

NORTH EASTERN RAILWAY.

---

Telegraph Department.

---

GENERAL INSTRUCTIONS

TO THE

MAINTENANCE

AND

CONSTRUCTION STAFF

---

NOVEMBER, 1903.

NORTH EASTERN RAILWAY.

---

TELEGRAPH DEPARTMENT.

---

GENERAL INSTRUCTIONS

FOR THE

GUIDANCE of all PERSONS

ENGAGED IN THE

**Maintenance and Construction**

OF THE

TELEGRAPHS

ON THE

NORTH EASTERN RAILWAY.

---

**November, 1903.**

---

PRINTED BY KNIGHT & FORSTER. WATER LANE WORKS,  
LEEDS.

## NORTH EASTERN RAILWAY.

The following instructions are supplementary to those contained in the Company's book of General Rules and Regulations, and each Inspector, Assistant Inspector, Foreman, Lineman, Assistant Lineman, and every other person employed in the maintenance and construction of the Telegraphs is required to have a copy of them in his possession, and at all times to strictly act up to them. Any infringement thereof must be immediately reported to the Superintendent.

This book is the property of the North Eastern Railway Company, and is to be delivered up on retirement from the Company's service, together with all tools, clothing, and other things belonging to the Company.

## INDEX.

	PAGE		PAGE
Absence from duty from sickness .....	5	Certificate, Medical .....	5
Absence from duty without leave .....	5	Construction, Foreman's address .....	6
Address of residence .....	6	"    "    duty .....	6
"    of Construction men .....	6	Construction, Inspector's duty .....	5, 8
Apparatus, connecting up .....	28	"    men, Sunday labour .....	14
Apparatus, order and cleanliness of .....	6	Crossover wires .....	7
Apparatus, out of order .....	13	Delivery notes .....	11
Apparatus, spare stock of .....	11	Diary, inspector and lineman's .....	12
Arms, arrangement of .....	23	Dip of wires .....	26
"    distance between .....	22	Duty of Inspector .....	5, 8
"    distance of bolt holes for .....	22	Earths .....	20
"    earth wiring of .....	23	Earthrods .....	20
"    slots for .....	22	Earth-wires .....	19, 20, 23
Assistance .....	6	Easements, record of .....	7
Attachments to Company's premises .....	7	Faults .....	10, 20
Batteries, attention to .....	17, 18	"    report of .....	12
"    maintenance of .....	17, 18	"    speedy removal of .....	5, 6
"    charging of .....	17, 18	Foreman, construction, address of .....	6
"    closets for .....	17	Foreman, construction, duty of .....	6
"    condition of .....	17	Guards .....	24
"    labelling of .....	11, 17	Holes for stay blocks .....	23, 25
"    Daniell .....	18	Illness .....	5
"    Leclanché .....	18, 19	Inspection of poles and wires on North Eastern property belonging to other Companies .....	7
"    plates for .....	17	Inspector's applications for stores .....	14
Binding in of wires .....	26, 27	Inspector, duty of .....	5, 8
Block, instruments .....	8	Instruments, knowledge of .....	8
"    "    case plates .....	8	"    labelling of .....	8
"    "    screen plates .....	8	"    lightning protectors for .....	8
"    wires, position on poles of .....	26	Insulation .....	20
Bolt holes, distance apart, for arms .....	22	Insulators, broken .....	6
Books, inspection of .....	7	Interruption Boards .....	10
"    pole diagram .....	7	Jointer, recording name of .....	28
"    whereabouts .....	12	Joints, covering of .....	6
Breaksdown .....	9	"    examination of .....	6
Bridge brackets .....	24	"    soldering of .....	27
Casing .....	27	"    tarring of .....	28
Call Cards .....	11		

	PAGE		PAGE
Labelling instruments .....	8	Stays, for lines of less than	
Labour, Sunday .....	14	5 wires .....	24, 25
Ladders .....	12	„ ditto of more than 5	
Laying out store .....	9	wires .....	24, 25
Lightning protectors .....	8	„ ditto of more than 10	
Linemen, duties of .....	6, 8	wires .....	25
„ examination of section		Stays for poles on straight....	24
„ by .....	6	„ „ „ „ bridges ....	25
„ residence of .....	6	Stores, application forms ....	13
„ travelling .....	6	„ at linemen's depôts ....	13
„ visiting sheets .....	13	„ collection and disposal	
Loading stores .....	10	of .....	10, 13, 14
Maintenance duties, satisfactory		„ delivery of.....	11
discharge of .....	6	„ laying out of.....	9
„ order and cleanliness in	6	„ loading up of .....	10
Medical certificate .....	5	Struts .....	28
Notice of interruption cards ..	11	Sunday labour .....	14
Pole-arming .....	22	Tablets, wiping of train .....	14
Pole diagram books .....	7	Tarring .....	27, 28
Pole-holes .....	23	Tar tins .....	12
Pole-roofs .....	24	Test boxes .....	14
Pole-setting .....	23	Testing .....	20, 21, 22
Pole-steps .....	24	Time Sheets.....	13
Poles at public crossings.....	24, 27	Tool-list .....	7, 14
„ depth to be planted in soil	22	Tools .....	11, 14
„ distance apart .....	23	„ loss of .....	14
„ tarring.....	27	„ worn out .....	14
„ old .....	28	Travelling by linemen.....	11
„ cutting off .....	28	„ by workmen .....	11
Residence, address of .....	6	Visiting signal boxes, &c. ....	12
Roadways, public, wires passing		Wire, lengths of .....	29
over .....	24, 27	„ short pieces of .....	29
Rules and regulations.....	9	Wires, binding in of .....	26, 27
Sickness .....	5	„ earth .....	19, 23, 27
Signal boxes.....	12	„ elevation of, above line..	26
Slots .....	22	„ position of, on poles .....	8, 28
Soldering paste.....	27	„ renewal of .....	28
Spans, length of .....	23	„ regulation of .....	26
Stay block holes .....	23	Wiring, crossover wires .....	26
Stayblocks .....	25	„ joints .....	6, 28
Stay brackets .....	24	„ over lines of railway ..	26
Stay rods .....	27	„ over roadways, &c. ..	26
„ „ tarring of .....	27	Workmen, travelling .....	11
		Works, maintenance .....	5
		„ renewal; construction	5
		„ completion of.....	7, 9

## GENERAL INSTRUCTIONS

FOR THE GUIDANCE OF  
ALL PERSONS ENGAGED IN THE MAINTENANCE AND  
CONSTRUCTION OF THE TELEGRAPHS ON  
THE NORTH EASTERN RAILWAY.

1. No person is to absent himself from duty without leave. In the case of unavoidable absence arising from illness, immediate notice must be given to his superior officer, and a medical certificate supplied as soon as possible thereafter.

2. It is the duty of each Inspector to carry out or to see carried out in an efficient manner, all works whether of construction, renewal or maintenance, unless specially instructed to the contrary, in the section entrusted to his charge; to see that there is no waste of time or material; that the charges are properly entered against each work, and in every way to protect the Company's interests.

3. It is especially his duty to see that the poles, stays, wires, insulators and apparatus throughout his section are well and efficiently maintained; that faults of all kinds are removed with the utmost rapidity, their cause ascertained and reported, with suggestions for the prevention of their repetition; that all block and other apparatus is maintained in thorough order; that the batteries are well and carefully maintained; that proper provision is made for them in all signal boxes and offices, &c.; that the instruments are kept clean and in good order, and that the leading in wires in connection therewith are sound and well protected from injury.

4. It is the duty of each Foreman or Leading man to see that all works upon which he may be engaged are carried out in a good, substantial and workman-like manner, and in accordance with his instructions; to keep the time of the men and to see that the appointed hours of labour are strictly adhered to; that his tools are maintained in good order, and that all stores are properly applied and accounted for. The absence of a Foreman from the work upon which his men are engaged, without permission or sufficient cause, will be regarded as a serious offence.

5. It is the duty of each Lineman or Assistant Lineman to attend to and rectify faults with the utmost expedition; to replace cracked and broken insulators; to see that all joints are sound and properly soldered; to look well to the earth connections at all points in his district, and otherwise to see that the wires, apparatus and batteries under his charge are kept in perfect order. If from any cause the Lineman is unable to carry out these instructions he must notify the same to the Inspector and ask for such assistance as may be necessary.

6. A list of the addresses of the Linemen and of the men forming the gangs is to be posted up in the Inspector's Office at each headquarter station, and a copy of the "Working Arrangements" applicable to the district in which the gangmen are employed is to be posted up in the store-room or other convenient place to which the men have access.

7. Linemen's addresses are also to be clearly entered in the "Whereabouts" book kept at their headquarter stations.

8. Particulars are furnished to the Inspectors of all easements granted to the Post Office, the Telephone Company or other parties, and it is their duty to keep a record of such easements, and to report to the Superintendent any cases of deviation from the authorised arrangements, or of the erection of wires, poles, or other fixtures, upon the Company's property, of which they have not been advised.

9. Careful inspection is to be made from time to time of the poles and wires passing over or erected upon the Company's property which do not belong to the Company, in order to see that they are maintained in an efficient and satisfactory manner, and any deficiency in this respect is to be immediately reported to the Superintendent.

10. Immediately on the completion of any work the Superintendent is to be advised; particulars being given as to

Date of Completion.

Length and locality of wires erected or taken down.

Position on the poles of wires erected or taken down.

Length and locality of pole-mileage erected or taken down.

Details of any alteration in the position of wires.

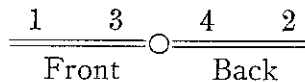
11. Every Inspector and Lineman is to keep his pole-diagram book carefully corrected up to date in the manner specified in the instructions pasted in the book. Inspectors are to see that the Linemen's books are properly made up at the time they check over the Linemen's tools against the lists supplied to them.

12. Wires are frequently referred to by the numbers which distinguish their position on the poles, thus:—

No. 0 is the saddle wire,  
 „ 1 „ top front wire,  
 „ 2 „ top back wire,  
 „ 3 „ second front wire,  
 „ 4 „ second back wire,  
 and so on.

The front wires are those nearest to the railway.

When wires are placed four upon an arm they are to be known and numbered as shown below.



13. All instruments are to be provided with lightning protectors, and Linemen should always carry spare protectors with them so that they may be able to replace any found defective.

14. All double line block instruments are to be provided with Up and Down line case plates; also with screen plates indicating the signal box with which they communicate.

15. On single lines block instrument case plates are not required but screen plates are to be provided.

16. Where more than one set of block instruments are fixed in a signal box, shelf plates are also to be provided. Linemen must make application through their Inspectors for any plates which may be required.

17. Every Inspector and Lineman is to make himself thoroughly acquainted with every description of instrument under his charge, and to make himself efficient in the working of the single needle speaking instrument.

18. Under no circumstances are stores to be laid out from a train in motion unless proper arrangements have been made for doing so. The loading and laying out must be carried out under the direction of the Inspector or of a qualified person appointed by the Inspector, whose instructions are to be exactly observed. The Inspector in charge of the laying out is to see that the stores, after being laid out, are placed well out of the way of the lines and traffic. In laying out or collecting up stores every precaution is to be taken to avoid accident to the men engaged in the work.

19. Whenever the weather is such as to suggest the probability of a serious interruption such as would be likely to call for the services of the men under his control, the Inspector should give instructions to the Foreman of his gang to hold himself with his men in readiness to render prompt aid if called for.

20. In cases of general breakdown from storms or other causes, Inspectors and Foremen in charge of men must at once do everything possible towards the temporary rectification of the interruption. The gangs of men are to be broken up and any man capable of handling the vice started with one or two others on the work of repair. Having made such arrangements the Inspector or Foreman should report to the Superintendent the steps he has taken. The greatest efforts must be directed to the speedy re-establishment of the block communication.

21. The instructions contained in the Company's book of General Rules and Regulations as to men working in tunnels, loading of timber, and use of lorries are to be strictly adhered to.

22. When a work is completed, all remaining stores, new or old, are to be sent in to the

Telegraph Stores at York; and an advice forwarded to the Superintendent, at the time of their despatch. Light loading of wagons is to be carefully avoided. Insulators must be properly packed in casks, so as to avoid breakage. Recovered poles which are not again fit for use may be sold on the ground at the rate of  $\frac{3}{4}$ d. per lineal foot, and the amount received for them remitted, per value parcel, to the Superintendent at York, together with particulars of the name and address of the persons to whom they have been sold.

23. In cases where recovered poles are few in number, and fit for further use, they may be left in a safe place on the line side until a convenient opportunity arises for picking them up, or until they can be used elsewhere.

24. No stores of any description must be sent by goods train, unless a free goods pass is handed in with the consignment note before the stores are sent away. The approximate weight of such material is to be entered in the consignment note.

25. "Boards" are provided at signal boxes to indicate to the Inspectors and Linemen when passing in the trains whether the telegraph apparatus is working properly, or whether it requires attention. The boards will always be exposed: when the white side is shown it is to be understood that the apparatus is working properly: when the black side is shown the signal box is to be visited as early as possible. The use of the boards will not, however, prevent in any way the Stationmaster or Signaller from acquainting the lineman of the existence of faults in the usual manner. Linemen are to visit the signal boxes, &c., for maintenance purposes at periodical intervals without reference to the indications shown by the boards.

26. Except when looking out for faults, or under other special circumstances, Linemen are not to ride in the guards' vans. While making their ordinary journeys, they are to ride in a carriage of the proper class, and to sit in the most convenient position for inspecting the wires and the "boards" at the signal boxes, which indicate whether or not the apparatus is working properly.

27. Gangmen are to ride in the workmen's carriages when such are available.

28. A "Notice of Interruption" card is to be supplied to every office and signal box in which telegraph apparatus of any kind is fixed. These cards are to be hung in a conspicuous place, and kept in good condition. Linemen are to make application through their Inspectors for any cards required.

29. Where telephones or speaking instruments are fixed "Call" cards are supplied, and it is the duty of the Lineman to see that they are kept in good condition, and to apply for any which may be required for replacing such as may be missing, dirty, or defaced.

30. Whenever apparatus, batteries, tools, &c., are sent into store, a delivery note giving full particulars of the articles forwarded must be sent by the same, or a previous, train. In the case of apparatus and batteries, the number of the instrument, if any, and the place at which the instruments or batteries have actually been in use, must be stated on the delivery note and upon the labels affixed to the apparatus or batteries when sent in for repair or renewal, for stock or from loan. Separate delivery notes are to be made out in respect of apparatus, batteries and tools.

31. Tar tins must only be forwarded by passenger trains when placed in the boxes supplied for the purpose. The tins and boxes are to be kept perfectly clean.

32. An entry is to be made in the whereabouts book of the proceedings every working day of each Inspector, Assistant Inspector, Lineman, and Assistant Lineman. The time of his leaving and return to his head-quarters must be entered on each occasion.

33. Before an Inspector or Lineman leaves a signal box in which he has been engaged with the apparatus or batteries he must see that all is in good order and working properly.

34. Inspectors and Linemen must take care to report promptly all cases in which the working of signal or points indicators shows any defect in the movements of the signal arms or points, or in the arrangement or condition of the contact boxes, so that the requisite information may be given to the Signalling Department. When the case seems to require it, information should immediately be given to the local Signalling Inspector, and a note that this has been done made on the report sent to the Superintendent.

35. All faults are to be reported by the Linemen, through their Inspectors, to the Superintendent, as early as possible after the fault has been removed, or at the end of the day if it still remains on. In making out the fault reports wires are to be referred to by their full names—not by code.

36. Whenever it is necessary to leave ladders on the railway they are to be secured by No. 8 wire to the pole on which work is being done, the ends of the wire being cut off close to the twist.

37. The entries made on the Lineman's visiting sheets are to be made in ink, care being taken to insert the name by which the places are known upon the stock lists. The sheets are to be signed by the Stationmasters or Signalmen when the apparatus and batteries have had the requisite examination and attention, and the Lineman is about to leave the place. The visiting sheets are to be sent to the District Inspector not later than Tuesday of the week following that to which they apply.

38. The Lineman is to report to the Inspector every case in which entries are made in the Signalmen's registers of bells missing or apparatus being out of order. A copy of such entries is to be made by the Lineman and sent to his Inspector by first train. The Inspector will ascertain what has been done or will determine what is required to be done and have the matter attended to at once. If there are no remarks in the book respecting the apparatus no return is to be made to the Inspector.

39. The Time Sheets are to be made out by the Inspectors and to be despatched so as to reach the Superintendent early on the morning of Friday in each week unless special instructions to the contrary are given. The authority for the carrying out of all new works, transfers, removals, etc., must be entered in the time sheet after the name of the work.

40. Linemen are allowed a small supply of stores, sufficient to enable them to meet any interruption to their wires, etc., and to carry on their maintenance duties during the month.

41. Forms for making application for such stores are sent out at the end of each month to the men concerned; they are to be filled up immediately and returned to the Superintendent. An advice of any



old material to be sent in to the stores by the Linemen is to be forwarded so as to reach the Superintendent in time for arrangements to be made for the train to be met on arrival.

42. Inspectors' applications for stores must specify the work for which such stores are required. Stores supplied for a specific work must be used on that work unless authority is obtained to use them otherwise.

43. Tablets used in the tablet form of instruments must be wiped clean and dry before being restored to the instruments.

44. It is desirable that telegraphists at offices in which test boxes are fixed, should possess a knowledge of their use, and thoroughly understand every description of instrument under their charge. Inspectors and Linemen must afford them assistance in acquiring such knowledge.

45. Inspectors, Foremen, Linemen, Assistant Linemen and others will have booked to them all tools which may be issued to them. The Inspectors are required to check the tools in the possession of the Linemen, etc., with the lists which will be supplied to them half-yearly.

46. All losses of tools are to be reported to the Superintendent, with a statement of the circumstances, in order that they may be replaced or crossed off the lists. Tools worn out are to be returned to the Superintendent at York for exchange.

47. Sunday labour is to be avoided as much as possible. In the case of removals to new signal boxes and the like, as much of the preparatory work as can be carried out previous to the date of removal is to be done.

# MAINTENANCE AND CONSTRUCTION REGULATIONS.

## MAINTENANCE & CONSTRUCTION REGULATIONS.

---

### BATTERIES.

1. Strict attention is required to the batteries in order to avoid failures and to ensure the proper working of the apparatus.
2. Battery closets are to be kept clean, dry, tidy and free from rubbish.
3. Where the batteries are numerous the sets belonging to the several circuits should be labelled and kept as far as possible separate from each other.
4. Linemen should on the occasion of each visit test the batteries with a "quantity" detector. One cell in good order will give as great a deflection as the whole battery; but a single bad cell will seriously interfere with the working of the entire set.
5. In connecting up a set of batteries care must be taken that none of them are reversed; the copper or carbon end of one battery must be connected to the zinc end of the next and so on.
6. Batteries must be kept dry but not in too warm a place or the liquid will evaporate quickly. If the liquid in a battery is frozen its action is stopped.
7. Linemen are to take such notes of the dates on which batteries are first put into use, and of the dates on which they are replated and renewed, as will enable them to give any information which may be required on this head.

## DANIELL (Sulphate of Copper). BATTERIES.

8. If two or more cells of a battery leak into each other a short circuit is formed; this also occurs if a porous partition is broken. In such a case the faulty cell or cells should be bridged over by connecting the straps of the battery plates by a piece of clean copper wire; this piece of wire is to be *soldered* to the straps.

9. The crystals of sulphate of copper put into the cells should be as large as possible; powdered sulphate of copper cakes together, dissolves very slowly, and cannot be removed from the battery without danger of breaking the cells.

10. In cleaning a sulphate battery the plates should be taken out and well scraped, the divisions of the trough thoroughly washed out and defective battery plates removed.

11. Before batteries are sent in for repair or renewal the battery plates are to be removed and the batteries washed out; the battery plates must be thoroughly cleaned and if in good condition used again; any recovered sulphate of copper being kept for future use.

## LECLANCHÉ BATTERIES.

12. Muriate of ammonia in the shape of "Voltoids" is used for charging these batteries.

For a cell of the No. 2 size 3 ounces (about 84 voltoids) are required; for the No. 1 size about 4 ounces (112 voltoids).

13. Water is to be poured into the glass cell so that when the porous cell is inserted the liquid will rise to a height of about two-thirds of that of the glass cell.

14. The solution in the glass cell should be clear; if it becomes cloudy it is an indication that more muriate of ammonia is required.

15. All the solution should then be drawn off and the cell again charged as at first with a fresh supply of muriate of ammonia and water.

16. When a battery is washed out the porous cells and zinc rods must be thoroughly cleaned before being replaced.

17. If a white deposit forms at the junction of the lead cap and the carbon plate it must be removed at once by means of a damp cloth.

18. Neither water nor muriate of ammonia must be allowed to remain on the terminals of a battery.

19. The terminals and connecting wires are to be kept quite clean and must not be touched with the fingers after muriate of ammonia has been handled.

20. Muriate of ammonia must not be kept in metal receptacles.

## EARTH WIRES.

21. It is as necessary that the earth connections of a circuit should be in perfect condition as it is that the line wire should be well and efficiently insulated.

22. Earth wires are to be of G.I. wire of No. 8 gauge and are to be connected to water pipes, *main* gas pipes, G.I. earthrods, the metals of the railway, or to such other objects as may be found to give a perfect earth connection.

23. Earthrods should be placed where the soil is as damp as possible.

24. The earth at each end of a circuit should be made from the same kind of metal; this is especially necessary in the case of short circuits.

25. When an earth connection is defective and offers a sensible resistance, a current sent on any one wire connected to it divides itself among the remaining wires, making the wires appear to be in contact.

### INSULATION.

26. For the proper working of a circuit it is necessary that the insulation should be as perfect as possible. With this object in view the insulators should be kept sound and free from dirt and any cracked or broken insulators replaced without delay.

### FAULTS & TESTING.

27. Faults on telegraph circuits are of three kinds viz:—

- Earths.
- Disconnections.
- Contacts.

An earth fault may be partial or full.

A disconnection may be total; or it may be partial as in the case of dirty or rusty contacts in the apparatus or when a joint is imperfectly soldered.

A contact may be full or partial; if two new wires are twisted together or if a piece of wire is thrown across them full contact will result; if the wires are rusty partial contact only will be noticed.

Partial contact is also caused by tree branches touching the wires, by cotton waste being thrown across them; by their resting against wet wood and in other ways.

28. The locality of such faults is to be found by testing.

29. In testing for "earth" a current is sent through a galvanometer from the testing office through the faulty wire, the wire being disconnected at certain points, previously arranged, in succession. If the circuit is disconnected on the testing station side of the fault, there will be no deflection of the galvanometer needle, but if the needle is deflected when the wire is disconnected at the next point (after having been again joined through at the first point) the fault is between that point and the point where the wire was first disconnected.

30. With a "disconnection," a similar course is followed, differing only in the fact that at the various test boxes the wire is connected to earth instead of being disconnected.

31. In testing for "contact" the wires must be disconnected at the testing points in succession; if when a current is sent on one wire and a galvanometer is put in circuit between the line and earth upon the other, no deflection of the galvanometer needle is observed, the wires have been disconnected on the testing station side of the

fault; if when the wires are disconnected at the next point (after having been again joined through at the first point) the needle deflects, the wires have been disconnected beyond the fault. The fault is therefore between the two points.

32. Before testing the line wire, it should be ascertained whether the fault is in the instrument or battery at the testing station. This is done by putting the instrument on short circuit, that is, by connecting together the A and B terminals of a single needle instrument with a piece of wire; if on moving the handle the needle then works properly the fault is not in the instrument or battery.

33. If the wire of a long circuit touch the wire of a short circuit, such as a block or bell wire, the long circuit will make *earth* through the short circuit, but *contact* will be strongly indicated on the long circuit.

34. To "cross" wires means to interchange them at each end or between two given points. To "put wires straight" means to restore them to their original places.

### POLE FITTING.

35. Arms are to be fitted on the South or East side of the pole only.

36. The slots cut in the pole are to be carefully cut at right angles to the pole, so that the arms fit tightly.

The slots need not exceed  $1\frac{1}{4}$  inch in depth.

37. The bolt hole for the top arm is to be bored 8 inches from the top of the pole. All other bolt holes are to be 12 inches apart.

38. Where 33 inch and 24 inch arms are used they are to be arranged alternately, viz.—the top arm is to be a 33 inch arm, the second a 24 inch, then a 33 inch and so on.

44 inch arms are to be used where desirable.

### POLE SETTING.

39. 18 and 20 feet poles are to be planted 4 feet 6 inches in the ground. 22 feet poles and over not less than 5 feet.

40. Pole holes or stay block holes must not be dug larger than is absolutely necessary.

41. For the earth wires of poles, new No. 8 gauge wire must be used. The earth wire is to be led down the pole from the top to the bottom leaving a projecting piece at the top; this projecting piece is not to be allowed to touch the roof. The earth wire is to be laid over the washers of the arm bolts and stapled at the top and bottom of each washer. Below the arms the staples are to be 30 inches apart.

42. Not less than 18 inches of wire must be placed at the foot of the pole.

43. Poles are to be placed 70 yards apart on straight lines and from 50 to 65 yards on curves, varying in accordance with the sharpness of the curve. They should be as regular as possible in height, and where they rise and fall, the rise and fall is to be properly graduated.

44. Roofs are to be fixed on the poles so that the ridges are parallel with the arms.

45. Pole steps are to be fixed 2 feet apart, and to be secured with  $3\frac{1}{2}$  inch coach screws.

46. Bridge Brackets are to be fixed with 5 inch coach screws.

Stay Brackets with  $2\frac{1}{2}$  inch coach screws.

### GUARDS.

47. Wires are to be guarded at public roadways and footpaths, at gate crossings, on curves towards the railway, and at other points when for any reason it may appear desirable to do so.

### STAYS.

48. All terminal poles and line crossing poles are to be stayed and provided with tighteners. Poles on curves towards the railway are also to be stayed.

49. High road crossing poles are to be stayed on each side (*i.e.* double stayed).

50. As a rule, poles carrying 5, or less than 5 wires only require staying upon the curves; in wild parts of the country or in elevated districts however, it may be desirable to stay the poles upon the straight as well as upon the curves, no matter what number of wires they carry.

51. Poles carrying more than 5 wires must be stayed on the straight as well as on the curves as may appear to be desirable.

52. For a line of poles carrying less than 5 wires a three strand stay of No. 8 wire will suffice for ordinary curves, but where the curve is severe a five strand stay wire is to be used.

53. For a pole line carrying 6 to 9 wires a stay wire of five strands is to be used.

54. For a pole line carrying 10 or more wires a stay wire of seven strands is to be used.

55. Where the facilities for staying are limited, and ordinary stays cannot be used one or more wood blocks are to be placed at the foot of the pole, so as to take the thrust.

56. All stays are to be neatly and carefully fixed.

57. The greatest care is to be taken in so placing them that there shall be no chance of their coming into contact with the line wires due to their expansion or contraction. No stay wire is to be within 1 inch of the line wire above it, or within 2 inches of the line wire below it.

58. All stays to poles at bridges are to be fixed where possible on the railway (not the road) side of the parapet walls, but if this cannot be done they are to be placed close to the walls.

59. Stay blocks are to be 36 inches by  $9\frac{1}{2}$  inches by 5 inches in size, or thereabouts, and are to be placed not less than 4 feet in the ground. The stay blocks for line crossing and terminal poles are to be placed 6 feet in the ground.

### WIRING.

60. In erecting wires a dip of 20 inches is to be allowed in mild weather and 14 inches in frosty weather in a span of 70 yards, and proportionately for longer or shorter spans.

61. The lowest wires are to be 20 feet from the ground at high road crossings; 17 feet at crossings over the railway, and 16 feet at field gate crossings.

62. Attention is particularly directed to the care necessary in erecting or taking down wires so as to prevent accidents at high road or other crossings from the wires catching or becoming entangled with foot-passengers, horses or vehicles. Such accidents can be prevented if efficient arrangements are made, and Foremen must see that their men carry out the arrangements properly.

63. In erecting block wires the two wires for the block instruments should, where possible, be run upon the same arm, and in connecting them up to the instruments that on the down side of the poles should be devoted to the block instrument governing trains on the Down line, and that on the up side of the poles to the block instrument governing trains on the Up line.

64. Wires crossing over lines of railway are to be terminated or shackled at each side.

65. Copper wire is to be used for the crossing wires to cabins, offices, &c.

### BINDING IN OF WIRES.

66. The approved methods of binding in iron and copper wires must be adhered to.

67. Wires are to be bound in on the outside of the insulators on straight lines; on saddle insulators on the side of the insulators the further from the railway; on curves so as to pull against the insulators.

### TARRING.

68. Poles are to be tarred when first erected and at periodical intervals. The tarring is to extend 4 feet above the ground line and 1 foot 6 inches below.

69. Saddles, pole roofs, stay wires, stay rods, stay brackets, bridge brackets, stay tighteners, notches for arms, open wires and cables through tunnels, and in the neighbourhood of cabin, &c., chimneys are to be tarred; also wood troughing and iron pipes used for telegraphic and telephonic purposes.

---

70. No. 8 G I wire is to be used for insulated earth wires.

71. Holdfasts for fixing casing are to be placed 12 inches apart.

72. Soldering paste is to be used for jointing copper wires.

73. Poles which carry wires over public roads must be frequently examined and kept in good condition. The stays of such poles must be perfectly maintained and the wires guarded.

74. No pole, stay pole, strut, stay, arm in bridge, bridge bracket, or other fixture must be placed within 4 feet 6 inches of the metals.

75. Old poles when not dug out must be cut off 6 inches below the ground line, and the ground properly filled in.

76. Wires are to be renewed one at a time.

77. A wire drum is to be used in paying out new wire and in coiling up old wire.

78. Joints made between iron and copper wires are to be well tarred.

79. Where two covered wires are required in connection with telephone circuits, twin twisted wire is to be used.

80. Poles are never to be cut at the bottom or butt end.

81. The two wires forming a double wire telephone circuit are to be erected on one side of a 44 inch arm; never with the pole between them.

82. Apparatus are to be connected up in accordance with the approved diagrams.

83. Foremen are to record, in carrying out works, the name of the man making the joints so that in the event of defective work, the fault may be brought home to the offender.

84. Short pieces of wire must not be left lying about the railway; they are frequently thrown upon the wires so causing interruptions.

The length of

1 cwt. of No. 8 G.I. wire is 566 yds.	} S.W.G.
1 " " 10 " " " 882 " "	
1 " " 16 " " " 3500 " "	

No. 12 $\frac{1}{2}$  copper wire weighs 150 lbs. per mile.  
 " 14 " " " 120 " " "

The length of

1 cwt. of $\frac{11}{16}$ stay wire is 188 yds.
1 " " $\frac{11}{16}$ " " " 113 " "
1 " " $\frac{11}{16}$ " " " 80 " "

---

The above instructions will take effect as on and from 1st December, 1903, and they will cancel all previous instructions issued to the Maintenance and Construction Staff.

CHARLES H. ELLISON,

TELEGRAPH SUPERINTENDENT.

York, *November*, 1903.