LESSON NO. 24

In this last lesson a description of the Train Control Operator's duties and the general concept of Centralised Traffic Control (C.T.C.) is given to assist locomotive crews to understand this system of operation more fully.

This lesson also covers the remaining Automatic Signalling Regulations questions which were introduced in Lesson No. 23. Read these questions carefully before formulating answers.

TRAIN CONTROL:

The Train Control System may be briefly described as one by which the movement of all trains and rolling stock in any particular area is brought under the direction of one individual. Under this system an increased measure of efficiency in operating is obtained, thus opening the way to effect economies that are not practicable under a wide distribution of responsibility. The close supervision by the Train Control Operator combined with voluntary co-operation of station staff and trainmen will show results in the more punctual running of trains and in the consequent check on train hours, trainmen's hours and often station hours also. However, before attempting to describe the system more fully, it would be as well to try and visualise how the system developed.

Prior to the introduction of the electric train tablet system, the lines were, with a few exceptions, all "open section", i.e. there were no signalling systems having the object of preventing more than one train being between any two stations or on one section, at the same time, and all trains adhered strictly to their scheduled crossings unless the crossings were altered by train advice from the Train Running Office, or Superintendent's Office, as it was then known. Telephone circuits were rare and practically all communication was dependent on morse instruments. Trains were not allowed to follow at less than 15 minute intervals as is the case today on open sections. Train crews and station staffs had, therefore, to pay the strictest attention to the "safety first" rule. With the introduction of the electric train tablet system the alteration of crossings was left largely to the discretion of the station staffs. The system also brought about better telephone communication and much of the telegraphic work was eliminated.

All wagon supply work was under the control of the Traffic Inspector from whose office emanated practically all the instructions in regard to the work of trains. Later the Traffic Inspector became separated from this phase of the work and it came under the direction of the Transport Officer. Stationmasters advised the Transport Office twice a day, or more often if required, particulars of wagons required, of loaded wagons to be forwarded and empty wagons available. The Transport Officer then directed by which train wagons were to be lifted and issued instructions to the Yard Foreman and the Guard regarding the work to be performed by each train.

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In the case of a train starting from a station other than that at which the Transport Office, was located, the instructions re the work to be performed were telegraphed to the Stationmaster at the station who, in turn, instructed the Guard . As is still the case, the position regarding the supply and distribution of wagons changed frequently and without good communication it was not easy to vary instructions previously given. As late as 1925, the only means of communication (except morse) between Wellington and Palmerston North was by phonophore and records show that it was almost always unworkable. Since then telephonic communications have been improved and developed exceedingly rapidly.

Good transport work is dependent on good communication.

In 1927 Messrs J.H.W. Smith and E.S. Brittenden were sent to South Australia to study the control system in operation on a portion of the South Australian Railways. They also visited New South Wales to study railway operating methods there, and on their return to New Zealand were delegated to introduce the Train Control system between Wellington and Marton and between Christchurch and Oamaru. Since then the system has been extended and now covers practically all the main line in both Islands.

The Principal feature of Train Control is the selector telephone by which means the Train Control Operator is in constant touch with all stations. This member directs and records the movement of all trains and takes a supervisory interest in the despatch of goods and rolling stock. He alters train crossings where necessary either by verbal instructions where tablet working is in operation or by crossing order where single line automatic signalling is in operation. He watches train delays, ascertains what shunting is necessary at intermediate stations, and directs according to circumstances whether in the interests of punctuality, a curtailment is necessary or any extension is permissible. Generally he assumes responsibility for many matters which in uncontrolled areas are left to the discretion of staff at stations who are not usually in possession of the necessary information to enable them to view the position as a whole.

Station staffs are responsible for advising the Train Control Operator the arrival and departure times of trains at their stations. This information is plotted on to a train diagram. Schedules of all timetable express, passenger and mixed trains are printed on the diagram with "special" trains superimposed in pencilled lines, and the Train Control Operator can thus see at a glance whether a train is maintaining schedule running or losing time. In some instances goods trains are also scheduled but generally in tablet, C.T.C. and double line automatic areas only the starting times from starting stations and the arrival times at destination stations are shown and the aim of the Train Control Operator should be to work this class of train through to its destination with as little delay as possible.

The extent of the duties performed in the respective Train Control rooms varies, but where the traffic is not dense and the time of the train control operator is not fully taken up with duties relative to the movement and despatch of trains, alterations to crossing C.T.C. operation, etc., this member also deals in detail with the loads of trains and work to be performed enroute.

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In this connection loading lists are made out by the Train Control Operator showing, inter alia, number and class of train, class of locomotive, composition and tonnage of train leaving starting point, and particulars of loads and empties to be dropped en route.

Officers-in-charge at intermediate stations advise the Train Control Operator before the arrival of a train the work to be performed, i.e. the number of wagons and gross tonnage to be put on train, whether straight lift, or time work is likely to take where the shunting is involved and roadside work to be performed. The Train Control Operator in turn advises the Officers-in-charge at intermediate points the number of wagons listed to be taken off train, and thus there is a complete understanding as to the work to be performed and the time likely to be taken. Also the information enables the Train Control Operator to sum up the situation and plan ahead in respect of crossings with opposing trains or fast overtaking trains, and he may vary the work or movement of any train as the situation demands. It should be noted that the Train Control Operator may vary the "Work of Trains" instructions issued by the District Traffic Manager, when the circumstances of the moment render it necessary to do so. Very often a disturbance in the normal timekeeping of trains renders this action necessary to give judicious loading of trains and ensure the best use being made of the locomotive power available. Moreover prompt transit of some trains will sometimes minimise congestion at sub terminal stations and also be a factor in making earlier release of wagons practicable.

Briefly, Train Control Operators undertake the following duties:-

Direct the movement of all trains, re-arranging crossings when necessary.
Direct the movement of all tonnage offering, attending specially to the prompt transit of livestock, perishables or other urgent goods.
Check locomotive arrangements to ensure that power ordered is sufficient to meet requirements.
Cancel unnecessary trains when anticipated tonnage does not eventuate, and making arrangements for the provision of additional trains when necessity arises.
Advise adjacent districts how connecting services are running and supply particulars of the outward tonnage being landed.
Obtain similar information in respect of inward trains and tonnage affecting their own district.
Keep in touch with stations and terminals with a view to obtaining full information regarding tonnage offering.
Advise stations in good time particulars of tonnage to be detached.
Obtain particulars of any important arramgements being made by Wagon Supply Office, and see that such arrangements are duly carried out.
Keep a check on trainmen's hours with a view to seeing that they are kept within the prescribed limits, and advise Locomotive Depots concerned promptly of any variations made to Drivers' runs or to locomotive runs.
Make suitable arrangements in connection with all train failures, train mishaps, or other emergency situations that may arise.

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Thus all movements are kept under review for some hours ahead in order that any alterations or adjustments may be anticipated and the possibility of having to make a hasty decision on some problem which should have been foreseen earlier is thus avoided. All sorts of contingencies arise and the most careful planning can be quickly upset.

The completed diagram becomes a visual record of the day's working. Any delays which appear excessive are inquired into at the time and this obviates much of the correspondence which previously arose through this cause.

Each morning the Transport Officer examines the previous day's diagram and inquires into any matter he considers requires attention.

Instructions for the movement of trains under the train control system are set out in Rule 112, and as far as possible the duties of the Train Control Operator described in the foregoing paragraphs, but the same must not be confused with the "Control of Train-Running" which is the function of a Train Running Officer or other duly authorised officer acting in the name of the District Traffic Manager, or Stationmasters where the latter have jurisdiction over a portion of a district - as defined in the Working Timetable. In the case of a serious mishap the Officer Controlling Train-Running must be advised immediately.

However, one of the most important duties delegated a Train Control Operator is that of altering the crossings of trains.

In areas where tablet is in operation this is accomplished by verbal arrangement with the officers in charge of the stations concerned.

In areas where single line automatic signalling is in operation the alteration is made by the issue of Mis-55 advice bearing in mind that the train which is to STOP SHORT of its scheduled crossing place must FIRST receive and acknowledge the crossing order BEFORE the second Mis-55 is sent to the crew of the opposing train. NOTE: Only authorised Train Running Officers will issue crossing instructions (Telegraphic train advice) in respect of trains running on "open sections", i.e. where tablet, automatic signalling, or C.T.C. is non-operative.

Also in order to meet contingencies which may arise during the period that authorised Train Running Officers are not on duty, Train Control Operators who have satisfied their Controlling District Traffic Manager as to their competency may be authorised to issue telegraphic train advices in the name of the District Traffic Manager (or Stationmaster controlling train running where applicable) in respect of the areas under their control, to provide for the following, viz :-

1. Switching In and Switching Out of tablet stations at other than the times authorised in the working timetable.

2. Institution of tablet working and signalling for trains previously authorised by working timetable instructions or train advice to run without tablet.

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NOTE: The suspension of tablet working (and consequential suspension of signalling) for any train may be arranged only by authorised Train Running Officers.

3. Cancellation of unnecessary goods trains.

4. Authorising a train to proceed through a tablet section without a tablet, in the event of :-

(i) Lost tablet.
(ii) Failure of tablet operator to come on duty - vide Tablet Reg.21, clause (a).

Where a Train Control Operator has jurisdiction over trains running in an "Open Section" area, very close attention must be given to the services when it can be foreseen that disturbed running is likely to take place. Although a duly authorised Train Running Officer would be called upon to issue a train advice for an altered crossing of opposing trains in such an area, this member's attention should also be drawn to instances where one train is likely to overtake another due to the latter losing time. It is essential that the 15 minutes interval (unless special provision be made for a lesser interval) between trains running in the same direction be strictly observed at ALL stages of the journey.

In conclusion it is desired to point out that in order to efficiently discharge the duties of a Train Control Operator, a member must have, as a basis, a good knowledge of the "Work of Trains" instructions, facilities, appliances and siding accommodation at stations, and has had a run over his district (preferably on the foot-plate of an engine and in the guard's van of a goods train) in order to familiarise himself with local conditions, etc. Such knowledge of outside conditions is of inestimable benefit to the Train Control Operator when called upon to deal with unusual conditions as he is enabled to correctly visualise the position as described by station staff or train crew.

CENTRALISED TRAFFIC CONTROL (C.T.C.)

In recent years the N.Z. Railways system has adopted a further improvement on the operating side in the form of "Centralised Traffic Control" now usually referred to as "C.T.C."

Briefly, this is a system whereby the complete control of points and signals over a selected area of railway can be centralised into one office and the necessity for signal boxes is therefore obviated. The extent over which one system can be made to apply is considerable and may extend from 30 to 50 miles on each side of the central station depending to some extent on the number of functions (signals and points) which it may be desired to operate.

The central machine is installed in the office and remote interlockings are installed at each location. The purpose of the Centralised Traffic Control itself is to initiate a movement of signals or points subject to the interlocking. The interlocking is of the ordinary electric type with relays and locking circuits. Every movement of the signals or points is indicated on the central frame and if desired an automatic chart can be installed so that the movements of all trains are plotted on the chart which runs to correspond with the time-keeping clocks so that the complete picture of a traffic operation can be obtained at any time. For normal working, signals and points are worked and controlled from the C.T.C. office panel similarly to those worked from a signal-box but arrangements can be made for the Train Control Operator to throw the work over to purely automatic working (if it is so desired) for a sequence of trains running in the one direction.

The main control panel consists of an illuminated diagram, below which are the operating keys for points and signals and the key for changing to automatic operation when desired. A train graph is supplied and the operator can not only work the C.T.C. machine but acts as the Train Control Operator for the section so equipped.

The central office is equipped with a train control telephone and the Train Control Operator combines the work of centralised traffic control operation with train control and train crews can, if necessary, obtain immediate contact with the operator.

Under the C.T.C. system the speed of operation is very much quicker than when traffic is handled by means of a number of signal cabins. For instance when making a crossing a train can be signalled into the main line. The points controls are then moved for the loop and as soon as the main line train is clear the road is automatically set for the loop. The signals and points for the first main line train can be then set up and this is reset and signalled immediately the loop train is clear of the fouling point. The main line train then proceeds with the minimum of delay.

The normal signalling of non-shunting trains is entirely under C.T.C. control but apparatus is also provided to enable shunting to be carried out locally by the train crews at a station where staff are not continuously on duty.

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This consists of a switch lock and manual lever on the siding points at the station, together with an electrically operated panel for working the main line points and signals.

The method of operation in the latter case is for a release to be given by the Train Control Operator, when requested by the train crew, after which the necessary points can be worked for shunting purposes by the use of the keys provided in the local panel, or by the mechanical switch-locked lever in the case of siding points. When shunting is completed the switch lock and local control key are placed to normal and the Train Control Operator advised, who then replaces his release key and once more takes control of all points and signals. The small diagram indications are illuminated so that there is no difficulty in the train crews operating the equipment at night time. It will be appreciated that with these arrangements there is no necessity to staff stations for signal purposes.

Thus it can be seen that the system is especially adapted for controlling and speeding up the movement of trains, and particularly for the purpose of reducing the time required for crossings on single line sections. This results in a considerable saving in the overall running time and assists towards a quicker turnover of locomotives and other rolling stock, plus the release of operating staff at crossing places.

It can be said that up to a few years ago the capacity of a line could only be increased by duplication, but this was altered by the adoption of the following methods:-

1. Single line automatic signalling, which by dividing the line between signal boxes or unattended crossing places into sections, permitted the closer spacing of trains, thereby allowing a greater track density.

2. Motor operated points plus Loop and Main line starting signals at principal crossing places which also permitted a speeding up in the movement of trains.

The installation of automatic signalling also increased the carrying capacity of double lines and in the future railway electrification schemes of this country, double-line automatic signalling will probably be made to permit of a headway of two minutes (or thirty trains per hour) on both "Up" and "Down" tracks if required.

Summed up C.T.C. can now be considered as the latest and most desirable method of expediting the movement of trains with increased safety and reduced operating expenditure. Because of the direct control of all signals from the one point instructions to train crews are given by means of signal indications and the issuing of crossing orders when trains are running late and out of timetable order is not required. C.T.C. provides a direct means for the Train Control Operator to convey his instructions to each train without relying on any intermediate person and without depending upon a system of communication and form of procedure which requires a great deal of time for the completion and delivery of such instructions.

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With C.T.C. and the use of long crossing loops in addition, the need for duplication is delayed when the time comes to increase the density of a single line equipped only with automatic signalling.

Occasionaly the C.T.C. system is subject to failure, mostly due to power supply disturbances. When the power fails all signal lights as well as the lights on the C.T.C. diagram in the Control Office are "blacked" out, and unless the Train Control Operator has kept his train diagram up to date to amlost the minute he may be at a loss to know just where the trains are, especially if there happens to be a considerable number of services involved. The most satisfactory way to handle a failure of this kind is to institute pilot working over the single line portions of track but generally some time must elapse before this can be done owing to the difficulty of locating and transporting the necessary staff. Trains therefore require to be advanced by Mis.58, authorising the train to pass the Departure signal in the Stop position.

These authorities are used for Departure signals only. They must not be used, or altered to suit, to give authority to pass any other type of signal. When a train is required to pass a Home Signal in the Stop position in double line areas of C.T.C. the member in charge of the station, acting under the direction of the Train Control Operator must proceed to the signal and after examining the points, pilot the train in on the main line. If there is no member on duty at the station the Guard, (Enginedriver in the case of a light locomotive) must communicate with the Train Control Operator and pilot the train as directed by the latter. Similarly, starting signals may be passed in the Stop position on verbal instructions <u>direct</u> from the Train Control Operator to the train crew. If the Train Control Operator is not in direct communication with the train crew the instruction must be telegraphed. Train crews must <u>not</u> accept verbal direction to pass signals from a third party.

It is not permissible to give direction re passing signals to train crews from other than the station where the signal is located.

1. (a) On what class of automatic running signal is an "L" light fitted?

   (b) What does it indicate when illuminated?

   (c) What action must be taken if the "L" light does not illuminate?

   AUTO. 20

2. When two trains are approaching an Attended or Unattended crossing station at the same time -

   (a) What indication will the Intermediate Signal show?

   (b) What indication will the Arrival Signal show?

   (c) Which train must unless otherwise instructed enter station limits first?

   AUTO. 20-21-22

3. In a Single Line Automatic Signalling Area not worked under C.T.C. when about to leave the loop -

   (a) What does Yellow over Red mean on the Arrival Signal?

   (b) What does Red over Red mean on the Arrival Signal?

   (c) What does Green over Red mean on the Arrival Signal?

   AUTO. 22

4. Describe the procedure to dispatch a train from the loop at an Unattended crossing station.

   AUTO. 22

5. Two trains are to make a crossing at an Unattended crossing station and the train due to take the main line arrives first and stops clear of the fouling point of the loop. What must be done immediately and why?

   AUTO. 22

6. In a Single Line Automatic Signalling Area describe the procedure -

   (a) To enter a switch-locked siding and be locked in.

   (b) For a train to return on to the main line after being locked in a switch-locked siding.

   (c) What must be observed when shunting a wagon off a through train into a switch-locked siding?

   AUTO. 24

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7. In Single Line Automatic Signalling Areas, describe fully the procedure when an assisting locomotive in the rear is detached at an Unattended crossing station.

AUTO. 25

8. When required to shunt an Unattended crossing station in a Single Line Automatic Signalling Area and the Departure Signal is at "Stop" at what point must you stop your locomotive?

AUTO. 26

9. When a shunting movement which passed a Departure Signal at "Proceed" is completed, but because of the length of the train the locomotive cannot set back within the Departure Signal, what authority will the Enginedriver require to proceed?

AUTO. 26

10. When and for what purpose are the following Mis. forms used

(a) Mis. 53 (b) Mis. 54 AUTO. 28

11. Describe fully the procedure to dispatch trains under pilot working in a Single Line Automatic Signalling Area.

AUTO. 28

12. In a Single Line Automatic Signalling area when the half pilot keys are required for pilot working -

(a) Where are they located?

(b) Whose authority is required before the half pilot key is removed?

(c) What effect on Departure Signals does the removal of the half pilot key have?

(d) How is a full pilot key obtained?

(e) Is the full pilot key the Enginedriver's authority to pass all signals in the section at "Stop"?

AUTO. 28

13. (a) What authority does the Enginedriver require to pass the Departure Signal at "Stop"?

(b) How will the train be dispatched if the Pilotman does not accompany the Enginedriver?

(c) Under what conditions may intermediate sidings be worked?

AUTO. 28

14. Describe the procedure to institute pilot working from the station in advance of a defective Departure Signal.

AUTO. 28

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15. If there was no communication between stations during pilot working, under what conditions may a following train be dispatched?

AUTO. 28

16. If in a Single Line Automatic Signalling Area the Locomotive Assistant is used as the Pilotman, what is the procedure if no relief Pilotman is available on arrival at the station at the opposite end of the block section?

AUTO, 28

17. If your Locomotive Assistant is the Pilotman in a Single Line Automatic Signalling Area -

(a) Describe the procedure for cancelling pilot working.

(b) Why is it not necessary to wear a Pilotman's badge in Single Line Automatic Signalling Areas?

AUTO. 28

18. If the pilot key was lost, state fully the procedure to be carried out.

AUTO. 29

19. If a half pilot key was lost, what is the procedure to work trains through the section?

AUTO. 29

20. A train has stalled in a Single Line Automatic Signalling Area -

(a) What is the procedure to clear the section to the station in advance?

(b) On what authority may the Enginedriver pass the Departure Signal at "Stop" when returning for the second portion of the train?

AUTO. 30

21. State the procedure when a train has stalled in a Single Line Automatic Signalling Area, and it is expedient for it to set back to the station in the rear.

AUTO. 30

22. (a) In a Single Line Automatic Signalling Area describe the procedure to clear the section of a disabled train if the relief locomotive is to be sent from the station in advance to clear the section to that station.

(b) In a Single Line Automatic Signalling Area if the relief locomotive is to be sent from the station in the rear to push the disabled train through the section to the station in advance, what is the procedure after the relief locomotive arrives at the station in the rear?

AUTO. 30

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23. When a train or trains have followed into a Single Line Automatic Signalling Section and are behind a disabled train and are unable to assist it, state the procedure to move the disabled train to the station in the rear. The relief locomotive will come from the station in the rear.

AUTO. 30

24. In a Single Line Automatic Signalling Area what is the procedure when a train has followed into the block section and is behind a disabled train and is able to assist it to the station in the rear only? There are no other following trains.

AUTO. 30

25. In a Single Line Automatic Signalling Area a locomotive has become disabled and cannot take any part of the train forward. What is the procedure to clear the section to the station in advance when a train is approaching from the rear in the same section and can assist?

AUTO, 30

26. In a Single Line Automatic Signalling Area describe the procedure to clear the section of a disabled train to the station in the rear. The relief locomotive being obtained from the station in the rear. There are no following trains.

AUTO. 30

27. In a Single Line Automatic Signalling Area the line is blocked by landslip or flood, by what method are trains worked up to the point of obstruction and what must the Enginedriver do when he returns out of the section with his locomotive?

AUTO. 31

28. In a Single Line Automatic Signalling Area a train is prevented by an obstruction from going forward. If one or more trains have followed the first train into the obstructed section, what is the procedure to clear the section to the station in the rear?

AUTO. 31

29. In a Single Line Automatic Signalling Area not worked under C.T.C. if signals are suspended for any reason -

(a) What authority will an Enginedriver require to proceed?

(b) How are signals passed during the suspended period?

(c) What are the instructions regarding the movement of trains under these conditions?

(d) If crossings are to be altered, how are they authorised?

AUTO. 32

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30. (a) Under emergency conditions when all signals and communications have failed, how will trains be worked?

(b) In what areas does this regulation apply?

AUTO. 33

31. In a Single Line Automatic Signalling Area not worked under C.T.C. -

(a) What authority is used to alter the running order of trains?

(b) Who issues this authority?

(c) How will it be delivered to the Enginedriver of a non-stopping train at an Interlocked or an Attended crossing station?

(d) What are the Enginedriver's responsibilities with this authority when he hands over to another Enginedriver?

(e) Under what conditions may this authority be cancelled?

AUTO. 34