to the Inspecting Officer at least one month before the date proposed for opening, and should, subsequently, accompany the report of the inspection sent to the Government of India.

1. A small index plan and section of the line, on which must be drawn all curves gradients, cuttings, and embankments, the position of large bridges, level-crossings, stations, mileage, &c.

Note.—The scale of the plan and section should be about 1 inch = 1 mile horizontal, and 1 inch = 100 feet vertical, with enlargement of detail, wherever the scale is too small to afford the prescribed information.

2.	A table of curves	see Form	A,	Section VII.
3.	„ gradients	„	B,	„
4.	„ ballast	„	C,	„
5.	„ important waterways	„	D,	„
6.	„ abstract of „	„	E,	„
7.	„ large bridges	„	F,	„
8.	„ stations	„	G,	„
9.	„ station machinery	„	H,	„
10.	„ „ buildings, staff quarters, &c.	„	I,	„
11.	„ level-crossings	„	K,	„

12. Drawings of any class of permanent-way (including points and crossings) not in ordinary use in India.

13. Drawings of girders other than those of Government standard type with calculation of strains.

14. Sections of tunnels.

Note.—If the Government of India lithographed types have been adopted in any case, it will be sufficient to refer to the type, giving the dates of the lithographs.

Section IV.—Certificates and Engagements.

The following certificates and engagements, duly signed by the Manager, are to be handed to the Inspecting Officer before he commences his inspection. These certificates must subsequently be sent to the Government of India and placed on record :—

1. Certificate that no structure infringes the limits of the standard dimensions prescribed by the Government of India.

2. Certificate that no engine or other vehicle exceeds the maximum moving dimensions prescribed by the Government of India.

3. Engagement that no infringement of the standard dimensions, either in structures or moving bodies, will be made without the consent of the Government of India, in writing, to each case of infringement.

4. Certificate that not more than two engines shall ever be allowed at one and the same time on any one track of a bridge.

5. Engagement that no alteration shall be made in the rolling-stock or its loads which will involve live loads in excess of those which may from time to time be prescribed* by the Government of India for each gauge respectively.

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* The live loads at present prescribed are given in type drawings—
Metre gauge I. B. No. A., dated 3rd June 1881.
5′ 6″ I. B. No. A., dated 3rd June 1881.
} Printed as Appendix B to these rules.

Section V.—Points for observation.

The attention of Inspecting Officers and Managers is particularly requested to the following points:—

1. The provisional list of standard dimensions to be followed as far as practicable: this list will be subject to alteration from time to time as found necessary.

2. Rails to be fished at the joints.

3. With flat-bottomed rails, the rails on both sides of the joints should be supported on bearing plates, double spiked outside.

4. Gate-keepers, provided with huts, should be posted at all gates capable of closing across the line. Gates closing across the line should be provided with signal boards and lamps which can be clearly seen by those on the approaching train.

5. Mile and quarter-mile marks should be provided, and gradient posts for all gradients exceeding 300 yards in length.

6. Stations and junctions should be properly protected by main and distant signals.

7. Arrangements should be made to avoid shunting over a junction. And when two lines meet, the junction should, in ordinary cases, be formed as a double line junction.

8. Level-crossings not commanding a clear view of the line on both sides should be protected by semaphore signals. Level-crossings in towns, or on populous thoroughfares, may require special protection by distant signal, electric bell or telegraph.

9. All signals worked by wire should be weighted so as to fly to 'Danger' on the fracture of the wire. (General Rule No. 25.)

10. Tunnels and long viaducts should be provided with facilities which will enable workmen to escape from an approaching train without difficulty.

11. The descents at the ends of platforms should be by ramps, not steps.

12. Facing points should be kept locked as far as practicable.

13. High level platforms, overbridges and other structures requiring this protection should be walled or railed in to prevent accidents to passengers.

14. Stations should not be on gradients steeper than 1 in 250. When they are unavoidably on steeper gradients, proper catch sidings should be provided to prevent runaway wagons from descending the gradient. Catch sidings may, under certain circumstances, be required at the foot of steep inclines.

15. Clocks at stations should be placed where they can be seen by the drivers and guards.

16. The block system, or some other system approved by the Government of India, will be adopted for the working of the traffic (see General Rules).

Section VI.—Tests.

System of testing iron bridges on Railways in India.

The Government of India do not approve of the system of testing iron bridges to an extent far in excess of the maximum loads they will have to carry in practice.

2. If tested too heavily, a faulty portion is likely to be strained and to cause failure afterwards, and the extreme test is no more a guarantee against failure than the lighter test.

3. The rolling loads assumed for the calculation of the strains in girders should give nearly an equivalent to a maximum of two engines of the heaviest class (if there is room for them on the span), with their full complement of water and fuel, with the remainder of the span covered with a train of wagons of the heaviest type, fully loaded. If this load, with an additional engine in the case of large span bridges, be adopted in testing bridges after erection, it will suffice.

4. In long spans the loaded wagons should be both before and behind the engines, so that the engines may stand as near as possible to the centre of the span. Officers who test wrought-iron bridges should ascertain, and report, whether this load, together with the dead load (including the rails, platform, ballasting, asphalte, girders or cross-girders, &c., &c.,) (but exclusive of the additional engine specified in the preceding paragraph in the case of large span bridges), produces a strain exceeding the specified stress in any part of the material, whether in the main girders, cross-girders, or rail-bearers.

5. The specified stress will be assumed at—

5 tons per square inch for iron in tension.

4 " " " " " " " compression.

6½ " " " " for steel in compression and tension.

6. When material is exposed to a tensile strain, deduction must be made to allow for the diminution of area caused by rivet holes or otherwise. When subject to a compressive strain, deduction should be made to allow for diminution of area caused by imperfectly filled *rivet* holes, and by holes for pins or bolts whether filled or not.

7. The testing load should pass over the bridge three times, and the deflection and oscillation (when practicable) should be noted at each time of passing.

8. At the first passage, the testing train should proceed slowly, and should be *brought to a stand* with its heaviest portion as near as possible to the centre of the span. It should remain in this position for at least 10 minutes.

9. At the second passage, also, the train should proceed slowly, and be brought to a stand, but need not remain in that position longer than is necessary to observe the deflection. The object of this test is to ascertain the deflection after the girder has recovered from the first test.

10. At the third, the train should pass over the bridge at a speed of 20 miles an hour.

11. When practicable, graphic diagrams should be taken of the deflection and oscillation under the test loads in the manner described in Appendix A attached.

12. For structures of cast-iron the breaking load should be determined from the formula:—

$B=3L+6l$, where:

B=Total breaking load.

L=Total permanent load, structure, platform, &c.

l=Maximum moving load=for each track, 2 of the heaviest engines as near as possible to the centre of the span, and the rest of the span covered with goods wagons of the heaviest type fully loaded.

Section VII—Forms.

FORMS A AND B.

List of Curves and Gradients.

It is not necessary to give a "complete" list of Curves and Gradients, but simply an abstract under different classes. For the sake of uniformity, the classes given below should be adopted on all Railways.

No.	Form A. Radius of curves, &c.	Length, miles.
	300 feet.	
	Above 300 ,, to 400 feet inclusive .	
	,, 400 ,, to 500 ,, ,, .	
	,, 500 ,, to 600 ,, ,, .	
	,, 600 ,, to 1,000 ,, ,, .	
	,, 1,000 ,, Straight line	
	Total .	

No.	Form B. Gradients.	Length, miles.
	1 in 30	
	Above 1 in 30 to 1 in 50 inclusive .	
	,, 1 in 50 to 1 in 80 ,, .	
	,, 1 in 80 to 1 in 100 ,, .	
	,, 1 in 100 to 1 in 150 ,, .	
	,, 1 in 150 to 1 in 300 ,, .	
	,, 1 in 300 to 1 in 1,000 ,, .	
	,, 1 in 1,000 Level	
	Total .	

All curves below the minimum of 300 feet radius, and all gradients below the minimum of 1 in 30, must be especially noted in addition to the above.

FORM C.

List of Ballast.

Position.	Length, miles.	Character of Ballast.
M M Between 1 and 28	28	Gravel.
,, 28 ,, 32	4	Broken-stone.
,, 32 ,, 45	13	Burnt clay and sand.
,, 45 ,, 81	36	Kunker.
,, 81 ,, 100	19	Burnt clay.
Total .	100	

FORM D.

List of Important Waterways.

Name of River.	Position, mile.	Drainage area, square miles.	Rise of flood water above low-water below.	Declivity of bed, feet per mile.	Maximum velocity in flood, feet per second.	Openings. No.	Openings. Clear span.	Openings. Flood area, feet.	Openings. Flood discharge, feet per second.	Openings. Value of K*	Character of foundations.	Remarks.

* Value of K in the formula Log. K=Log. D.—¾ Log. M.
Where D=Total discharge of the river in extreme flood in feet per second,
M=Drainage area in square miles.
K=Coefficient for Colonel Dickens's formula.

FORM E.

Abstract of Waterway.

Clear spans.	Total area of waterway.	Area per mile of railway.	Remarks.
In culverts and bridges not exceeding 10 feet clear span			
In ditto exceeding 10 feet, but not exceeding 20 ,, ,, ...			
In ditto ,, 20 ,, ,, 40 ,, ,, ...			
In ditto ,, 40 ,, ,, 60 ,, ,, ...			
In bridges exceeding 60 feet clear span			
Total .			

FORM F.

Abstract of large Bridges.

Name of River, &c.	Position, mile.	Openings. Number.	Openings. Clear span.	Height of underside of girders above. Flood level.	Height of underside of girders above. River bed, (Maximum).	* Remarks.

* In the case of a bridge being adapted for road traffic, it should be stated whether the accommodation provided is for foot traffic, or wheel traffic, or both, and whether such traffic is carried on the same or different level to the railway.

FORM G.

List of Stations.

Name.	Class.	Position, mile.	Distance apart. Station to Station.	Distance apart. Of Engine Stations.	On what gradient.	On what curve.	Remarks.
Average distance apart .							

FORM H.

List of Station Machinery, &c.

Name of Station.	Number.							
	Tanks.	Pumps.	Water cranes.	Hydrants.	Station signals.	Distant signals.	Engine turn-tables.	Weigh-bridges.
Total number .								
Average number per 100 miles of Railway								

FORM I.

List of Station Buildings, Staff Quarters, &c.

Name of Station.	Number required.													
	Passenger Stations.	Refreshment rooms.	Waiting rooms.	Third class waiting sheds.	Latrines.	Goods sheds.	Engine sheds.	Carriage sheds.	Station masters' quarters.	Running room for guards.	Running room for drivers.	Staff quarters.	Porters' quarters.	Police quarters.
Total number .														
Average number per 100 miles of Railway . .														

FORM K.

List of Level Crossings.

	Description of Level crossing.	Number.	Average No. per 100 miles.	Remarks.
A	With gates closing across the Railway, and with huts . .			
B	With gates not closing across the Railway, but with huts .			
C	Level-crossings without huts			

Govt. of India Central Printing Office, No. 329 P. W. D.—12-12-86—100.

Enclosure to Public Works Department Circular No. 19 Railway, dated 30th August 1883.

APPENDIX A.

TO THE RULES FOR THE INSPECTION OF RAILWAYS PRIOR TO OPENING.

Memorandum on a self-recording arrangement for testing girder bridges.

There are now a large number of important bridges in India already erected, and others in course of construction; these bridges are carefully tested in the manufacturer's yards in England, and again on erection in India, and if the results of these tests were recorded in a convenient form, they would be of great use in detecting faults in design in girders already built, and would also be of value for reference when designing new bridges.

The self-recording arrangement shown in the accompanying sketch might, it is believed, be used with advantage for this purpose, as it is exceedingly simple and inexpensive, is self-acting, is independent of errors of observation, and records, on a diagram drawn by the girder itself, all its movements, both lateral and vertical during test.

The arrangements will be understood at once from the sketch. The pencil is parallel to the centre line of the bridge, and the paper at right angles to the same. If therefore the girder under test move simply up and down in a vertical plane, a vertical line would be the result, showing by its length the actual amount of such movement. Lateral oscillation converts this line into a figure more or less complicated, which will be a closed figure or not according to whether or not the girder returns exactly to its former position.

On the sketch are given facsimiles of diagrams actually obtained from the 60 feet Warren girders on the Nizam's Line. It will be seen how much the figure varies under the same load according to the speed, and according to whether it is taken from the top or bottom boom.

The paper can generally be fixed to scaffolding, staging or other structure used in erecting the girders, but if such be not available, a trestle can generally be put up for the purpose at a trifling cost, care being taken to select for experiment the land spans where the girders are at the least height above the ground. Where a number of bridges have to be tested, the girders of which are at a moderate height, a portable trestle may be used and carried from one to the other in the testing train.

In the sketch the bar carrying the pencil is shown straight, but in some cases it will have to be cranked to enable it to be attached to special forms of girders.

In practice the following points require attention :—

(*a*).—The pencil should be sharp pointed, and the extreme sharpness rubbed off by a few strokes on a piece of paper. The point should be looked to before each test. The pencil should not be very hard, about H or F being the best. A pencil of lead or copper might be used on "metallic" paper; this would prevent risk of the pencil point breaking just at the moment of test, but would not give such a fine line in the diagram.

(*b*).—The paper should be hard with a fine smooth surface. Card is the best material for the purpose. It should be two or three times the size of the expected figure and fastened so as to be truly at right angles to the rails.

(*c*).—After the card is fixed a truly vertical line should be marked on it with a plumb line before commencing work.

(*d*).—The position of the pencil point on the figure at beginning and end of test should be carefully marked.

(*e*).—In every case two diagrams should be taken simultaneously, one from the top and the other from the bottom boom of the girder. If the two main longitudinal girders are not rigidly connected by distance pieces, a pair of diagrams should be taken from *each* girder at the same time.

(*f*).—Diagrams should always be taken from the centre of the span, but for spans of 150 feet or upwards, diagrams should also be taken at intermediate points.

(*g*).—Several diagrams should be taken for each test to get an average, as with anything except a very moderate speed, the motion of the bridge is a good deal modified by the motion of the engine and the position of its cranks when passing the point at which the diagram is being taken. If the oscillation of the engine be synchronous and in the same direction as the wave along the girder when passing the point of observation, the movement will be a maximum.

(*h*).—Immediately the card is taken down the following particulars should be noted on it :—

The top of the card.

The side nearest the bridge.

Nature and weight of load.

Speed.

Name of bridge and number of girder.

Top or bottom boom.

Position of pencil point at commencement and end of test.

(*i*).—Care should be taken that the trestle or scaffolding on which the card is supported is quite free from the bridge, and that there is no plank or anything from one to the other by which vibration might be communicated.

Government of India Central Printing Office—No. 329 P. W. D.—12-12-86—100.

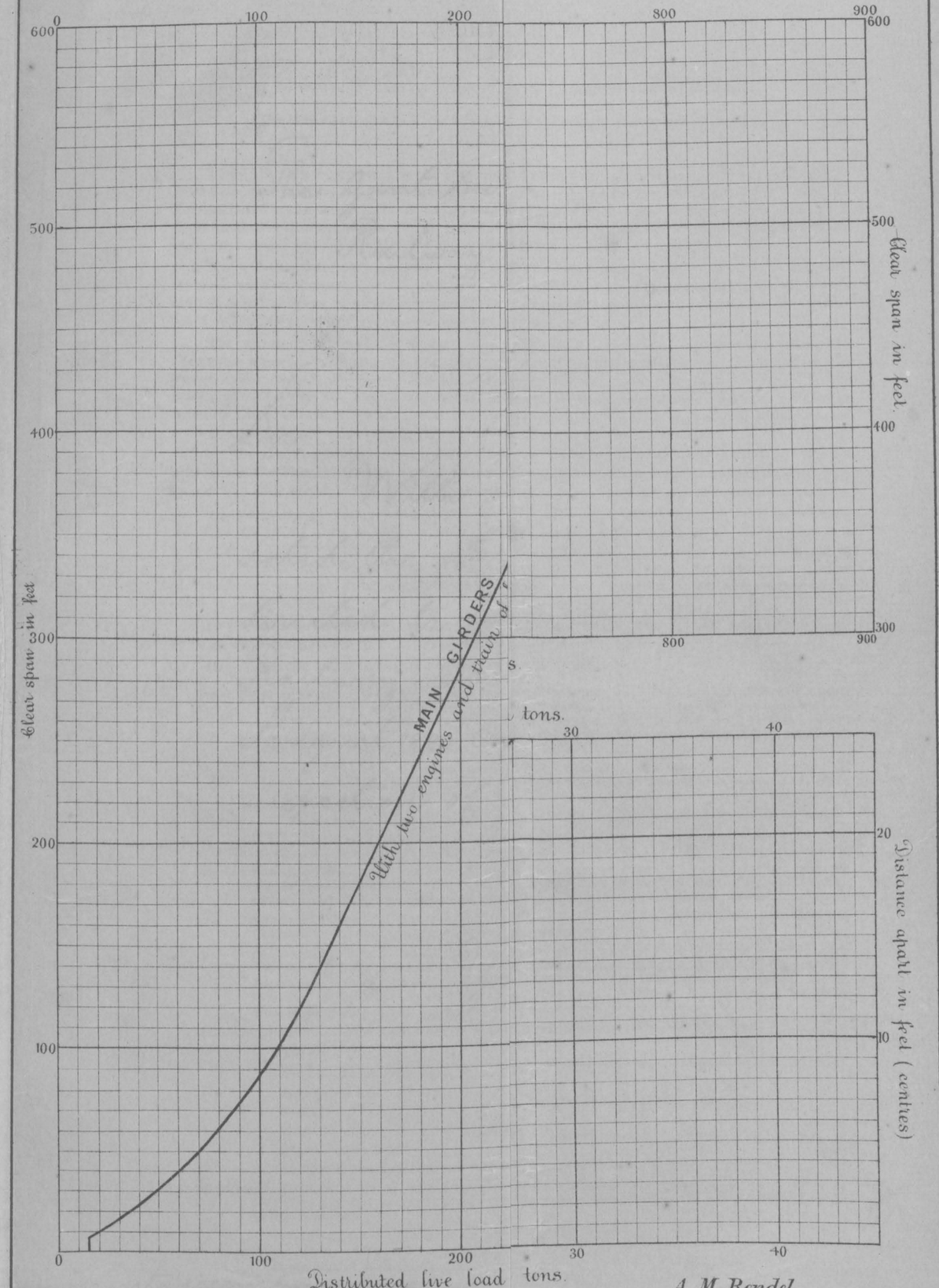
TYPE DRAWINGS

INDIAN STATE RAILWAYS.

NEW SERIES.

METRE GAUGE.

I. B. Nº A.



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on a pair of wheels in the cent

A. M. Rendel,
Consg Engr to the Secy of State,
Guilford L. Molesworth,
Consg Engr to the Govt of India.
3rd June, 1881.

No. 833 R. C.

All communications should be addressed to the Secretary.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

RAILWAY Construction

To

The Joint Secretary to the Government of Madras
Railway Branch Public Works Department

Simla, the 17th September 1890

Sir,

With reference to your No. 1317 R. dated the 4th September 1890 I am directed to forward 20 spare copies of Railway Circular No. 19 dated the 30th August 1883 containing Rules for the inspection of railways prior to opening.

I have the honour to be
Sir,
Your most obedient Servant

F. S. Talbot

Offg: Under Secretary

Documents accompanying
Circular No. 19 Ry: of 1883.

(20 Copies by Parcels Post.)

Encl. to J.H. Gent 22

P.W.Cs. 9135

B

No. 1503 R. of 11th Octr '90.

20 Copies will be forwarded to the Comg Engr. for Railways with Reference to his endorsement No. 573 of 26th August 1890.

20. S.C.

JH 10/10/90

SS 27/9/90

D.R.

Rec. 26-9-90

B.

No 1503 RD 11th Octr '90

To D

The Comg Engr for Rys with compliments.

46/LC

4RC 10/10.

R10/X Engr

Hm 4-X-90.