

Public Works (1893) Department.

RAILWAY BRANCH.

G.O., No. 1255R

DATED 26th September

[Despatch Abstract.]

Rules.— Copy of— for determining the maximum permissible stress and working load for railway bridges of wrought iron or steel finally approved by the Govt of India, forwarded to the agents, Madras, South Indian and Nizam's Guaranteed State Railways.

BACK PAPERS.

[illegible]

FURTHER PAPERS.

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

No. 1369 R. C.

GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
RAILWAY CONSTRUCTION.

TO
THE SENIOR GOVERNMENT INSPECTORS OF RAILWAYS, MADRAS, BOMBAY,
CALCUTTA, LUCKNOW, CENTRAL DIVISION, AND ASSAM.

Calcutta, the 13th December 1892.

SIR,

SIR, I am directed to inform you that the Government of India has had under consideration the strength of the existing iron and steel girders of railway bridges in this country.

2. Many girders have now been 25 years or more in use, and, owing to successive increases in the axle loads of engines and rolling stock, are probably subjected to heavier strains than they were originally designed to bear. I am therefore directed to invite your attention to this important subject and to impress upon you the necessity for an early and thorough investigation of all girder bridges on the lines within your circle of inspection in order to ascertain whether the girders are of sufficient strength for the loads they are at present required to carry.

3. The attention of the agents and managers of the railways within your circle should be invited to the subject and reports of the action taken by them in the matter should be called for and submitted at an early date for the information of the Government of India. You should also specially note on this subject in your periodical inspection reports.

4. A copy of a specification which it is proposed to issue for the guidance of inspectors in determining the stability of iron or steel bridge frames is enclosed for information. This specification is about to be sent to the Secretary of State for consideration, and it is to be understood that it is now issued subject to any modifications that may be decided on after the views of the Consulting Engineer for Railways at the India Office have been received and considered.

I have the honour to be,

I have the honour to be,

SIR,

Your most obedient Servant,

F. B. HEBBERT, *M. Inst. C. E.*,

Under Secretary.

Documents accompanying.
Proposed rules regarding working
stresses on bridge frames.

G. I. C. P. O.-No. 631 P. W. D. - 15-12-92.-325.-J D. d.

Enclosure to Government of India, Public Works Department, letter
No./369 R. C., dated 13th December 1892.

WORKING STRESS FOR RAILWAY BRIDGES.

DRAFT RULES.

Maximum permissible stress—

1. For any member of a railway bridge of wrought-iron or steel, the *total working load* is to be taken as the greatest 'moving load' multiplied by a co-efficient and added to the actual 'fixed load.'
2. The co-efficient to be used for this purpose is 2.0 in all cases, except for the upper and lower booms of triangulated girders, for which a co-efficient of 1.5 may be used.
3. The stress per square inch, either in tension or compression, due to the 'total working load' thus calculated, is not to exceed the following:—

	Tons.
Wrought-iron	7
Steel	9

4. The working stress per square inch given above, whether for tension or compression, is to be taken on the *net* available area at the *weakest* part of the member of the structure to which it is applied, after deducting all holes for rivets, pins, bolts, etc.
 5. For members in compression the working stress given above is subject to such reduction as may be necessary according to column formula.
 6. For the purposes of this rule 'fixed load' is to be taken to mean the weight of the structure itself, with roadway, flooring ballast, permanent-way, etc., complete. (*See also 'wind pressure' below.*)
- 'Moving load' is to be taken as follows:—

- (a) A train load for each line of rails calculated as specified under 'train load' below.
- (b) If there be a road or foot-way in addition to, and distinct from, the railway, an additional moving load of 4 tons per 100 square feet of such road or foot-way.

Train load—

1. *Type train.*—For the purpose of calculating the train load to be allowed for on each line of rails, the 'type train' is to consist of two engines on the specification given as Appendix A with a train of loaded wagons taken at a uniform weight per foot run as follows:—

	Tons.
5 ft. 6 in. gauge	1.2
Metre gauge	0.8

The engines are to be taken as running either in the ordinary way or coupled head to head, and occupying any position in the train.

2. *Type engine.*—To facilitate the determination of the stresses which may be produced by the 'type train,' a diagram of a 'type engine' is given as Appendix B. It is to be understood that this diagram does not represent any actual engine, but an imaginary engine so designed as to produce on a bridge the most severe effect practicable under the specification given as Appendix A.

Wind pressure—

1. The amount of wind pressure on a railway bridge is to be calculated on the assumption that the maximum normal pressure may be one and a half tons per 100 square feet of surface exposed. The surface exposed to be reckoned as follows:—

- (a) A train surface calculated on a height of 13 ft. 6 in. on the 5 ft. 6 in. gauge; or 11 ft. 0 in. on the metre gauge, multiplied by the total length of the girder.

- (b) The actual surface (as seen in elevation) of that portion of one girder which may be below rail level, or at a height above rail level of more than 13 ft. 6 in. on the 5 ft. 6 in. gauge, or 11 ft. 0 in. on the metre gauge. Also,
- (c) In the case of triangulated girders, the actual vertical surface (as seen in elevation) of that portion of the leeward girder which may be below rail level, or at a height above rail level of more than 13 ft. 6 in. on the 5 ft. 6 in. gauge, or 11 ft. 0 in. on the metre gauge.

2. The total wind pressure thus calculated is to be provided for by a proper system of wind-bracing or floor-plating, and its effect taken into account as forming a part of the stress on the chords of the main girders. Proper arrangements must also be made at the girder ends to secure sufficient stiffness to resist racking action where diagonal stiffeners are not used.

3. Wind pressure is to be treated as 'fixed load,' and its effect on the different members of the structure is to be allowed for as provided in the rule for 'maximum permissible stress.'

WORKING STRESS FOR RAILWAY BRIDGES.

APPENDIX A.

5 ft. 6 in. GAUGE.

LOCOMOTIVE ENGINES.

Extract from Government of India 'Standard dimensions,' for the 5 ft. 6 in. gauge, showing permissible wheel loads and other particulars for locomotive engines.

	Ordinary Standard.
	Tons.
Weight on a pair of wheels—	
Maximum under any circumstances	15
Maximum per foot of diameter	3.75
Weight per foot run of wheel base—	
Maximum for either engine or tender separately in the case of tender engines	3.00
Maximum for tank engines	4.00
Weight per foot run over buffers—	
Maximum for engine and tender together in the case of tender engines	1.625
Maximum for tank engines	1.875
Total gross weight—	
Maximum for engine and tender together in the case of tender engines	86
Maximum for tank engines	60

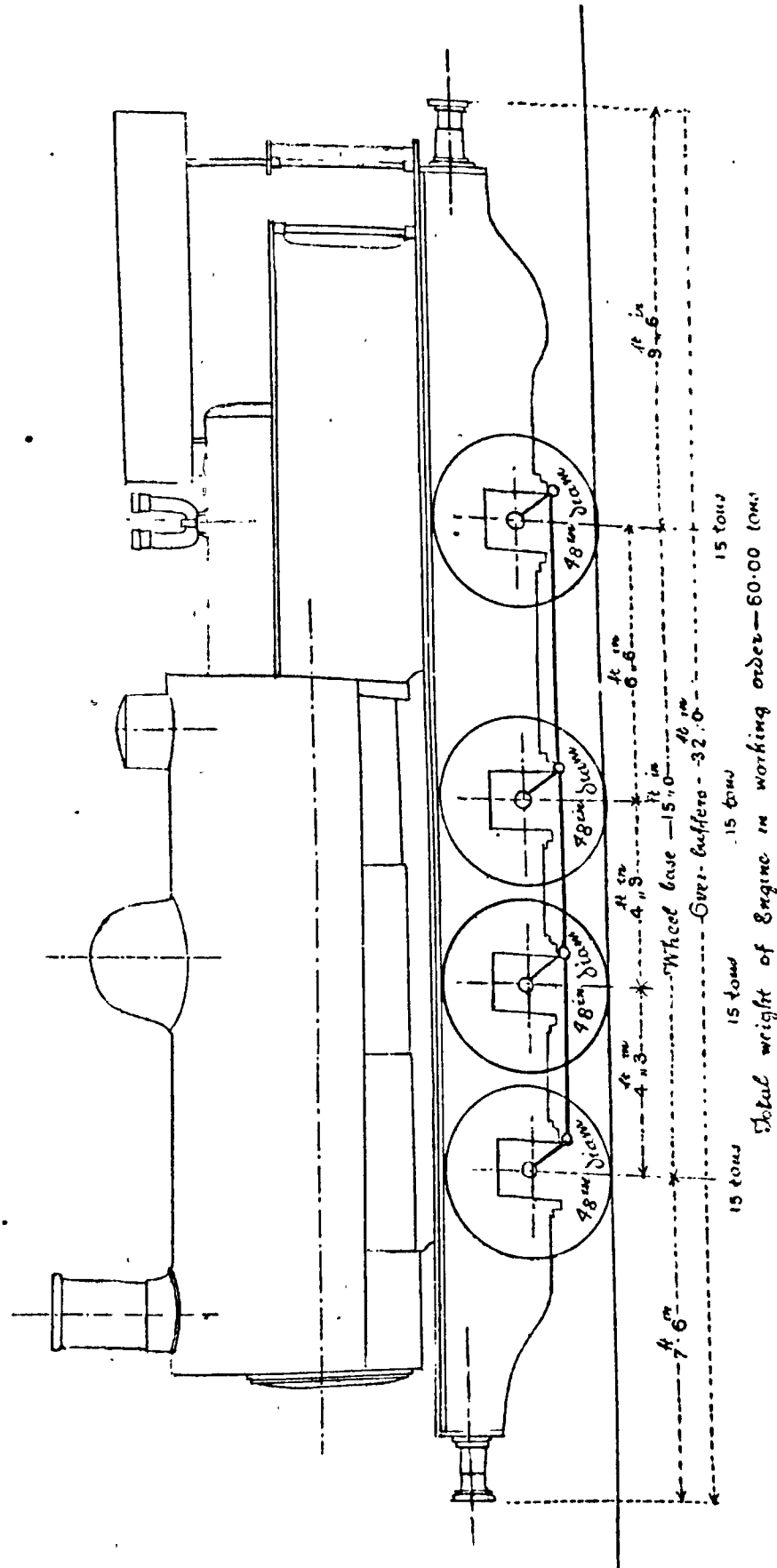
N.B.—The weights given above are the maximum permissible under any circumstances, with engine in working order and full load of fuel and water.

NOTE.—The maximum effect measured in bridge stresses permissible under this specification is practically the same both for tank engines and for tender engines. In designing a 'type engine' to facilitate the determination of bridge stresses under this specification it is therefore immaterial whether a tank engine or a tender engine be represented, and a tank engine has been adopted for this purpose as being more convenient—(See Appendix B).

5 ft. 6 in. GAUGE.

TYPE ENGINE. FOR DETERMINATION OF BRIDGE STRESSES.

Scale— $\frac{1}{4}$ inch to 1 foot.



NOTE.—It is to be understood that the 'type engine' illustrated in this diagram does not represent any actual engine, but an imaginary engine designed so as to produce on a bridge the most severe effect practicable, subject to the provisions of the specification given in Standard dimensions under the head 'locomotive engines,' for which see Appendix A.

APPENDIX B.

METRE GAUGE.

WORKING STRESS FOR RAILWAY BRIDGES.

LOCOMOTIVE ENGINES.

APPENDIX A.

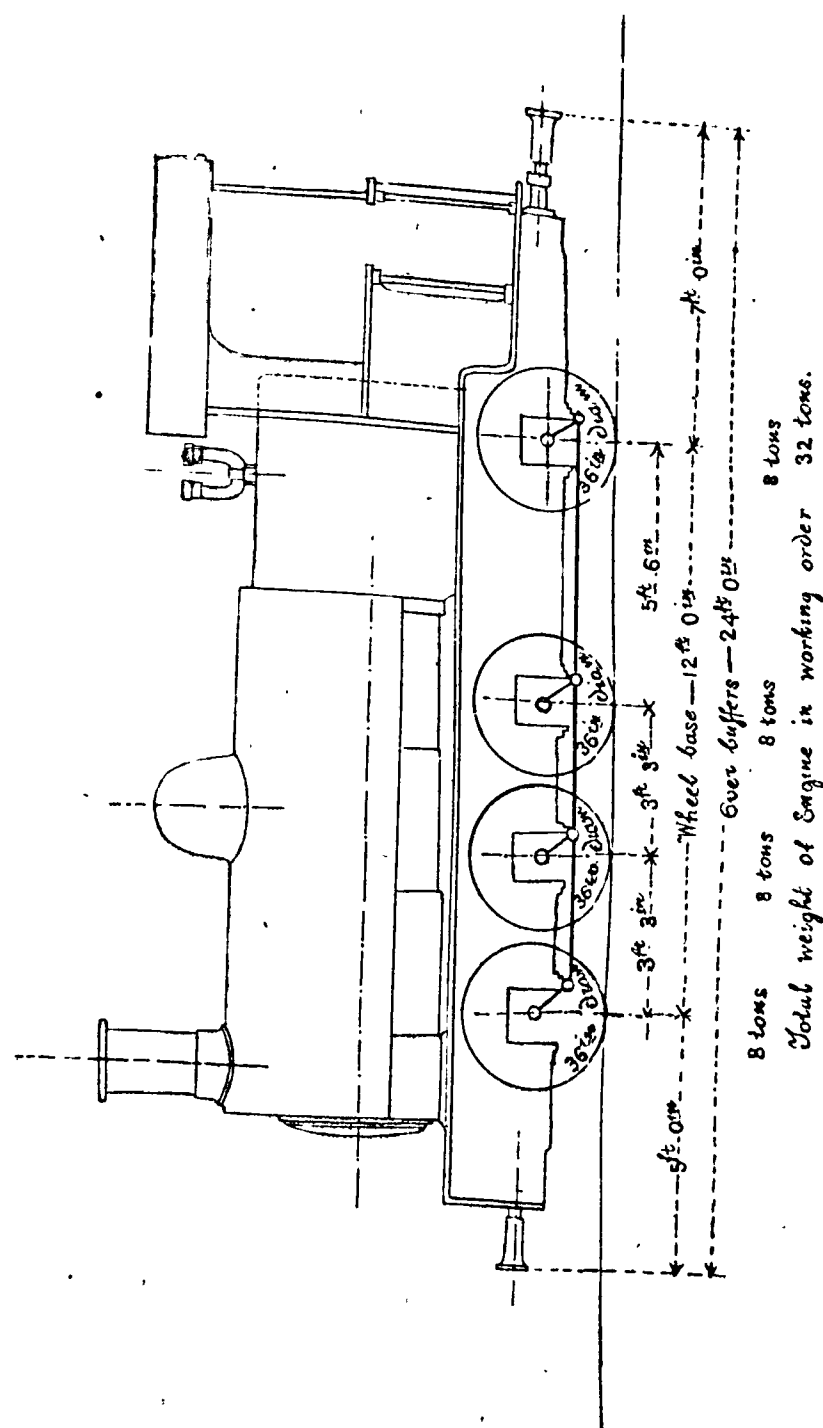
Extract from Government of India 'Standard dimensions' for the metre gauge, showing permissible wheel loads and other particulars for locomotive engines.

	Ordinary Standard.
Weight on a pair of wheels—	Tons.
Maximum under any circumstances	8
Maximum per foot of diameter	2.67
Weight per foot run of wheel base—	
Maximum for either engine or tender separately in the case of tender engines	2.00
Maximum for tank engines	2.67
Weight per foot run over buffers—	
Maximum for engine and tender together in the case of tender engines	1.125
Maximum for tank engines	1.333
Total gross weight—	
Maximum for engine and tender together in the case of tender engines	46
Maximum for tank engines	32

N.B.—The weights given above are the maximum permissible under any circumstances, with engine in working order and full load of fuel and water.

NOTE.—The maximum effect measured in bridge stresses permissible under this specification is practically the same both for tank engines and for tender engines. In designing a 'type engine' to facilitate the determination of bridge stresses under this specification it is therefore immaterial whether a tank engine or a tender engine be represented, and a tank engine has been adopted for this purpose as being more convenient.—(See Appendix B).

NOTE.—It is to be understood that the 'Type engine' illustrated in this diagram does not represent any actual engine, but an imaginary engine designed so as to produce on a bridge the most severe effect practicable, subject to the provisions of the specification given in Standard dimensions under the head 'locomotive engines,' for which see Appendix A.



G. I. C. P. O. —No. 631 P. W. D.—14-12-92.—800

SERIAL
No. 13

No. 551 R. C.

GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
RAILWAY CONSTRUCTION.

To
THE SENIOR GOVERNMENT INSPECTORS OF RAILWAYS, MADRAS, BOMBAY,
CALCUTTA, LUCKNOW, CENTRAL DIVISION, AND ASSAM.

Simla, the 1st June 1893.

SIR,

WITH reference to paragraph 4 of Government of India letter No. 1369-R.C., dated 13th December 1892, I am directed to inform you that the draft rules for determining the maximum permissible stress and working load for railway bridges of wrought-iron or steel have been finally approved by the Government of India.

2. I am accordingly to request that these rules may form the basis of the investigations now being made, in accordance with the orders conveyed in the circular quoted above, in order to ascertain whether the girders of the bridges within your circle of inspection are of sufficient strength for the loads they are at present required to carry.

I have the honour to be,

SIR,

Your most obedient Servant,

J. B. Herbert

Under Secretary.

Documents accompanying.
Nil

To
*The Senior Government Inspector
of Railways,
Madras.*

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Sept. 3. 10. 93

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No. 1255R 26 Sept 93

of rules

Copy forwarded
to the Agents, Andromeda
South Indian & Mysore
Gd. S. Railways.

Yours

$\frac{16}{9}$ E.R.

Set of copy to my title
circulate to our Regs.

Yours

$\frac{7}{1}$

J.C. 3.1

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