

CHAPTER XXIX

INTERLOCKING

29001. Definition.- Interlocking means an arrangement of signals, points and other appliances, operated from a panel or lever frame, so inter-connected by Mechanical locking or Electrical locking or both that their operation must take place in proper sequence to ensure safety.

29002. Basic Principles.- The basic principles of interlocking may be laid down as follows :-

1. It shall not be possible to take "off" conflicting signals at one and the same time.
2. It shall not be possible to take "off" signal for the running line until :-
 - (a) all points on the running line are correctly set and facing points locked.
 - (b) all points, giving access to the running line from the sidings and goods lines, are set against the running line.
 - (c) level crossing gates if included or controlled by interlocking are locked across the roadway.
 - (d) a signal lever operated when drawn must lock or back lock as necessary the levers operating the points and gate locks referred to above.
3. When all signals are in the "On" position, all points which would be locked by taking 'off' such signals must be free for shunting purposes.
4. It must be impossible to take "off" a Warner Signal, until all the relative stop signals in advance have first been taken "off" and when "off" it must back lock all such signals.

29003. Interlocking - How accomplished :- Points, Signals and other units are usually, operated by means of levers. Interlocking between these levers is accomplished either by mechanical or by electrical means. In the former method, which is more prevalent at present, some mechanical contrivance variously designed, controls the relation between one lever and the other.

At less important stations the point, signal and other levers are interlocked by means of keys which are used to lock or release the levers, either in the normal or in the reverse position, as required. At other stations the levers are interlocked by means of tappets inside a box of the lever frame, which is normally kept covered and sealed.

29004. Isolation.- A line is said to be isolated from the Adjacent line or lines when no movement on the adjoining lines can foul it. Isolation can be achieved by any of the following methods.

- (a) Snag dead end, (b) sand hump, (c) trap points, (d) setting of points (e) permanently locked points, (f) Scotch Block and (g) Hay's Derail.

29005. Indirect or Direct Interlocking.- (a) Indirect interlocking means that the points are set and locked from one place and the signals are operated from another place and another lever frame; the interlocking is effected by means of keys carried from one place to the other.

(b) Direct interlocking means that all levers, viz. the point, the point locks and the signal levers are concentrated in one lever frame and worked therefrom; the interlocking is effected by means of rigid connections between levers without the use of keys.

29006. Standards of Signalling and Interlocking.- Interlocking at stations is standardised into three different classes viz. I, II and III. The regulations prescribing the three standards have been drawn up primarily to meet the needs of crossing stations on the single line but, with such modifications as may be necessary in regard to the equipment of signals, these are also applicable to other stations both on single and double lines. The standards are as follows :-

Note :- For details see para 170 to 174 of "Indian Railway Signal Engineering Manual".

(A) Two aspect signalling.

(a) Standard I.

(i) Speed - 50 kms. per hour.

(ii) Isolation - Isolation of the main line is recommended, but is not essential.

(iii) Points - the facing points should be provided with key locks, locking both switches independently and the switches detected independently by relative signals.

(iv) Interlocking - Interlocking between points and signals may be carried out indirectly by means of key locks.

(v) Signals - Outers and bracketted Home signals shall be provided. The provision of Starter signals is optional. Working Warners may be provided for metre gauge stations where trains run through, if considered necessary, but are not required for other stations signalled to standard I.

(b) Standard II.

(i) Speed - 75 kms. per hour.

(ii) Isolation of the main line is essential.

(iii) Points - the facing points should be provided with plunger type locks, locking both switches independently and the switches and the bolt being detected independently by relative signals.

(iv) Interlocking - The interlocking between points and signals may be direct or indirect. Where indirect interlocking is used, signals shall be worked from a position under the control of the Station Master and key must be provided to enable the Station Master to lock up the signal frame.

- (v) Signal - Outers, Warners and bracketted Home signals must be provided, and Starters where considered necessary; (ii) Where Starters are not provided the "off" position of the Warner signal shall be dependent upon the receipt of 'Line Clear' on the block instrument.

(c) Standard III.

(i) **Speed - Unrestricted speed.**

(ii) Isolation -) same as for Standard II.

(iii) Points -)

(iv) Interlocking.- the interlocking between points and signals must be direct.

(v) Signals. - Outers, Warners, bracketted Home Signals and Starters must be provided and Advanced Starters as may be necessary.

(B) Multiple aspect signalling.

The Standards, their speeds, requirements of isolation equipments of points and requirements of interlocking between points and signals are the same as in the case of two aspect signalling. The Signalling, however, should be as under :-

(i) Standard I - A Distant and a Home Signal in each direction.

(ii) Standard II - A Distant, a Home and a Starter Signal in each direction.

(iii) Standard III - A Distant, a Home and a Starter signal in each direction.

29007. Failure of Interlocking:- In case of failure of Interlocking, trains shall be worked strictly in accordance with rules prescribed for the purpose in General and Subsidiary rules book. Entry of the failure, its rectification with remarks must be recorded in Signal & Block failure register (SE-32) kept with Station Master on duty.

29008. Painting of Levers.- Levers shall be painted in the following colours :-

(a) Warner signals (two-aspect) lever-green.

(b) Distant signal (multiple-aspect) lever 45° aspect yellow.

(c) Distant signal (multiple-aspect) lever 90° aspect-green.

(d) Other Signal levers ... Red

(e) Slot lever mechanical ... same colour as of the lever slotted, with a 6" (150 mm.) wide blue band in the middle.

(f) Slot lever electrical ... same colour as of the lever slotted with a 6" (150 mm.) wide yellow band and in the middle.

(g) Points lever ... Black

(h) Facing points lock lever.	...	blue.
(i) Economical facing point lock lever	...	upper half-black lower half-blue.
(j). Station Master's control lever	...	upper half white lower half-black.
(k) Lever-crossing gate control lever	...	chocolate.
(l) Release lock lever	...	black, with a 6" (150 mm) wide blue band in the middle.
(m) Detector lever (D.W.)	...	red and blue bands 6" (150 mm.) wide alternately.
(n) Route lever.	...	upper half red, lower half black.
(o) Siding key control lever	...	black.
(p) King lever	...	red and white bands 6" (150 mm.) wide alternately.
(q) Spare lever	...	white

29009. Numbering of levers in frames.

1. All levers, including spares, are numbered consecutively through the frame from left to right. Each lever is provided with a name plate showing its function and the number of the other levers in the order of operation which must precede to release it.
2. The levers are broadly classified into three groups :-
 - (i) Up signal levers/slotting levers.
 - (ii) Down signal levers/slotting levers.
 - (iii) Point, lock, shunt signal and other levers.
3. The group to which the lever connected to the first approach signal, or warner signal, situated to the left, or the person working the levers, belongs is allotted the first set of consecutive levers, lying to the left of the frame. The second set of consecutive levers is allotted to group (iii), and the third set of levers lying to the right is allotted to the remaining group. All levers, including spares/spaces, of each group are, then numbered consecutively, starting from the first lever on the left. The relative position of the levers of each group, generally, corresponds to the relative position of the units they operate.

29010. Explanation of certain simple terms.-

1. COUPLED POINTS.- When two or more points are worked by the same lever.

2. **CROSSINGS.**- The appliances provided at the Junctions where two lines cross or join one another.
3. **COMPENSATOR.**- It is an appliance provided to compensate for difference in length of roddings and wires due to variations in temperature.
4. **CRANK.**- It is an appliance fitted with the rodding to change the direction of the motion given by the lever.
5. **DETECTOR.**- It is an electrical or mechanical device which prevents the signals from being taken 'OFF' unless the points are correctly set.
6. **ECONOMICAL POINT LOCK OR S.L.M. (Switch & Lock Movement).**- When the facing points and the facing point lock are worked by the same lever, it is called "Economical Point Lock" or "S.L.M."
7. **FACING POINT LOCK.**- It is a plunger bolt provided at facing points, which ensures that the points are correctly set and locked to prevent them from being moved.
8. **FACING POINT LOCK BAR.**- It is a bar provided at facing points connected with a facing point lock, which prevents facing point lock being moved while a vehicle is passing or standing over it.
9. **FOULING BAR.**- It is a bar provided at the fouling points between two diverging roads which prevents points being set and locked and signal being taken 'OFF' for one road while a train is standing short of clearance on the other road.
10. **LOCKING.**- A lever is said to be locked when in the normal position it cannot be pulled over. A lever is said to be locking another lever when owing to the former's remaining in the normal or reverse position the latter cannot be pulled over.
11. **RELEASE.**- A lever releases another lever, when due to its operation the latter can be pulled. If lever No. 2 can only be pulled over when lever No. 1 is pulled then lever No. 1 is said to be de-releasing lever No. 2.
12. **SLOT.**- It is an electrical or mechanical arrangement where by a signal can only be lowered by the joint operation by two or more persons, but can be put back to 'ON' by any one of them.
13. **TONGUE RAILS.**- These are rails with tapered movable ends which controls the setting of the route.
