

DIRECTOR OF S & T ENGINEERING.
WEST MIDLANDS PROJECTS GROUP.

DEPARTMENT OF TRANSPORT
REQUIREMENTS



DEPARTMENT OF TRANSPORT REQUIREMENTS

D.O.T REQUIREMENTS

1. Signalling
2. Points
3. Interlocking and Controls
4. Gradients
5. Construction Gauge

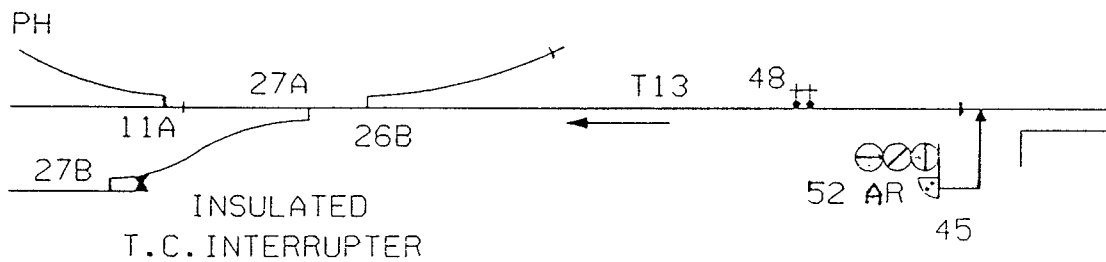
DEPARTMENT OF TRANSPORT REQUIREMENTS

Extract from railway construction and operation requirements for passenger lines and recommendations for goods lines (Department of Transport Requirements). This extract is not exhaustive.

1. **SIGNALLING**

1.1 Provision of Signals

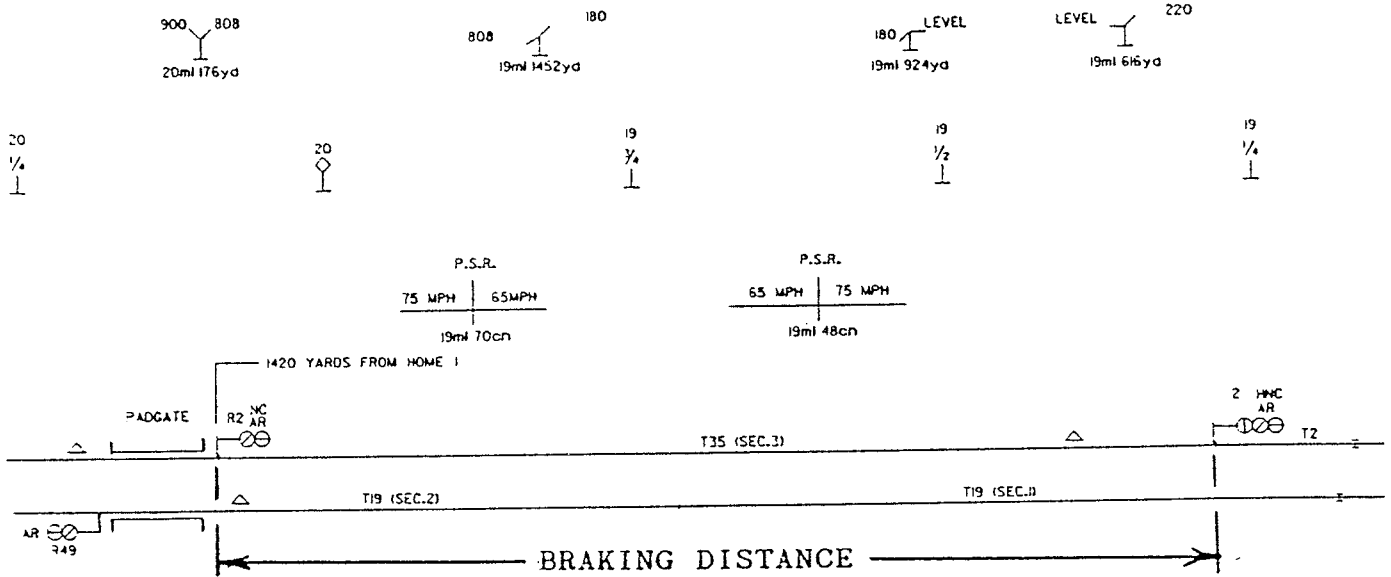
Signals should normally be situated on the left of the line to which they apply or vertically over it and failure of the operating mechanism should display the most restrictive aspect.



Stop and distant signals must be provided on all running lines at each block post, the number of stop signals required being determined by the number of connections and operating requirements at a particular block post.

DEPARTMENT OF TRANSPORT REQUIREMENTS

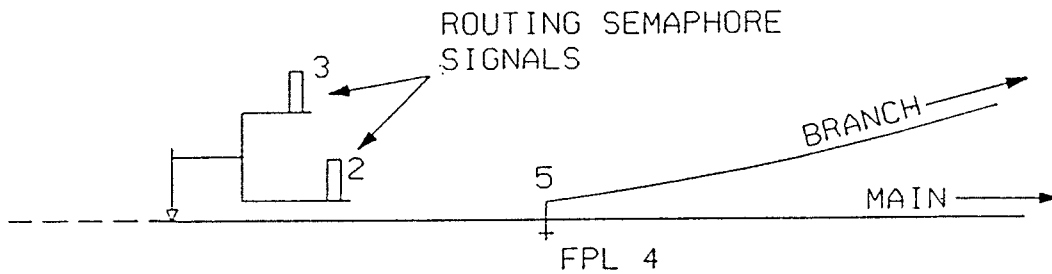
The Distant signal should be positioned at braking distance from the first stop signal (braking distance being dependent on speed of line and gradient).



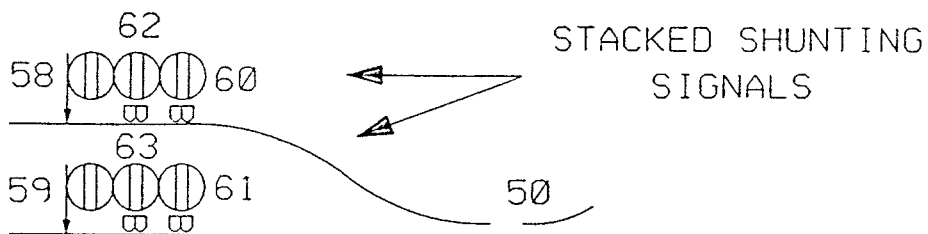
DEPARTMENT OF TRANSPORT REQUIREMENTS

1.2 Junction Signals (Semaphore)

At diverging junctions, signals should be arranged laterally to provide a separate signal for each route. The importance of the route being indicated by the height of the signal. This is usually achieved by mounting the signals on a bracket or gantry type structure.



Where the signal is an exit signal from a sidings and all moves are slow speed, it is permissible to arrange the signals vertically, the uppermost arm applying to the furthest to the left.



DEPARTMENT OF TRANSPORT REQUIREMENTS

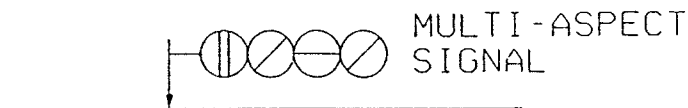
1.3 Colour Light Signals

(a) Consist of 2, 3 or 4 aspect signals and again should be positioned on the left of the line to which they apply and be at drivers' eye level.

<u>Aspect:</u>	<u>Indication:</u>
Red	Stop
Yellow	Caution, be prepared to stop at next signal.
Double Yellow (Displayed vertically)	Preliminary Caution - prepare to pass next signal at restricted speed and to find it at Yellow.
Green	Clear - next signal is at Green, Double Yellow, or Yellow.

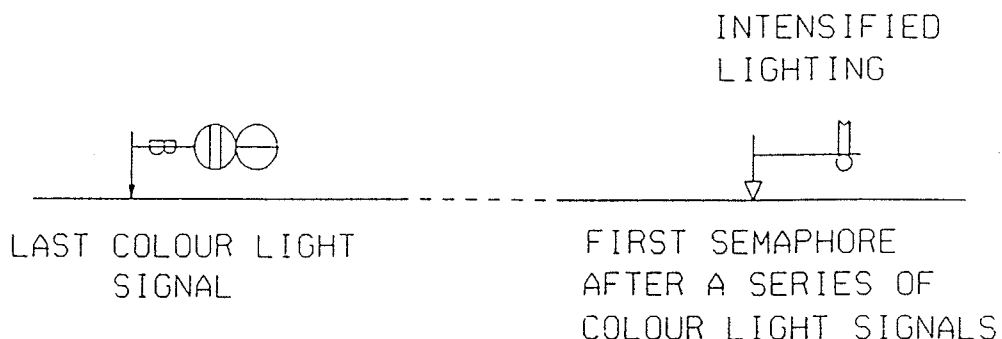
The clear aspect of the last running signal approaching terminal platform of station to be yellow. A subsidiary call-on (Position light) is to be used for a train entering a partly occupied platform line as for an engine joining its train. Controls to be provided to prevent admittance into a fully occupied platform line.

Suitable precautions to be taken with colour light signals of the multi-lens type to prevent phantom indications through reflection of external light. The units to be mounted vertically and upwards in the order Red, Yellow, Green. The additional Yellow on the four aspect unit to be mounted above the Green.



DEPARTMENT OF TRANSPORT REQUIREMENTS

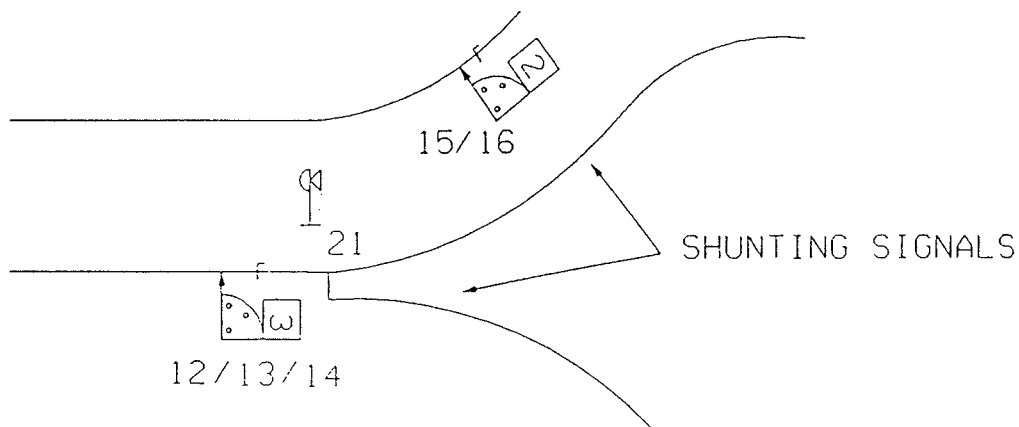
Special lighting arrangements may be required at the first semaphore signals encountered after passing a series of colour light signals.



(b) Shunting and Subsidiary Signals

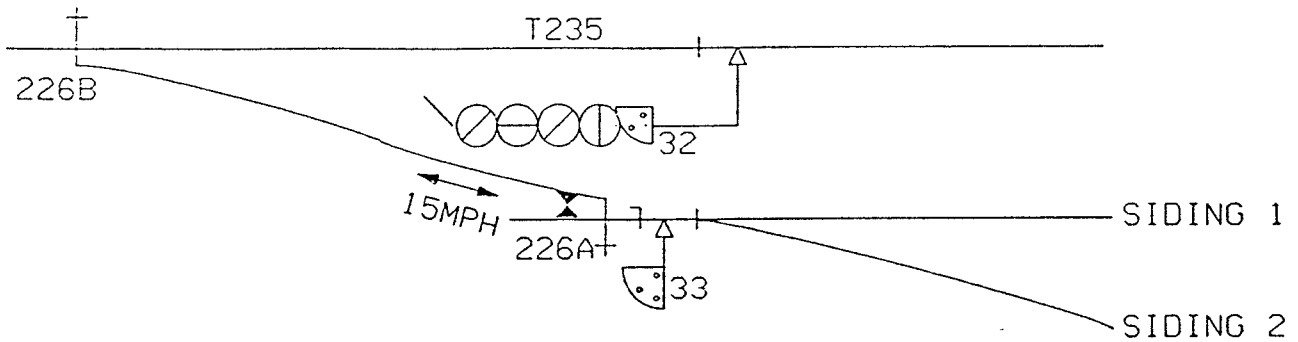
Shunting and Subsidiary signals to be of the two aspect position light type.

<u>Aspect:</u>	<u>Indication:</u>
Red light and white light displayed horizontally.	Stop
Two white lights inclined upwards at 45 degrees.	Clear



DEPARTMENT OF TRANSPORT REQUIREMENTS

The previous aspects apply to shunting signals. Subsidiary signals associated with a Main colour light have no normal signal aspect. When cleared, in order to qualify the Stop indication of the associated running signal, the subsidiary signal displays two white lights at 45 degrees.

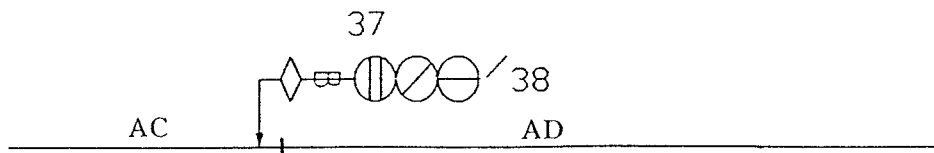


(c) Junction Signals

The main type of route indicator used with colour light signals is the "bar of white light" (5 white lights at angles of 45 degrees, 90 degrees, 135 degrees, 225 degrees, 270 degrees, 315 degrees), the route furthest to the left being at 135 degrees and that furthest to the right at 225 degrees.

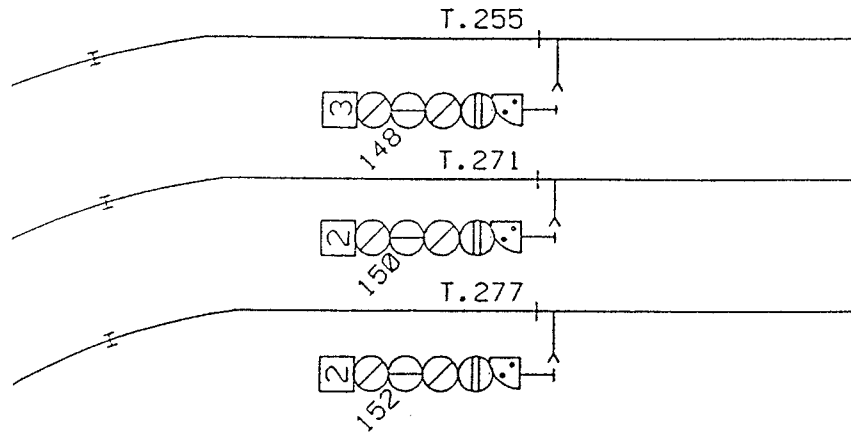
The route indicator is only illuminated for the routes diverging from the main route and must be proved to be illuminated before the signal can display a proceed aspect.

Clearance of the signal to a diverging route to be controlled by the approach of the train when a reduction in speed is required.



DEPARTMENT OF TRANSPORT REQUIREMENTS

Where more indications are required than it is possible to provide with the previous type of indicator or the speeds of all routes are low a "Theatre type" or "Stencil type" indicator may be used.



(d) Bulb failure

Precautions to be taken against failure of lights of running signals, eg. by the use of double filaments or by extending controls to govern the indications of the signal in rear.

(e) Telephones

Telephones for drivers' used to be provided at signals working automatically on main line systems, and also at controlled signals if the signal box from which they are worked is not easily accessible, on account of distance or other hazards. Such telephones to be normally of selective type or on individual circuits as a precaution against confusion particularly when used to instruct a driver to pass a signal at Danger in the event of failure or other emergency.

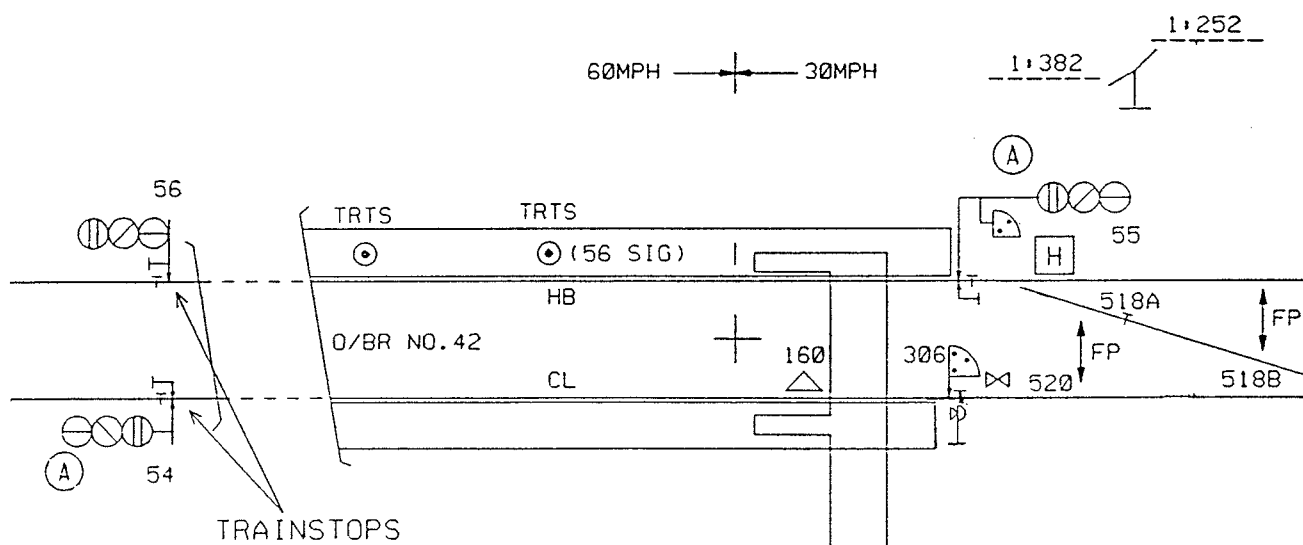
Telephones at signals working automatically to be arranged to communicate with the next open signal box ahead, in which the controlling track circuits should be indicated.

DEPARTMENT OF TRANSPORT REQUIREMENTS

Unless track circuits in the running line extend to the next open signal box in rear of a loop or reception line entered by remotely worked facing points a conveniently situated telephone to be provided alongside the loop to enable the guard of a train which has entered it to report to the controlling signalman that the train is complete and clear of the main line.

(f) Automatic Train Control

Equipment of train stop type with suitable proving controls, to be provided on urban electric railways in tube or tunnel, and on their extension in the open. An approved form of equipment of warning type for distant and multi-aspect signals is desirable on important main lines.



DEPARTMENT OF TRANSPORT REQUIREMENTS

2. POINTS

2.1 General

Points to be so situated that movements over them can be seen from the signal box from which they are worked, unless suitably indicated track circuits are provided as an alternative to direct vision. Manually worked points to be not more than 250 yds from the box.

(With the present vertical P & C it is considered that 100 yards double-ended and 250 yards for single-ended is the maximum for manually operated points).

All points have two or more stretcher bars.

Where conditions are suitable, uncoupled spring trailing points may be used, arranged either to remain in the position to which they were last moved by a train, or to return to a normal position, as may be appropriate in each case.

2.2 Facing Point Equipment (Figure 1)

Facing points on passenger lines, and all points regularly used in the facing direction by passenger trains to have:-

- (a) A bolt lock through a third stretcher bar, with its bolt either worked through a locking bar or controlled by track circuit. Locking bars, if used, to be longer than the greatest inter-axle dimension of vehicles likely to pass over them.
- (b) A stock rail gauge tie.
- (c) Apparatus to detect that each switch is in its proper position, and that the points are bolted before the relative signals can be cleared.

Similar equipment is desirable at facing points in freight lines used exclusively for running movements and to be provided if derailment at them might foul an adjacent passenger line.

DEPARTMENT OF TRANSPORT REQUIREMENTS

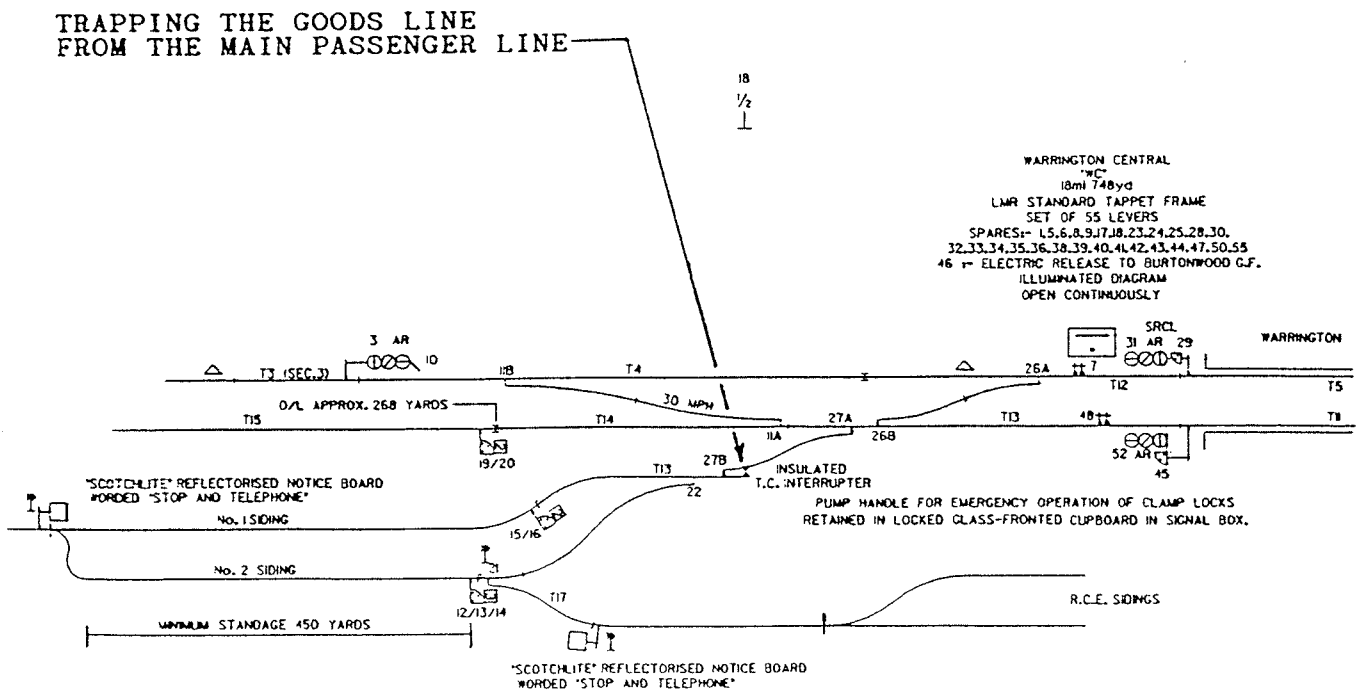
2.3 Trap Points

Connections between freight lines or sidings and passenger lines to be provided with trap points to protect the latter unless other connections will serve for this purpose. Such trap points to be of the double tongue type unless otherwise approved, with sufficient length of lead rail or other means to guide vehicles de-railed at them away from the passenger line.

Detection by the relevant signals of the closed switch of facing trap points is desirable, also of trailing points in passenger lines which are used in the facing direction for shunting.

Facing points, with sand drag where practicable may also be necessary on passenger lines in the absence of other acceptable arrangements.

- (a) At crossing loops on single lines, if the stop signal at the entrance to the loop is not at an adequate distance from the fouling point at its exit, or where the line is worked on any non-token method.
- (b) At the exit from passenger loops and from bay and loop platform lines, to protect traffic on the through lines.
- (c) Approaching swing or other moveable bridges.



continued

DEPARTMENT OF TRANSPORT REQUIREMENTS

3. INTERLOCKING AND CONTROLS

3.1 Interlocking

Point and signal levers to be so interlocked that the Signaller cannot clear a signal for the movement of a train unless 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 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 such signals have been replaced. Points also, where practicable, to be so interlocked as to avoid the risk of collision.

Distant signal levers to be so interlocked that they cannot be pulled until the levers of all related Stop signals have been pulled. Levers operating Stop signals next in advance of trailing points operated from same box should, when worked, lock such point levers in either position, unless this locking will unduly interfere with traffic movements for which there is adequate space between the signals and points concerned.

If directing signals are situated at some distance from facing points a track circuit or other device may be necessary to ensure that, after the signals have been passed, it shall not be possible to unbolt or move the facing points until the whole of the train has cleared them. Where it is difficult for a Signaller to estimate clearance it may be necessary to provide track circuits interlocked with the signals in order to define the fouling point of junctions, siding connections, crossings etc.

Electrical interlocking and the control of colour light signals to conform to the foregoing principles.

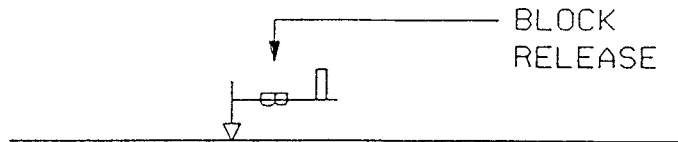
Where power points are controlled from a lever frame, completion of the stroke of the point lever to be prevented until the points have reached the corresponding position, unless equivalent provision is made to ensure the signal indications correspond with the position of the points. Signals leading over power worked points to be at Danger before the points are operated by hand in emergency: correspondence between the position of the points and of the control lever when power operation is resumed to be ensured. Levers controlling electrically operated devices to have shortened handles.

DEPARTMENT OF TRANSPORT REQUIREMENTS

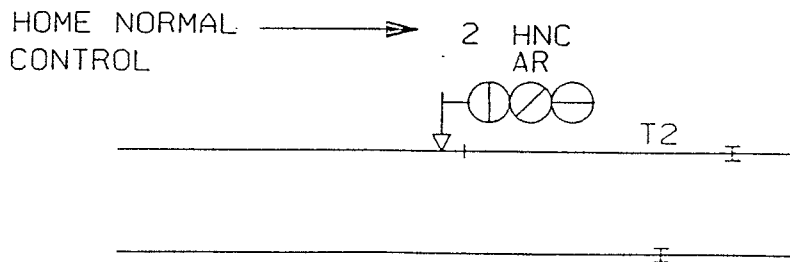
3.2 Signal and Block Controls

Where passenger lines are worked by the absolute block system consideration should be given to providing the undermentioned controls:-

- (a) Release of the signal controlling entrance to a block section, for one operation only, by acceptance of a train by the Signaller at the far end of section.

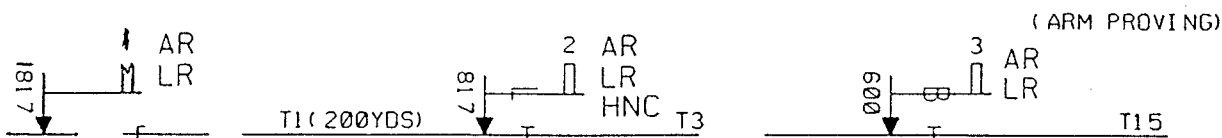


- (b) Prevention of such acceptance unless either the first Stop signal worked from the box concerned is at Danger or the lever working it is in the normal position.



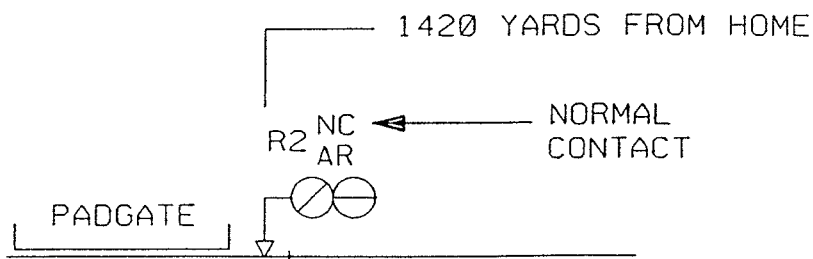
DEPARTMENT OF TRANSPORT REQUIREMENTS

- (c) Interlocking between successive Stop signals worked from the same box to ensure that none can be cleared for a train unless the next ahead of it has been restored to Danger.



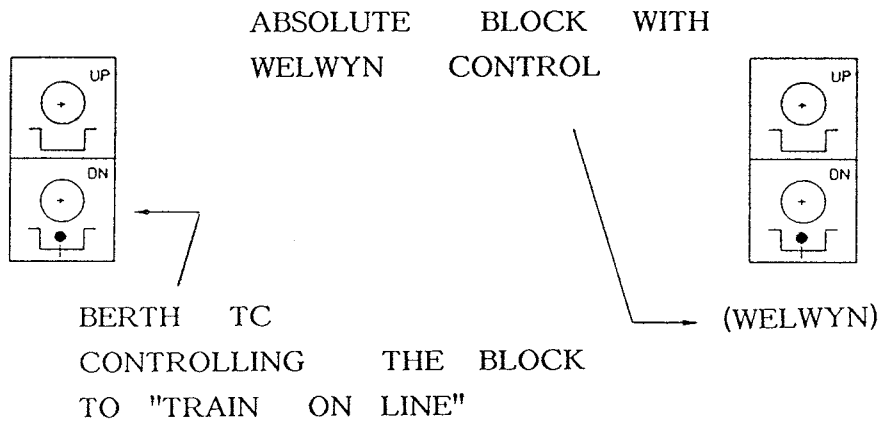
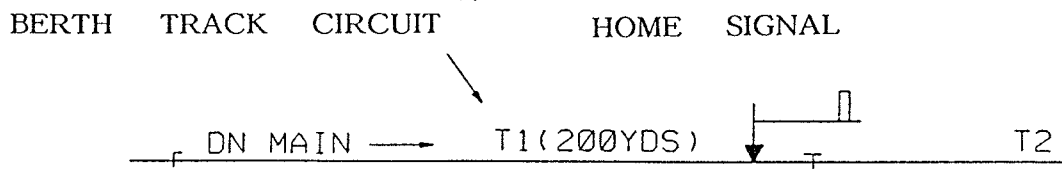
LEVER	RELEASED BY	LOCKS NORMAL	LOCKS B/W'S	RELEASES
1	2.3			
2				1
3		2 (SEQ)		1
4				

- (d) Prevention of acceptance of a train unless the arm of the Distant signal is at Caution.



DEPARTMENT OF TRANSPORT REQUIREMENTS

- (e) Exhibition of "Train on line" indication on the block instrument, even if not already displayed, while a track circuit approaching the Home signal is occupied; also the maintenance of that indication after departure of the train, until it is taken by the Signaller to alter it.
- (f) Prevention of acceptance of a train, unless the previous train has passed through the block section and has occupied and cleared a track circuit or its equivalent at its forward end.



DEPARTMENT OF TRANSPORT REQUIREMENTS

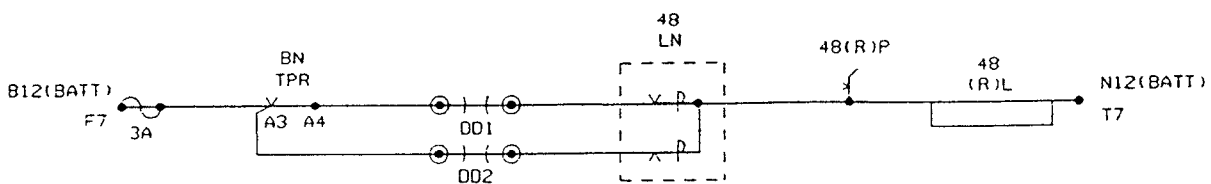
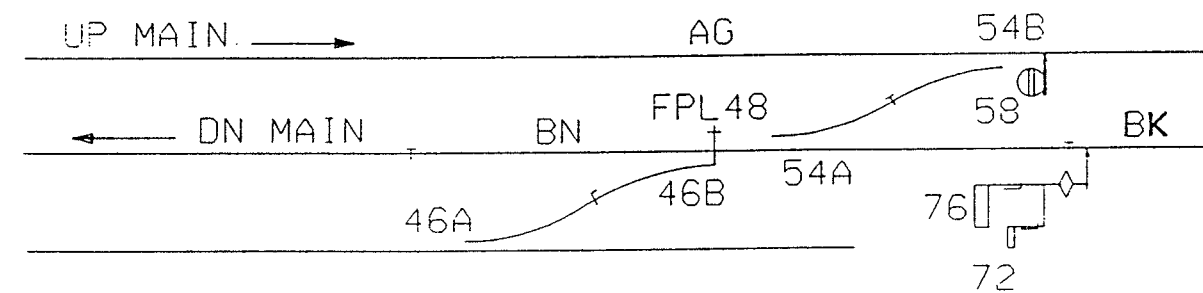
3.3 Track Circuits

Arrangements to be made where necessary for reminding the Signaller of vehicles standing within his control.

If track circuits are numerous an illuminated diagram should be provided in preference to separate indicators. If of the "normally dark" type, the diagram should have at least two bulbs for each track circuit indication.

Unbolting of facing points in a track-circuited section to be prevented when the track circuit is occupied. All power worked point levers to be locked in both normal and reverse positions by occupation of the track circuit in which they lie. (Applies also to manually operated points.)

Trap points and catch points in track circuited areas may require track circuit interrupters.



DEPARTMENT OF TRANSPORT REQUIREMENTS

3.4 Approach Control of Points

Approach control arrangements to be provided for facing points.

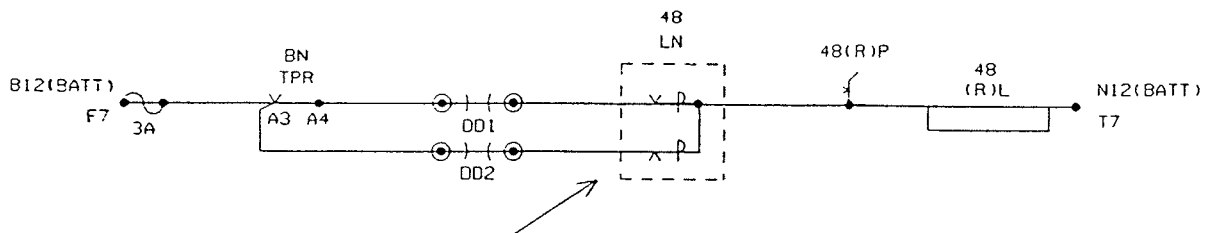
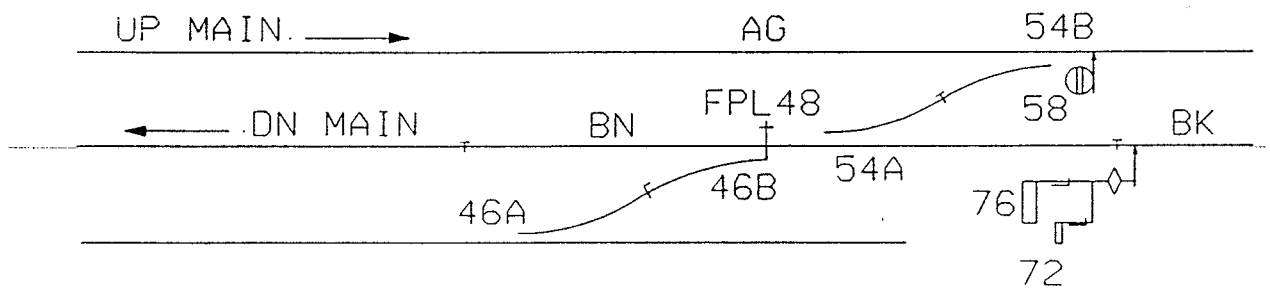
These arrangements are to prevent operation of the points until a suitable time has elapsed after the directing signals leading over them have been restored to Danger (if previously cleared for an approaching train and replaced before it reaches them), and after the berth track circuit has been occupied. The method of application of this control, either by occupation of track circuits in the block section approaching the signals, or by association with the block instrument indications, to depend on the circumstances of each case.

DEPARTMENT OF TRANSPORT REQUIREMENTS

3.5 Releases

Arrangements for releasing the track circuit control of signalling apparatus where provided to minimise delays to traffic arising from track circuit failure, etc. to be incapable of remaining in the release position and to conform with the following principles:-

- (a) Controls holding signals at Danger. No release to be provided.
- (b) Control of block instrument indications. No release to be provided, except to deal with the cancellation of a train already accepted; such releases to be normally of the slow acting manually operated type, worked at the forward signalbox or, in special cases, of the co-operative type.
- (c) Control of points and facing point locks. Releases to be sealed.



SEALED RELEASE PLUNGER ENABLES S/MAN TO OVERCOME TRACK CONTROL UNDER TRACK FAILURE CONDITIONS

- (d) Approach control of remote facing points. Releases to be of the slow acting type, either automatically or manually operated and to be ineffective until the signal concerned has been placed at Danger and the berth track circuit at the signal has been occupied; they need not be sealed.

DEPARTMENT OF TRANSPORT REQUIREMENTS

3.6 Outlying Sidings

On double lines, ground frames working siding connections which are remote from a signalbox and not protected by adjacent signals to be released mechanically or electrically from the signalbox; alternatively the ground frame may be controlled through the medium of the block circuits, or where there are track circuits extending through the whole block section, it may be released by suitable track circuit control.

It is desirable for the trap points of such sidings to be detected to ensure that they are left open, before normal traffic can be resumed.

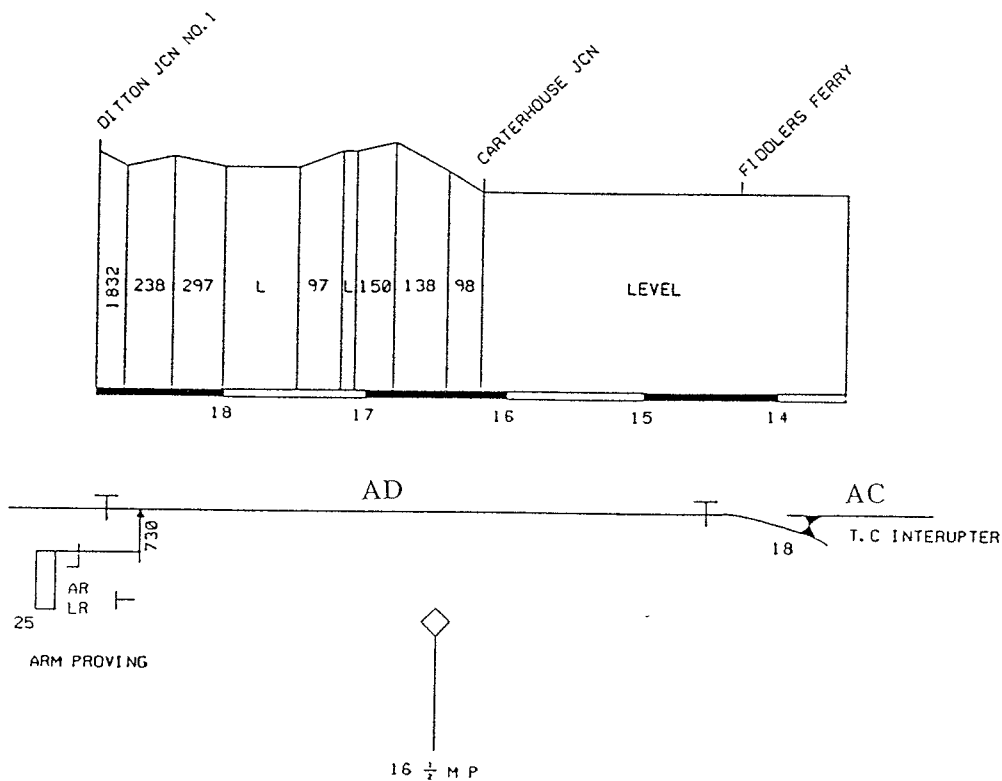
The controls of ground frames at outlying sidings into which a train can be shunted complete, while other trains pass, to be so arranged that it cannot leave the siding to resume its journey until block acceptance has been given from the signalbox in advance, if equivalent arrangements exist for main line movements. Track circuits may be required in the vicinity of such sidings to ensure that the running line is left clear when a train is shunted into the siding.

DEPARTMENT OF TRANSPORT REQUIREMENTS

4. Gradients

On double lines where the gradient is 1 in 260 or steeper, one or both of the following arrangements may then become necessary.

- (a) Worked facing safety points, with or without a sand drag, unless a special arrangement to use an existing facing siding connection is practicable.
- (b) Single or double self acting trailing catch points a full train's length in rear of the first Stop signal of the higher block post on the ascending line, unless a special arrangement to utilise an existing trailing connection at the lower block post is practicable and suitable. On long gradients additional catch points may be necessary.



On single lines, one or more of the following safeguards may be necessary:-

- (c) Worked catch points, with or without a sand drag, facing in the descending direction, either in the single line, suitably located in relation to other connections (including intermediate sidings) or, at a crossing place in the loop used by descending trains, a suitable existing connection may be used in either case.

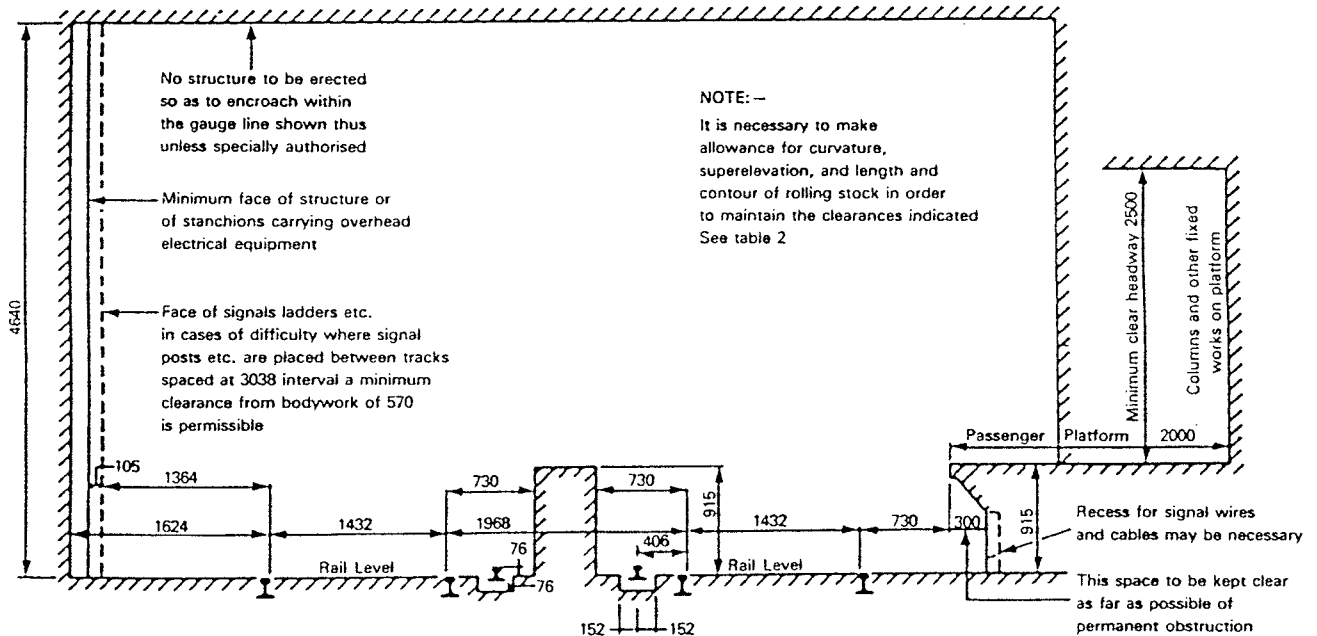
DEPARTMENT OF TRANSPORT REQUIREMENTS

- (d) Interlocking between worked points and the token instruments to ensure that the former are left in the derailing position behind an ascending train.
- (e) Self-acting trailing catch points at the lower end of a loop used by ascending trains.
- (f) An additional siding in which the whole of a train can be placed clear of the main line before operations are commenced.

5. Construction Gauge

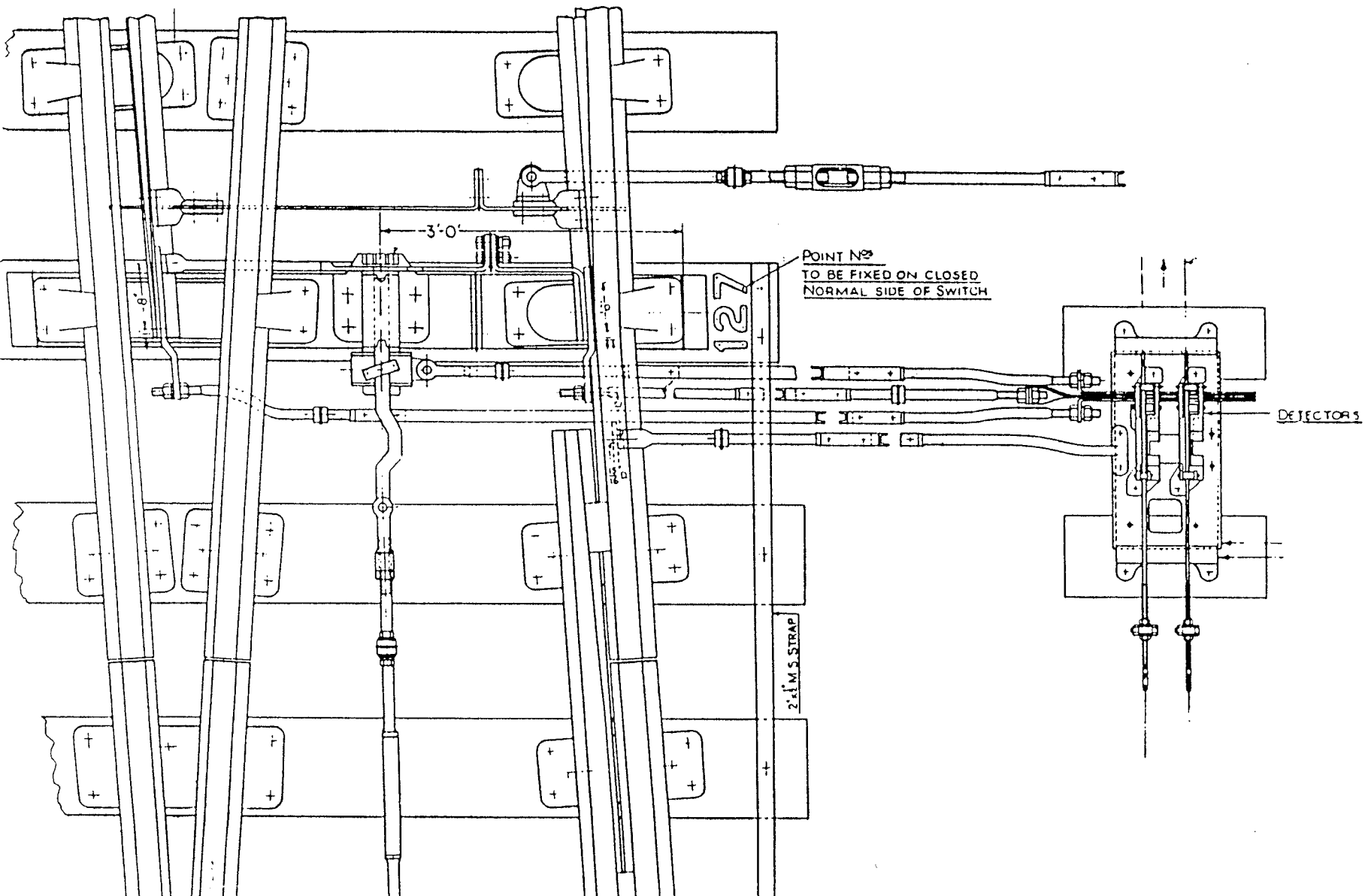
Signalling equipment should not be located so that it encroaches on the construction gauge limits shown below, due allowance should be made for lines on curves for inclination, length and contour of rolling stock.

The top of signalling apparatus should not encroach above rail level except where indicated.



CONSTRUCTION GAUGE
Dimensions are in millimetres

DEPARTMENT OF TRANSPORT REQUIREMENTS



end