



Requirements for Passenger Lines and Recommendations for Goods Lines

of the Minister of Transport in regard to

Railway Construction and Operation

- A. Documents to be Furnished*
- B. Requirements and Recommendations*
- C. Modes of Working Single Lines*
- D. Appendices*

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**A.—DOCUMENTS TO BE SENT TO THE SECRETARY,
MINISTRY OF TRANSPORT.**

NOTE.—*The detailed information asked for under paragraph X, clauses 5, 7 and 8, should, whenever possible, without causing undue delay to the works, be forwarded in time to permit of examination by the Minister of Transport before works under this head are commenced. Before a statutory second notice is forwarded, the tabular statements under paragraphs I to IX inclusive and the information under paragraph X, clauses 1 to 4 and 6, will be required.*

I. Copies of the Parliamentary Plans and Sections with any deviations which may have been made during construction marked thereon in red; and with the corrections in the distances, levels, inclinations, sections of ground, and radii of curves, rendered necessary by such deviations, also marked in red. The positions of the several stations to be given also. 5

II. A table of Gradients and level portions.

III. A table of Curves and straight portions.

IV. A table of Cuttings and Embankments.

V. A table of all Bridges, either under or over the railway.

VI. A table of Viaducts carrying the railway.

VII. A table of all Level Crossings of public, occupation, private or bridle roads, and footways.

VIII. A table of Tunnels.

IX. A table of Aqueducts and Culverts, 5 feet or more in diameter or width. 15

According to the prescribed forms.* The situations of works, &c., should be described by reference to a fixed point. 10

X. Detailed information under the following heads:—

1st. *Permanent Way*.—Whether the line be double or single or partly double and partly single; the distances from the fixed point adopted in the tables, at which the single portions, if any, commence and terminate—or, for a single line, 20 at which the passing places or the sidings commence and terminate; the width at formation level; the guage; the space between the lines, and between the lines and sidings; the description (with a diagram section if necessary) of rails employed, their length and weight per yard; the description and weight of chairs, where these are employed; the mode of fixing and securing rails; the fastenings 25 adopted for the joints of rails; the description of sleepers, with their smallest and average scantling and length, their distances from centre to centre if transverse, and, if longitudinal, the details of any ties by which they are connected; the nature of the ballast, and its depth below the under surface of the sleepers.

2nd. *Fences*.—Description of fences adopted for the line, giving, in the 30 case of post and rail fencing, the height of the top rail, and the distance between posts; and in the case of wire fencing, the height, number of wires, distance between supports, and means of straining.

3rd. *Drainage*.—If, on any part of the line, the drainage has been attended with peculiar difficulty, details should be given. 35

4th. *Stations*.—Their names, and their distances from the fixed point; the gradients on which they are situated and approached; and the length and height of the platforms.

5th. *Width of Line*.—Minimum Clearances. The minimum lateral and overhead clearances to be shown by means of scaled diagrams, for single and 40 double lines respectively, giving the outlines of minimum structural and maximum loading gauges. Separate diagrams will be required in respect of clearances:— (a) inside station limits, (b) outside station limits, and (c) tunnels.

6th. *Bridges and Viaducts*.—Drawings in detail of all bridges and viaducts, either over or under the railway (other than those which are merely 45 duplicates in all respects), accompanied by such diagrams, stress sheets, calculations, &c., as may be necessary to enable the sufficiency of the design in detail to

* These will be supplied on application.

be examined. The weight of, and the total dead and live loads on each main girder, to be stated on the drawings.

7th. *Plans and Sections of the Stations, Platforms, Approaches, &c.*

8th. *Plans or Dimensioned Diagrams of the Signalling Arrangements at*
5 *all junctions, stations, block posts, &c.*

B.—REQUIREMENTS AND RECOMMENDATIONS.

NOTE.—*These apply to construction or reconstruction and alterations or additions. It will be seen that references are made in the text to the possibility of relaxation to meet individual cases. It should also be noted that, in order to*
10 *secure economy, with due regard to safety, when no references to relaxation are made, these Requirements may be modified at the discretion of the Minister of Transport, having regard to such special circumstances as may be submitted for consideration in each case. Standardisation of signalling and block working, &c., principles is also desirable. With these ends in view, it will therefore be*
15 *desirable to submit, whenever practicable, plans of works, for which approval is required, before they are commenced.*

Attention is drawn to paragraph 34 and Appendix IV., which deal with the applicability of these Requirements to Light Railways and lines of local interest.

20

BLOCK TELEGRAPH.

1. Apparatus to be installed for ensuring, by means of the Block Telegraph system, or by other approved method, *e.g.*, automatic signalling, an adequate interval of space between following trains, and, in the case of junctions, between converging or crossing trains.

25 In the case of single lines, or sections of single lines, worked by one engine or motor vehicle (or two or more such engines or vehicles coupled together) carrying a staff, no such apparatus will be required.

On lines used purely for goods or mineral traffic, some other approved method of working may be substituted for Block Telegraph.

30 On passenger roads, exemption from block working in special conditions may be granted when essential for traffic purposes.

SIGNALS.

2. In the interests of economy, and to avoid confusion, the number of signals provided, and their height, should be limited to what is actually necessary
35 for safety and traffic purposes.

Up and down Distant signals for each block post, to be provided on all running lines which have two-position Stop signals. One Distant signal in each direction, with the necessary control from each signal-box, is sufficient for a number of block posts closely grouped together, unless there are good reasons to
40 the contrary.

At diverging junctions, one Distant signal only should be provided, worked for the junction line over which the highest speed is permissible, unless in exceptional circumstances more are essential.

Where special circumstances, *e.g.*, permanent speed restriction, justify the
45 adoption of an unworked signal, it should be secured in the warning position and not coupled up or duplicated for directing purposes.

The interval between a Distant signal and the first Stop signal to which it applies must be such that a train in proximity to the former, and moving at the highest authorised speed, can be stopped before passing the latter.

50 Stop signals to be provided for each up and down line at all block posts. At diverging junctions, a separate running signal will be necessary for each direction of movement. Where outer and inner Stop signals are provided on the approach to diverging junctions, it will not be necessary to give the full route indication at the former which is given at the latter.

At stations with a number of diverging lines, one signal with indicating apparatus for each approach line should, as a general rule, be provided instead of separate signals. When, however, there are through fast lines, a separate arm should be provided for each. On passenger lines, all connections within yard limits to be under the protection of Distant and Stop signals. 5

3. All signals, as a rule, to be immediately on the left of, or vertically over, the line to which they apply. At diverging junctions, bracket signals are preferred to signals carried on separate posts, unless there are reasons to the contrary.

In the case of shunting signals, where more than one are necessary, direction may be indicated by carrying them vertically one below the other, in which case 10 the top signal will apply to the line on the extreme left, the second signal to the line next in order from the left, and so on.

Semaphore Distant signals to be distinguished from Stop signals during daylight by Yellow-coloured arms, with notches cut out of the ends. They must be placed below, and be controlled by, Stop signals, if these are carried on the same 15 post and applicable to the same direction. A Distant signal placed under a Stop signal of the box in rear must unless the circumstances are exceptional, be repeated under all Stop signals in advance of that signal which are worked from that box, with the necessary additional control by such signals.

Signals for shunting movements should be readily distinguishable from 20 running signals. They should therefore be placed as close to the ground as the circumstances permit, and should be of the miniature arm or other approved type, with small lights.

The facing side of the arms of all semaphores (including miniature), and the face of disc signals to be painted to accord with the colour of the light exhibited 25 in the Danger or Caution position.

A special type of shunting signal for wrong line movement is not considered necessary. In such cases where it is not possible to turn the movement in the right direction on to a running line by reversing a cross-over or on to a siding by reversing the points, an indication, visible by night and day, of the limit of such 30 movement will meet the case.

With semaphore signalling, indications for "calling-on" movements to be given by a small arm carried under the relative Stop arm. By night, a White light to be shown in the normal position, and the light authorising the "calling-on" movement to be Green. "Calling-on" signals to be used only for the specific 35 purpose of indicating to the driver, either that the line between the "calling-on" signal and the next Stop signal (or buffer stop, when there is no Stop signal in advance) is occupied, or that he is required to stop for instructions at the signal box ahead. The "calling-on" signal should not therefore be capable of being worked at the same time as the relative Stop signal. 40

Stop signals when working automatically under the "Stop and Proceed" regulation should be distinguished by the letter "A." In the case of controlled signals when working automatically the letter "A" should be visible both by night and by day, and should be obscured when the "Stop and Proceed" regulation does not apply. 45

For two-position semaphore signals, the arm indication to be horizontal for Danger, and 45 degrees for Clear.

Light signals of an approved type should be used, in lieu of semaphores, for three or more aspect signalling. They may also be used for two aspect signalling. 50

Signals to be so designed as to give a Danger indication in the event of any failure of the mechanism which operates them.

4. Front lights of all running signals to be Red for Danger, Yellow for Caution (including the warning position of Distant signals), and Green for Clear. These colours, in each case, to be within the approved standards. White to be 55 used for the back lights of signals.

With semaphore signalling, back lights, visible only when signals are at Danger, and no larger than actually necessary, to be provided when the signalman cannot see the front light of any signal which he works, the arm of which is visible by day. Back lights should be provided for all ground signals. 60

For two-position shunting signals, the normal light indication may be either Red or Yellow. The Red light to be used only when it is necessary to indicate that the signal is not to be passed without special permission, unless it is in the Clear position. In other cases Yellow to be used. In the case of shunt ahead signals, etc., carried under running arms, the lights used to be the same as those 65 for "calling-on" signals, with lettering as necessary.

The arms of all Stop signals, and the Danger or " on " aspect exhibited by all light signals, which cannot readily be seen by the signal man, and the arms of all Distant signals, to be repeated in the signal-box from which they are worked. It is desirable that the lights of all semaphore Stop and Distant signals upon 5 important lines with high speed traffic, should be repeated, unless either the front or back lights can readily be seen from an adjacent signal-box.

To prevent confusion with signal lights, the use of coloured lamps for engine head lights or other purposes should be avoided. Red to be used for tail lights.

A Red light to be used by night to define the position of buffer stops at the 10 termination of platform arrival lines.

5. All worked signals, except where necessary at level crossings, should, as a rule, be dispensed with under the following conditions :—

On single lines—

15 (a) At all stations and siding connections upon a line worked by one engine or motor vehicle (or two or more such engines or vehicles coupled together) carrying a staff, when all points are locked by such staff.

(b) At any intermediate siding connection upon a line worked under the train staff and ticket system, or under the electric token system, where the points are locked by the train staff or electric token.

20 In special conditions, signals may also be dispensed with at crossing loops upon a line worked under the train staff and ticket system, if the loop points are locked by the relevant staff.

25 (c) At intermediate stations which are not token stations, upon a line worked under an electric token system; sidings, if any, being locked as in (b).

On double lines—

30 (a) At an intermediate siding connection, either where " lock and block " or other similar approved apparatus is in use, or where the points are mechanically or electrically controlled from one or both of the adjacent signal-boxes, and the relative running signals suitably interlocked.

(b) At stations which are not block posts, where there are no connections.

POINTS.

6. Points to be so situated that movements over them shall be within view 35 of the signal-box from which they are worked, unless an approved alternative for direct vision by the signaller, *e.g.*, track circuited diagram, is provided.

The limit of distance from levers working points to be 350 yards, unless the points are power worked and occupation of the lines is electrically indicated in the signal-box, in which case the distance may be indefinitely extended.

40 All points to be fitted with not less than two stretchers. Rodding, or other approved method, is to be used throughout for the mechanical working of all points, and also for bolting them when required. In certain conditions the use of unworked trailing points will be permitted.

45 Facing points on passenger lines, and all points commonly used in the facing direction by passenger trains, to be fitted :—

50 (a) With bolt-lock through a third stretcher; and with locking-bar, or some other approved device. The operation of the bolt-lock must depend upon the correct movement of the locking-bar where it is used. The length of locking-bars to exceed the greatest interval between any two adjacent axles likely to be used on the line.

55 Where approach track circuiting is used in substitution for the locking-bar at power-worked facing points, the controlling track should, wherever possible, be of sufficient length, having regard to speed of traffic and time taken to operate the points, to ensure that, if the point lever is worked immediately before the track circuit is occupied, the points shall have completed their movement before the train reaches them.

(b) With stock rail gauge tie.

(c) With means for detecting the position of each switch, as well as the bolt-lock by the relative signals.

60 It is desirable that—

(i) All trailing points used in the facing direction for shunting movements should be detected with the relative signals. Single switch detection for each direction of movement will be accepted in such instances.

65 (ii) On goods lines, used exclusively for running movements, facing points should be equipped as on passenger lines.

SIGNAL-BOXES AND INTERLOCKING.

7. The levers working points and signals to be brought close together in a signal-box, or on a properly constructed stage. The signal-box to be sufficiently commodious to allow the signalman to have free access where necessary to windows. It should be provided with a clock, and with up and down three-position block instruments for signalling trains on each line of rails. The point levers and signal levers to be so placed in the box that the signalman, when working them, shall have a thoroughly good view of the railway; and the box itself to be so situated, elevated and constructed as to enable the signalman to get the best possible view of all the operations for which he is responsible. Lights in the signal-box to be so arranged as not to be mistakable for fixed signals. Telephone communication between signal-boxes is desirable. 5

Adequate arrangements to be made where necessary for reminding the signalman of vehicles which are standing within his control. In the case of passenger lines with high speed traffic, or where light engine, crossing, &c., movements are frequent, these arrangements should preferably be automatic when Stop signals are at a considerable distance from the box, or the signalman's view is likely to be obstructed. 15

8. Point and signal levers to be so interlocked that the signalman shall be unable to clear a fixed signal for the movement of a train, until after he has set the points in the proper position for it to pass, and bolted them as necessary, that it shall not be possible for him to clear at one and the same time any two fixed signals, which may lead to a collision between two trains, and that, after having cleared the signals to allow a train to pass, he shall not be able to move any points connected with, or leading to, the line on which the train is moving until the signal is replaced. Points also, where necessary, to be so interlocked as to avoid the risk of a collision. 20

In the case of signals situated at a distance from facing points, some form of locking or device may be called for to ensure that, after the signal has been passed, it shall not be possible to move the facing points until the whole of the train has cleared them. 30

Levers operating Stop signals, which are next in advance of trailing points, operated from the same box, when worked, to lock such point levers in either position, unless this locking will unduly interfere with, and the interval between the relative signals and points is adequate for, traffic movements. 35

Distant signal levers must be so interlocked that the signals cannot give a Clear indication when any of the relative Stop signals are at Danger.

Electrical locking may be necessary in certain conditions between block instruments, or token instruments, and the levers operating points or signals.

Interlocking between the up and down token instruments may also be necessary on a single line where there is a block post which is not a passing place. 40

With track circuit in use for reminding a signalman of vehicles standing within his control, the occupation of the track should be shown by an indicator in the box, and should, when necessary, electrically lock the running signal, or signals, in rear leading on to the same line; or alternatively control the block instrument. 45

With automatic and controlled automatic signals and continuous track circuiting, the occupation by a vehicle of any section of track circuit should return to, and hold at, danger a sufficient number of signals in rear to provide an adequate interval between following trains. The occupation of any track circuited section of line may also be required to lock electrically, as necessary, in one or both positions, points on or crossing over, that section. 50

SIDINGS AND SAFETY POINTS.

9. Sidings to be so arranged that shunting operations upon them shall involve the least possible use of, or obstruction to, running lines. The possibility for having in the future to extend passenger platforms should not be lost sight of in designing the layout of stations. 55

Safety points to be provided upon goods and mineral lines and sidings, at their junctions with passenger lines, with the points normally set against the passenger lines and interlocked with the signals. 60

Facing safety points, with or without an overrun or sand drag, may also, in default of other acceptable arrangements, be necessary :—

- 5 (a) On single lines, at crossing places, where an adequate interval of space is not provided between the Stop signal controlling the approach to the loop and the fouling point of the loop lines at the other end; or where the line is worked on any non-token system.
- (b) On bay and loop platform lines, as a protection to traffic on the through lines.
- (c) On approaches to opening bridge spans.

10

JUNCTIONS, &c.

10. Where it is difficult for a signalman to estimate clearance, it may be necessary to provide bars, or other approved device, in order to define the fouling points of junctions, siding connections, crossings, &c.

STATIONS.

15 11. The lines of railway leading to passenger platforms to be arranged so that the platform roads may be entered in the normal direction of movement without reversing; and so that, in the case of double lines, or of passing places for passenger trains on single lines, each line shall have its own platform.

20 Curvature of platform lines and of station yards generally to be avoided as far as possible.

At terminal stations, a double line of railway must not, as a rule, end as a single line.

25 12. Platforms to be continuous, and of sufficient length to accommodate the longest passenger trains using them. In layouts of passenger stations connections with the platform lines should, as a rule, be clear of the platforms. This does not apply to mid-way scissors or other connections in stations where platforms are long enough to accommodate two trains.

30 The minimum clear width of any platform throughout its length to be 6 feet. At important stations the width to be not less than 12 feet, except for short distances at either end in any case of difficulty. In the case of island platforms, the minimum width for an adequate distance on each side of the centre of its length to be 12 feet. The descent at the ends of platforms to be by ramps and not by steps.

35 Columns for the support of roofs, and other fixed works, not to be less than 6 feet clear from the edge of platforms. A general clear headway of not less than 8 feet to be provided over platforms. The height of platforms above rail level may vary according to traffic and other conditions; as a rule, it should be 3 feet; but in no case less than 2 feet 9 inches or more than 3 feet at permanent stations, without special approval.

40 The edges of the platforms to overhang not less than 12 inches, and the recess so formed to be kept clear as far as possible of permanent obstruction. A special recess may be necessary for the accommodation of signal wires, cables, &c. The interval between the edges of platforms and the footboards of carriages to be as small as practicable.

45 Waiting rooms or shelters, and conveniences, to be provided at junction stations, and elsewhere as may be necessary.

Names of stations to be shown on boards, and on the platform lamps. Platforms must be adequately lighted, and fenced when necessary.

50 In the case of halts, the above-mentioned requirements in respect of clear width of platform, lighting, and fencing as necessary, will apply; together with such of the other requirements as may be considered necessary in each case.

55 13. On viaducts or bridges under the railway, in the vicinity of stations or stop signals at the approach to stations, a fence on each side of sufficient height to be provided, unless adequate protection is afforded by the structure, to prevent passengers, who may by mistake in the dark leave the carriages, from falling from the viaduct or bridge.

60 14. Footbridges or subways to be provided for passengers to cross the railway at all exchange and other important stations. They may also be required at all stations where there is not public access to, and booking facilities on, both platforms, and when there is a frequent service of express trains. Luggage lifts, as a rule, to be provided at important stations, where there is no subway with inclined approach.

Staircases or inclined approaches forming the main communication to or from platforms to be at no point narrower than at the top, and the available width to be in no case contracted by any erection or fixed obstruction below the top. They must be of ample width at all stations, with special regard to the possibility of crowding, and barriers at the top may be required. 5

Where there are gates also at the bottom, means of communication between the attendants at the top and bottom may be necessary. The actual position, the type, and the direction of movement, of gates will be for consideration in each case.

On underground and tube railways special regard to be given to the prevention of overcrowding of passengers on their way to or from platforms by the control of lifts, emergency staircases, &c. 10

The steps of staircases to be never less than 11 inches in the tread, nor more than 7 inches in the rise, and midway landings to be provided where the height exceeds approximately 10 feet. 15

Efficient hand-rails to be provided on staircases and inclined passenger footways. The slope of inclined footways and ramps not to exceed 1 in 8.

A clock to be provided at every station, in some conspicuous position visible from the platforms or concourse.

EMERGENCY APPLIANCES AND FIRE PRECAUTIONS. 20

15.—(a) It is desirable that as a general rule passenger trains, whether steam or electrically operated, should be adequately supplied with the following emergency appliances:—

(i) Ambulance First Aid requisites.

(ii) Set of Salvage Tools. 25

(iii) Fire Extinguishers, Sand for electrically operated trains, &c.

Some emergency equipment may also be found necessary at stations, yards, and isolated signal-boxes.

(b) It is desirable that all new and reconstructed passenger stock be electrically lighted. 30

(c) Special precautions to be taken against danger of fire on electrically operated railways, *vide* Appendix I.

GRADIENTS.

16. It is desirable to avoid constructing a station on, or providing a siding in connection with a line which is laid upon a gradient steeper than 1 in 260. 35

In the case of steeper gradients, either at a station or siding connection, or within a section between two block posts where the level of one is appreciably lower than that of the other, danger may arise:—

(a) In the case of engines being overpowered by their load;

(b) From vehicles running backwards, in the case of trains, which 40 have become divided; and

(c) From vehicles running away after having been uncoupled on a running line.

On double lines, one or both of the following arrangements may then become necessary:— 45

(i) The provision of worked facing safety points, with or without a sand drag, when a special arrangement to utilise an existing facing siding connection is not practicable.

(ii) The provision of a single or double self-acting throw-off switch a full train's length in rear of the first Stop signal of the higher block 50 post on the ascending line, when a special arrangement to utilise an existing trailing connection at the lower block post is not practicable.

On single lines, except where it is possible to work the traffic with an engine at the lower end of an unfitted train, one or more of the under-mentioned measures may be necessary:— 55

(i) The provision of worked safety points or sand drag, facing the normal direction of descending traffic in a suitable position in the loop at one or both of the block posts, where a suitable arrangement to utilise an existing facing siding connection is not practicable.

(ii) The provision of trailing safety points at the lower end of either 60 an existing or specially constructed loop.

(iii) The provision of an additional siding, in which the whole of a train can be placed clear of the main line before shunting operations are commenced.

5 (iv) The provision of properly interlocked worked points, a sufficient distance from a siding connection, which can be set as a trap behind vehicles standing below that connection.

TURNTABLES.

17. Turntables, where no triangle is available, will be required at terminal stations and other necessary places, of sufficient diameter to enable the longest 10 tender engine likely to run on the line to be turned without being uncoupled.

Exceptions to this requirement will be on lines upon which the traffic is worked solely either by electric traction or by engines suitably fitted and protected for running in both directions, and on short journeys worked by tender engines when speeds are low.

15 All turntables to be adequately lighted. They should be kept at a safe distance from adjacent lines of rails, otherwise the turntable bolt must be interlocked in the signal lever frame.

BRIDGES AND VIADUCTS.

20 *"The following Requirements in respect of bridges and viaducts apply particularly to under-bridging, more especially to structures under 300-ft. span.*

"In the case of road bridges over a Railway, the Requirements should be followed where the circumstances are applicable."

18. *General.*—All bridges and viaducts to be constructed, or when reconstructed to be built, as a rule, to comply with the following general require- 25 ments :—

(a) It is desirable that bridges and viaducts should, when practicable, be wholly constructed in some form of masonry, brickwork, or concrete. In such cases they must have parapet walls on each side, not less than 4 feet 6 inches in height above rail level, and at least 18 inches thick up 30 to a height of 12 inches above rail level, or where wheel guards or raised check rails are provided in accordance with clause (d) of this Requirement, a railing 3 feet 6 inches high fixed upon a masonry, brickwork or concrete wall at least 18 inches thick to a height of 12 inches above rail level may be provided. Reinforced concrete parapet walls may be of less thickness.

35 (b) Special attention to be paid to the stability of high girder structures particularly those carrying a single line.

(c) A substantial railing, not less than 4 feet 6 inches in height above rail level, to be erected in the case of all steel and iron under-bridges and viaducts, unless the girders are themselves sufficiently high. In exposed 40 places, an efficient wind screen may be required if the design does not in itself provide protection.

(d) On all important bridges and viaducts, where necessary, substantial wheel guards to be fixed above the level of, and sufficiently close to, the rails to prevent derailment. Where approved, check rails at least 45 one inch above the level of the running rails may be used instead of wheel guards. The guards or rails to be extended a sufficient distance on the approach side of the bridge or viaduct, such extension to be below the level of the rails at its commencement.

(e) Facilities for inspection may be necessary.

50 (f) Cast-iron columns of small size must not be used for abutment or pier work in the case of high structures.

(g) All exposed structural timber work on bridges or viaducts to be protected from fire, or specially treated.

55 (h) Items to be taken into account in calculating stresses in the case of all bridges and viaducts to follow, as far as they are applicable, the provisions of Part 3 of the British Standard Specification No. 153 for Girder Bridges.

(i) In the case of girder bridges, the provisions of British Standard Specification No. 153, Parts 1, 2, 4 and 5, to be followed in respect of 60 materials, workmanship, details of construction and erection.

19. *Standard of Loading.*—In the case of all bridges and viaducts the conventional system of standard gauge loading shown in the addendum to the British Standard Specification No. 153 for Girder Bridges is recommended for adoption. A standard of 18 units represents approximately maximum existing 65 (1920) loading in accordance with the Railway Engineers' Association Curve.

To allow, however, for a possible increase of axle loads, a standard of 20 units is recommended for use in the case of all heavy main lines where a higher standard is adopted. Lower multiples of the unit will be acceptable in the case of lines constructed for lighter loading.

20.—*Permissible Stresses.*

(1) Masonry.—The working stress may be between one-quarter and one tenth of the ultimate crushing strength of the material, in accordance with the workmanship and the reliability tests made before construction.

(2) Reinforced Concrete.—It is desirable that specifications in respect of material, and the method of and notation for calculation, should follow some well-recognised practice, and be submitted in sufficient detail to permit of general examination.

It may be assumed that the modulus of elasticity of concrete remains constant within the limits of the working stress, and that the reinforcement takes up all tensile stress. The working stresses for steel and iron in tension to be as laid down in the British Standard Specification No. 153 for Girder Bridges.

It is desirable that concrete for bridge work should have an ultimate crushing strength of 2,400 lbs. per sq. inch; the tests to be with 6-inch cubes at 28 days. In no case should it be less than 2,000 lbs. per sq. inch. All cement to comply with the latest British Standard Specification.

Concrete in compression must not be subjected to a greater total equivalent static working load than one-fourth of the ultimate crushing strength.

An adequate period must be allowed before removing mouldings, casings, false work, &c., from reinforced concrete structures.

It is most important that an adequate thickness of concrete covering should be provided to all metal reinforcement.

(3) Timber.—The working stress to be not greater than one-fifth of the ultimate strength of the material used.

(4) Steel and iron.—The working stress to be as laid down in the British Standard Specification No. 153 for Girder Bridges. The Engineer responsible for any steel or iron structure to forward a statement of the tests to which the material has been subjected.

(5) Cast iron.—This material must not be used for the superstructure of underbridges. When it is used in an overbridge the working stress to be as laid down in Part 3 of the British Standard Specification No. 153 for Girder Bridges.

21. *Application of the Requirements to Existing Structures.*—The Requirements in regard to the calculation of stresses for new structures to apply also to any reconstruction of existing bridges.

PERMANENT-WAY.

22. British Standard Specifications and Sections for all details of permanent-way to be adopted, unless authority to the contrary is given. On lines on which the normal traffic is heavy and worked at high speed, the weight of new rails should not be less than 85 lbs. per yard, and, in the case of a chaired road, the common chairs should not weigh less than 45lb. each. On lines where traffic conditions are less severe, chairs weighing not less than 40 lbs. each may be used. The minimum length of rail, as a rule, to be 30 feet. On lines normally used for light traffic and moderate speeds, lower weights of rails and chairs may be used.

23. Chairs, if used, must be secured to the sleepers, at least partially, by metal bolts, screws, or spikes. With flat-bottom rails, or bridge rails, the fastenings at joints and at one or more intermediate places to consist of fang or other through bolts, and such rails, on curves with radii of 15 chains or less, to be tied to gauge by iron or steel ties at suitable intervals.

24. Check rails to be provided in curves where the radius is 10 chains or less. They may be necessary also in the case of flatter curves, if high speed is contemplated.

25. Fixed diamond crossings must not be flatter than 1 in 8 except in special circumstances. Movable diamond crossings may be at any angle and are to be treated as worked facing points.

STANDARD DIMENSIONS.—CLEARANCES.

26.—(1) *Structural Clearances.—New Lines.*

In the case of New Lines, after allowance has been made for curvature, super-elevation, and length of rolling stock, the standard static lateral clearance,

measured between the point of maximum over-all body width of the broadest stock likely to be used on the line and any standing work, including standards carrying overhead electrical equipment (other than passenger or loading platforms, bridge girders, or disc or miniature signals, up to a height of 3 feet from rail level),
 5 over the whole vertical height between rail level and the top of the highest carriage doors, to be as follows :—

(i) 2 feet 4 inches in respect of all structures. Special consideration to be paid to the position of cables, &c., or attachments of any description in tunnels and under bridges.

10 (ii) 2 feet in respect of all signal and lamp-posts, ladders, water columns, &c. In cases of special difficulty, where signal posts, &c., are placed between tracks with only 9 feet clear interval (*vide* para. 27), the minimum clearance of 18 inches from body-work is permissible.

15 Minimum lateral clearance of 3 inches to be provided between load gauge and platform coping, and also between load gauge and structures in the 6-foot way, below the level of 3 feet above rail level.

In sidings and at the entrance to all goods sheds, buildings, &c., into which vehicles work, the standard clearance of 2 feet 4 inches to be provided above the
 20 general level of the ballasting.

In the case of New Lines, having steam traction, or electric traction without overhead equipment on structures, after allowance has been made for curvature and super-elevation, the desirable standard overhead clearance, measured from the maximum load gauge likely to be used on the line, to be 12 inches.

25 In cases of special difficulty, this dimension may be reduced to a minimum of 6 inches, unless there is any possibility of future electrification on the overhead system, in which case it must not be less than 10 inches.

In the case of New Lines, having electric traction with overhead equipment, after allowance has been made for curvature and super-elevation, the desirable standard clearance, under any conditions likely to arise, to be as follows :—

30 (i) Between the underside of any live wire or conductor overhead and the maximum load gauge likely to be used on the line :—

(a) 3 feet in the open.

(b) 10 inches through tunnels and under bridges.

35 (ii) Between any part of the structure and the nearest point of any live wire or conductor overhead, 6 inches, after making allowance for any appreciable vertical movement of the live wire or conductor.

In the case of the electrification of existing lines, the last two dimensions may be reduced to 4 inches as absolute minima.

40 (iii) From rail level to overhead conductors at accommodation and public road level crossings, 18 feet; and 20 feet above rail level where there is a likelihood of men, in the conduct of their duties, having to stand on the top of engines or vehicles.

45 (iv) Between any part of the bow gear and any structure to be 3 inches as an absolute minimum, after full allowance has been made for lateral movement of the bow.

(2) *Structural Clearances.—Existing Railways.*

(i) Where structures are rebuilt, clearances to be provided for as given in para. (1).

50 (ii) When permanent alterations are proposed affecting—

(a) Lateral clearance, by increasing the interval between tracks or by introducing wider rolling stock;

(b) Overhead clearance, by alteration of the rail level or by the introduction of higher rolling stock;

55 (c) Overhead clearance, by the electrification of an existing line;

Unless the minimum dimensions and clearances specified for new lines can be provided or maintained, each case to be referred to the Ministry of Transport, so that it may be dealt with on merits, having regard to the expense involved in providing standard clearances.

60 (3) *Clearance between Trains.*

(i) On New Lines, the minimum lateral clearance on running tracks between vehicles of the greatest width likely to be used, to be 18 inches, measured at any point over all body-work. Having regard to super-elevation and the length and contour of rolling stock, the distance between tracks to be suitably increased on
 65 curves to provide this clearance at all points.

(ii) The above also applies to Reconstruction of or alteration to existing lines, where reasonably possible.

(iii) Where there is a minimum clearance of 18 inches between stock : door and commode handles, &c., must not project more than 3 inches beyond the maximum body dimension on each side. 5

(4) *General.*

(i) Where there are places at which the above-mentioned lateral and overhead clearances do not obtain, the existing clearances must not be reduced, nor must the length or number of such places be increased without approval.

(ii) The above-mentioned lateral and overhead clearances will not apply 10 in particular cases, *e.g.*, tube railways, where stock of a special type is used, and where suitable arrangements are made for the safety of men employed on maintenance and inspection work.

(iii) In respect of overhead telegraph, telephone, and stay wires crossing the railway, the minimum clearance, in the open, to be 20 feet above rail level. 15

INTERVALS BETWEEN LINES.

27.—(1) In all new construction, having regard to the lateral clearance conditions set forth above, the interval between adjacent straight lines, where there are two only, not to be less than 6 feet clear between the rails. If, however, the greatest overbody width of stock likely to be used will not permit of the 20 provision of the clearances named, this clear interval between two adjoining tracks to be increased as necessary.

(2) Where additional single running lines, or pairs of double lines are laid alongside existing main lines, a standard clear interval between rails of not less than 10 feet to be provided. 25

In the case of reconstruction, on existing railways where special difficulties exist, this dimension may be reduced to 9 feet.

(3) In new work, and also in reconstruction on existing railways (except when otherwise approved in cases of special difficulty), the clear interval between a running line and the nearest siding to be not less than 9 feet. Where wagon 30 examination or shunting operations are likely to be regularly performed by men upon sidings, this dimension should be increased to not less than 10 feet.

NOTE.—*Appendix II. illustrates the foregoing Requirements in respect of Clearances, &c. It also shows a desirable standard structure gauge which is recommended for adoption for New and Reconstructed lines.* 35

LEVEL CROSSINGS.

28.—(1) At all level crossings of public roads, gates, where they are prescribed, must be constructed completely to close alternately across the railway and across the road on each side of the crossing. They must not be hung so as to admit of being opened outwards towards the road. Stops to be provided 40 to keep them in either position.

In all cases where the normal position of gates is across the roadway, arrangements will be required to work them either from a signal-box, or by an attendant, for whom special accommodation may be necessary. Where the normal position of gates is across the railway, an attendant will be necessary, 45 unless the gates can be opened when required and closed by the trainmen.

At public road level crossings in or near populous places the gates to be either close-barred or covered with wire netting.

Red discs or targets for daylight and red lamps, one on each side of the crossing, for night, to be fixed on gates; the discs or targets, and lamps, accord- 50 ing to the position of the gates, to show toward the road; also towards the railway if there is no fixed Stop signal at the gates. One such disc or target and lamp to be fixed on the gates on each side of the crossing.

Fixed railway signals will not be required when, having regard to the traffic, gradients, &c., a sufficiently good view of the discs or lamps is obtainable 55 by enginemen of approaching trains to enable them to stop short of the gates when they are across the railway. When, however, the view obtainable by enginemen is insufficient for this purpose, and it is considered necessary to give additional protection beyond that furnished by the gate discs or lamps, a fixed

signal of the Distant signal type to be provided. The Distant signal may be either of the one-position unworkable type, when it is desired to give warning only of the proximity of the level crossing, or of the two-position worked type when information in respect of the actual position of the gates at the level crossing is conveyed. In the latter alternative the Distant signal must be interlocked with the gates.

At important level crossings, or where conditions require them, Stop as well as Distant signals interlocked with the gates will be necessary.

At all level crossings of public roads or footpaths a bridge or a subway for pedestrians may be required.

Attendants at level crossings provided with gates should, as a rule, receive warning by bell or otherwise of the approach of trains from either direction.

(2) At public road level crossings when gates are not prescribed and cattle guards may be used to prevent trespass upon the railway, speed reduction and whistle boards will be required at suitable distances on the railway on each side of the level crossing. Warning boards visible both by day and night will also be required on each public road and approach. It will be necessary to ensure that a good view of the railway line in each direction is obtainable from the road approaches to the level crossing by clearing or lowering obstructions to sight such as hedges, &c.

(3) For field, private and occupation road level crossings, single gates should be used. They should be hung so as to open away from the railway line.

29. Sidings connected with the main lines near a public road level crossing to be so placed that shunting may be carried on with as little interference as possible with the level crossing; and, as a rule, the points of the sidings to be not less than 100 yards from the crossing.

MILE POSTS, &c.

30. Mile, half-mile and quarter-mile posts, and gradient boards to be provided along the line.

REFUGES, &c.

31. Tunnels to be in all cases constructed with refuges for the safety of men working upon the line. On underbridges without parapets or similar structural protection, handrails to be provided. When the railway is on a long viaduct, or is enclosed by vertical cutting or retaining walls, refuges may also be required; but in such cases where clearance, allowing for suitable standing room, of not less than 5 feet from the outer edge of the running rail is available, refuges will not usually be necessary. All refuges to provide such clear headway as to permit of men standing upright therein, and must not be obstructed by signal wires, cables, point rods, gas and water mains, &c.

CONTINUOUS BRAKES.

32. Continuous brakes (in accordance with the order and schedules under the Regulation of Railways Act of 1889), complying with the following requirements, to be provided on all trains carrying passengers, viz. :—

(1) The brake must be instantaneous in action, and capable of being applied by the engine-driver and guards.

(2) The brake must be self-applying in the event of any failure in the continuity of its action.

(3) The brake must be capable of being applied to every vehicle of the train, whether carrying passengers or not.

(4) The brake must be in regular use in daily working.

(5) The materials of the brake must be of a durable character, and easily maintained and kept in order.

See Appendix III. for exceptions or modifications with respect to continuous brakes.

UNDERTAKINGS BY RAILWAY COMPANIES.

33. Any undertaking furnished by a railway company to be under the seal, and signed by the Chairman and Secretary of the Company.

LIGHT RAILWAYS.

34. In respect of Light Railways, or lines of local interest, each case will be considered as regards the applicability of the foregoing Requirements, on merits; having in view the gauge, volume of traffic, axle-loads, and speed limits. A general outline of some of the relevant variations and relaxations is given in Appendix IV.

C.—MODES OF WORKING SINGLE LINES.

In the case of a single passenger line, an undertaking must be sent to the Ministry of Transport, through the inspecting officer, to the effect that one of the following modes of working single lines will be adopted, namely:— 10

I. By train-staff and train-tickets in the mode described in the following rules, combined with the absolute block-telegraph system.

Rules for working the single lines between A, B, C, &c.

1. Either a train-staff or a train-ticket is to be carried with each engine or train to and fro, and for this purpose (one, two, or more) train-staffs and sets of train-tickets will be employed, *e.g.*:— 15

	<i>Colour of Staff and Ticket.</i>	<i>Form of Staff and Ticket.</i>	
One between A and B ...	Red	Square	
„ „ B and C ...	Blue	Round	20
„ &c. „ &c.	&c.	&c.	

2. No engine or train is to be permitted to leave or pass either of the staff-stations A, B, C, unless the staff for the portion of the line over which it is to travel is then at the station; and no engine-driver is on any account to leave or pass a staff-station without seeing such train-staff. 25

3. If no second engine or train is intended to follow, the staff is to be given to the engine-driver.

4. If other engines or trains are intended to follow before the staff can be returned, a train-ticket, stating “ staff following ” is to be given to the engine-driver of the first engine, and so on with any other except the last, the staff itself being sent with the last. After the staff has been sent away, no other engine or train in the same direction is to leave the staff-station, under any circumstances whatever, until the return of the staff. 30

5. The train-tickets are to be kept in a box fastened by an inside spring, and the key to open the box must be the train-staff, so that a ticket cannot be obtained without the train-staff. The removal of the train-staff must lock the box. 35

6. The train-staffs, the train-tickets, and the ticket-boxes are to be painted or printed in different colours, *e.g.*, red for the line between A and B, blue for that between B and C, &c., the inside springs and the keys on the staffs being so arranged that the red staff cannot open the blue box, or the blue staff the red box, and so forth. 40

7. The ticket boxes are to be kept in the signal boxes or in the booking offices at the staff stations. 45

8. The sole person authorised to receive from an engine-driver, or exhibit or deliver to an engine-driver the staff or ticket is either the station-master, the inspector, the signalman, or the person in charge for the time at a staff station.

9. In the event of an engine or train breaking down between two staff stations, the fireman or guard is to take the train-staff, if with the train, to the staff station in the direction whence assistance may be expected, so that the staff may be at that station on the arrival of an engine. Should the engine or train that fails be in possession of a train-ticket instead of the staff, assistance can only come from the station at which the train-staff has been left. The fireman will accompany any assisting engines to the place where the engine or train broke down. 50 55

II. By divided train-staff (without train-ticket) combined with the absolute block-telegraph system.

In this case one-half of the staff will be marked “ ticket ” and the other “ staff.” 60

The rules for working a single line in this case will be similar in all respects to those above quoted, with the exception that the " ticket " portion of the staff is substituted when required for a train-ticket. Each portion of the staff can be fitted with a key for controlling intermediate siding connections.

5 (N.B.—For light railway working, the block-telephone in lieu of the block-telegraph system will be accepted with either of the above-mentioned modes of working.)

10 III. With only one engine or motor vehicle, or two or more such engines or vehicles coupled together upon the single line or any section thereof at one and the same time.

Such engines or motor vehicles to carry the staff belonging to the line or section on which the train is travelling.

(N.B.—No ticket to be allowed under this mode of working.)

15 IV. By an electric token system, under which only one of the tokens applying to any section can be in use at the same time.

(N.B.—The approval of the Ministry of Transport to be obtained for the apparatus proposed to be used, and for the rules of working, which should be of a somewhat similar character to those detailed under mode of working, No. 1.)

V. By any other method approved by the Minister of Transport.

20 Ministry of Transport,
July, 1928.

D.—APPENDICES.

APPENDIX I.

REQUIREMENTS IN REGARD TO THE PRECAUTIONS TO BE TAKEN AGAINST DANGER
OF FIRE ON ELECTRICALLY-OPERATED RAILWAYS.

APPENDIX II.

DIAGRAM ILLUSTRATING LATERAL AND OVERHEAD CLEARANCES IN ACCORDANCE
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APPENDIX III.

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SECOND SCHEDULE, PART III.

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VARIATIONS FROM AND RELAXATIONS OF THE REQUIREMENTS IN THE CASE OF LIGHT
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APPENDIX I.

REQUIREMENTS IN REGARD TO THE PRECAUTIONS TO BE TAKEN AGAINST
DANGER OF FIRE ON ELECTRICALLY OPERATED RAILWAYS.

A.—GENERAL TO ALL ELECTRICALLY OPERATED RAILWAYS.

- 5 1. In the construction of rolling stock, either non-inflammable material, or wood of the hard wood variety only to be used in the vicinity of the electrical traction equipment. Interior fittings, panel seats, &c., to be, as far as possible, of incombustible material.
2. All cables to be insulated, as far as possible, with material which, in case of fire or fusing, will not give off dense smoke or fumes. The method of fixing and protecting cables and other
10 electrical equipment to be such as to minimise the possibility of fusing or arcing taking place.
3. Arrangements to be provided, by which the train-staff can, in emergency, satisfactorily remove, or cause to be removed, the electrical pressure from the section occupied. In tunnels exceeding half a mile in length where unfavourable conditions are likely to arise, apparatus may be called for whereby the railway staff can, from approved points, communicate by telephone or
15 other approved apparatus with the sub-station or stations concerned.
4. Platforms in underground stations, not to be constructed of wood, and woodwork to be eliminated, as far as possible, from signal-boxes, lifts, offices, &c. Soft or highly inflammable wood should not be used.
- Stacking of sleepers, or other inflammable material on the formation in proximity to running
20 lines in tunnel sections should be avoided.
5. Efficient appliances for extinguishing electrical fires to be provided as necessary, in addition to hydrants, hose, &c., for dealing with fires in station premises.

B.—ADDITIONAL REQUIREMENTS FOR SUBSURFACE RAILWAYS AND TUBE SECTIONS OF RAILWAYS.

6. In the construction of rolling stock for tube railways, metal throughout is preferred;
25 woodwork must be reduced to a minimum, and should be of the hard wood variety.
7. As far as practicable, main electric cables should not be carried through the train.
8. It is desirable that the arrangements set forth in Clause 3 should, on tube railways, be such that the train-staff can, in emergency, remove the electrical pressure from the section occupied, without leaving the train.
- 30 9. On the sections of railway in tube, sleepers or longitudinal timbers to be of hard wood, not creosoted, and to be laid in concrete preferably to ballast. Where the permanent-way construction does not furnish a surface suitable for emergency use as a footway by passengers, a satisfactory footway formed of incombustible material to be provided.
- On subsurface railways where ballast is used, it should be covered with a layer of gravel or
35 finely broken stone, free from dust and finished to a level surface flush with the top of the sleepers. No timber planks to be used to form a footway.
10. Tunnels of tube railways to be provided with emergency lights on circuit independent of the traction supply. The tunnel emergency lighting should preferably come into operation automatically, in the event of the removal of the traction supply pressure.
- 40 All station platforms, stairways, and passages on tube sections of railways to be conspicuously lighted, and provided as necessary with efficient illuminated exit and other notices. The lighting in these places, and in the illuminated exit and other important direction notices, to be supplied from two different sources, in the approximate proportion of 75 and 25 per cent. One of these sources must be an outside undertaking or other approved alternative. On subsurface railways,
45 the question of a dual source of supply for lighting stations, &c., will be for consideration.
11. In tube railway stock at least two lights not dependent upon, and to come into operation automatically in the event of the failure of, the main supply, should be provided in each carriage in addition to one hand lamp per vehicle.
- Conditions may make it desirable for emergency lighting arrangements to be provided in stock
50 worked on subsurface lines.
12. Separate entrances to, and exits from, each station platform to be provided. Consideration should be given to congestion on platforms, and to equality of loading throughout trains in fixing the position of platform entrances and exits.
13. On tube railways, adequate ventilating ways with fans, &c., as necessary, to be provided
55 from stations or tunnels to the surface.
14. On tube railways, means to be provided at both ends of all trains to enable passengers to alight from the cars in case of emergency.
15. Means to be provided for enabling drivers to put themselves into direct telephone communication with sub-stations, or adjacent railway stations, from any part of a tunnel on tube lines.

APPENDIX III.

EXTRACT FROM ORDER UNDER THE REGULATION OF RAILWAYS ACT, 1889

SECOND SCHEDULE—PART III.

EXCEPTIONS OR MODIFICATIONS WITH RESPECT TO CONTINUOUS BRAKES.

A.—PASSENGER TRAINS.

5

1. In passenger trains a proportion of vehicles may be run unbraked subject to the following conditions, namely:—

(a) That all such vehicles have continuous pipes of the pattern in use upon the trains with which they are running.

(b) That effective use can be made of the passenger communication device, if such vehicles carry passengers. 10

(c) That the proportion of such vehicles shall not exceed one in four in every passenger train running a distance not exceeding 10 miles without a stop.

(d) That the proportion of such vehicles shall not exceed one in six in every passenger train running a distance exceeding 10 miles without a stop. 15

Provided that for the purpose of conditions *a*, *b*, *c*, and *d*, the number of vehicles forming a train be counted as follows:—

Horse box, carriage truck, fish van, or other 4-wheeled vehicle

not carrying passengers as $\frac{1}{2}$ vehicle.

Coaching vehicles, 4 or 6-wheeled as 1 vehicle. 20

Coaching vehicles, 8 or 12-wheeled as 2 vehicles.

Tank engine, 4 or 6-wheeled-coupled as 2 vehicles.

Tender engine, 4-coupled as 3 vehicles.

Tender engine, 6 or 8-coupled as 4 vehicles.

2. Except as hereinafter provided the last vehicle of every passenger train shall be fitted with the continuous brake of the pattern in use upon the train. Provided that, where necessary to avoid delay in working, one vehicle only, not being a passenger-carrying vehicle, may be placed at the rear of any such train without being fitted with the continuous brake, or (notwithstanding anything hereinbefore contained) with the continuous pipe. 25

NOTE.—Grooms or attendants travelling in horse-boxes, &c., are not counted as passengers. 30

B.—MIXED TRAINS.

1. "Mixed" trains for the conveyance of goods and passengers in which the goods wagons are not required to have continuous brakes, may be run, subject to the following conditions, namely:—

(a) That the engine, tender, and passenger vehicles of such "mixed" trains shall be provided with continuous brakes worked from the engine; 35

(b) That the goods wagons shall be conveyed behind the passenger vehicles with brake-van, or brake-vans, in the proportion of one brake-van with a tare of 10 tons for every 10 wagons, or one brake-van with a tare of 13 or more tons for every 15 wagons, or one brake-van with a tare of 16 or more tons for every 20 wagons, or fractional parts of 10, 15, or 20 wagons respectively; 40

(c) That the total number of vehicles of all descriptions on any such "mixed" train shall not exceed 30; and

(d) That all such trains shall stop at stations, so as to avoid a longer run than 10 miles without stopping, but nothing in these Regulations shall require a stop to be made between two stations should the distance between them exceed 10 miles. 45

2. Upon lines where the maximum speed of trains is limited to 25 miles per hour, all trains may be "mixed."

Upon lines where no trains are booked to travel between stations at an average speed of more than 35 miles per hour, half of the total number of passenger trains may be "mixed." Authority to work a larger proportion of "mixed" trains must be obtained from the Minister of Transport. 50

Upon lines where trains are booked to travel between stations at an average speed exceeding 35 miles per hour, the like authority must be obtained before any "mixed" trains are run.

3. Trains for the conveyance of horses, cattle, or other stock, when vehicles are added for the conveyance of passengers, shall be subject to the same regulations and conditions as apply to "mixed" trains; provided, however, that for the purpose of this Part III., B, of the Second Schedule to this Order, drovers, grooms, or other persons travelling in charge of such stock shall not be deemed to be passengers. 55

A passenger vehicle provided for the special accommodation of persons travelling in charge of stock must, however, be marshalled next the engine, and be provided with the continuous brake worked from the engine. 60

4. When, in addition to one goods brake-van at the rear of a "mixed" train, a passenger brake vehicle is included as part of the continuously braked stock, it will not be necessary for a guard to ride in the passenger brake-vehicle. If the composition of the train necessitates a second (or third) goods brake-van, a second (or third) guard will be necessary, unless communication between the vans is such as to enable one guard to operate efficiently the hand-brakes on the vans. 65

NOTE.—The above Regulations do not apply to troop train traffic.

APPENDIX IV.

VARIATIONS FROM AND RELAXATIONS OF THE REQUIREMENTS IN THE CASE
OF LIGHT RAILWAYS OR LINES OF LOCAL INTEREST.

SECTION A is applicable as necessary.

5 SECTION B.—Para. 1. *Block Telegraph*.—An acceptable apparatus, where such is necessary at all, for providing an adequate interval of space between following trains will be some form of telephone instrument.

10 Paras. 2 to 5. *Signals*.—Home and starting signals only for each direction at stations on single lines which are staff or electric token posts will be necessary. Distant signals will not be necessary unless stop signals cannot be seen for a distance of a quarter of a mile. Distant signals in such circumstances may be of the unworked type.

15 Para. 6. *Points*.—An economical type of facing point lock, that is, one which enables the points, bolt lock, and locking bar (when used) to be worked by one lever, is recommended. A locking bar will not be required when the lever working the facing points is alongside them. Rodding for the mechanical operation of points may not be necessary.

Paras. 7 and 8. *Signal-boxes and Interlocking*.—A ground frame which need not have overhead cover, is acceptable in lieu of a signal box.

Para. 9. *Safety Points*.—Worked scotches or derailleurs may be used instead of safety points, where protection is necessary.

20 Paras. 11 and 12. *Stations*.—Platforms need not, unless traffic necessitates, be of greater width than 6 feet. If the carriages are of the tramway type, or have adequate steps attached to enable passengers to descend and ascend from the ground, raised platforms are not necessary.

25 Para. 16. *Gradients*.—This requirement is in general not applicable, but provision may be necessary to avert danger resulting from vehicles running back owing to the existence of steep gradients at stations or intermediate sidings.

Para. 17. *Turntables*.—Not as a rule applicable.

Paras. 18 to 21. *Bridges and Viaducts*.—Light standards of loading are permissible. Reductions for impact effect on account of speed are given in the B.S. Specification No. 153, Part III.

30 Paras. 22 and 23. *Permanent-way*.—Not generally applicable. The weight of rail in each case may be selected, having regard to speed, alignment, and general traffic conditions, from the range quoted in the following table:—

	Weight of Rail in Lbs. per Yard.	Maximum Axle Loading in Tons.
	30	4 to 6
35	35	5 to 7
	40	6 to 8
	45	7 to 9
	50	8 to 10
	55	9 to 11
40	60	11 to 13
	65	13 to 15
	70	15 to 17

Special cases will be considered on merits by the Minister of Transport.

Para. 24. *Check Rails*.—Minimum radius may be taken as eight chains for the standard gauge.

45 Para. 28. *Level Crossings*.—The arrangements are for consideration in each individual case.