देवेन्द्र कुमार शर्मा
महाप्रबंधक
Devendra Kumar Sharma
General Manager

मध्य रेल, छत्रपति शिवाजी महाराज टर्मिनस,
मुंबई - 400 001.
CENTRAL RAILWAY
CHHATRAPATI SHIVAJI MAHARAJ TERMINUS
MUMBAI - 400 001

दिनांक : 31.12.2018

संदेश

मुझे यह जानकार अत्यंत प्रसन्नता हो रही है कि मध्य रेल के पुणे मंडल द्वारा कर्मचारियों की जानकारी एवं लाभ हेतु विभिन्न पुस्तिकाएं जैसे- '**स्थापना प्रश्न-मंच**' (Establishment Question Bank), नवनियुक्त कर्मचारियों को रेल संबंधी प्राथमिक नियमों की जानकारी हेतु '**स्वागत पुस्तिका**', सेवानिवृत्त कर्मचारियों के लिए '**निपटारा पुस्तिका**' एवं '**वरीयता सूची**' को प्रकाशित किया जा रहा है। साथ ही, यह पुस्तिकाएँ एवं अन्य सुविधाएं 'railkarmikseva' App एवं 'www.railkmarmikseva.in' पोर्टल पर उपलब्ध कराना पुणे मंडल का Digital India की ओर एक सराहनीय कदम है।

रेल प्रशासन अपने कर्मचारियों के हितों को लेकर सदैव तत्पर रहा है। इन पुस्तिकाओं के माध्यम से नव-नियुक्त कर्मचारी, कार्यरत कर्मचारी एवं सेवानिवृत्त कर्मचारी भी लाभान्वित होंगे। मुझे आशा है कि कर्मचारियों के हित में किए जा रहे इन कार्यों का सभी क्षेत्रों में लाभ मिलेगा।

उक्त पुस्तिकाओं के सफल प्रकाशन के लिए मैं पुणे मंडल का हार्दिक अभिनंदन करता हूं।

31.12.2018

(देवेन्द्र कुमार शर्मा)
महाप्रबंधक

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सत्यमेव जयते
भारत सरकार / Government of India
रेल मंत्रालय / Ministry of Railways
मध्य रेल / Central Railway

एन. स्वामिनाथन आय. आर. पी. एस.
प्रधान मुख्य कार्मिक अधिकारी
N. Swaminathan I.R.P.S.
Principal Chief Personnel Officer

प्रधान कार्यालय / Headquarters' Office,
कार्मिक विभाग / Personnel Department,
मुंबई छ.शि.ट. / Mumbai CST 400 001.

संदेश

कार्मिक विभाग, पुणे मंडल निरंतर कर्मचारियों के हित में विभिन्न योजनाओं के माध्यम से प्रयासरत रहा है। इसी कड़ी में 'स्थापना प्रश्न-संच' का प्रकाशन पुणे मंडल द्वारा किया जा रहा है। यह प्रश्न संच कर्मचारियों को विभागीय परीक्षा के अध्ययन के लिये काफी सहायक होगा।

किसी भी संगठन में पदार्पण करने के पश्चात प्रत्येक कर्मचारी को उस संगठन द्वारा दी जाने वाली सुविधा एवं संगठन के नियमों की संपूर्ण जानकारी होना अत्यंत आवश्यक है। कर्मचारियों की इस आवश्यकता को देखते हुए पुणे मंडल द्वारा नव-नियुक्त कर्मचारियों के लिए 'स्वागत पुस्तिका' का प्रकाशन किया जा रहा है उसी तरह कार्यरत कर्मचारियों की 'वरीयता सूची' एवं सेवानिवृत्त कर्मचारियों की जानकारी एवं उपयोग हेतु 'निपटारा पुस्तिका' का प्रकाशन भी किया जा रहा है।

'स्वागत पुस्तिका'एवं 'निपटारा पुस्तिका' के माध्यम से नव-नियुक्त कर्मचारी एवं सेवानिवृत्त कर्मचारियों को रेल सेवा के नियमों तथा कर्मचारियों को सेवानिवृत्ति के पश्चात प्रदान की जाने वाली सुविधाओं की जानकारी मिल सकेगी जिसका वे भविष्य में लाभ उठा सकेंगे।

पुस्तिकाओं में शामिल जानकारी रेलवे बोर्ड/मध्य रेल मुख्यालय द्वारा समय-समय पर जारी की गई अधिसूचनाओं, परिपत्रों और नियमों पर आधारित हैं।

पुस्तिका प्रकाशन के लिए मैं मंडल रेल प्रबंधक तथा कार्मिक विभाग, पुणे को हार्दिक शुभकामनाएं देता हूं।

(एन. स्वामिनाथन)
प्रधान मुख्य कार्मिक अधिकारी
मध्य रेल, मुंबई छशिमट

मिलिंद देऊस्कर (आईआरएसएस)
मंडल रेल प्रबंधक

MILIND DEOUSKAR (IRSS)
Divisional Railway Manager

सत्यमेव जयते

मंडल रेल प्रबंधक कार्यालय
पुणे मंडल, मध्य रेलवे, पुणे 411 001.
Office of the Divisional Railway Manager
Pune Division, Central Railway, Pune - 411 001.
Tel (BSNL) : 020 - 26137400 | Rly.: 55000

संदेश

पुणे मंडल का कार्मिक विभाग सदैव ही अपनी विविधतापूर्ण कार्य - शैली से हर क्षेत्र में अग्रणी रहा है। पुणे मंडल में नव-नियुक्त कर्मचारी, कार्यरत एवं सेवानिवृत्त कर्मचारियों के हितों को ध्यान में रख कर बनाई गई 'स्वागत पुस्तिका' 'सेटलमेंट पुस्तिका', 'वरीयता सूची' एवं 'अस्थापना प्रश्न-संच'का प्रकाशन कार्मिक शाखा की एक और उपलब्धि है।

इन पुस्तिकाओं को 'railkarmikseva' App एवं 'www.railkarmikseva.in' पोर्टल पर भी उपलब्ध कराया गया है।

मेरा मानना है कि रेल प्रशासन में रेलों के सुरक्षित संचालन का जितना महत्व है उतना ही महत्व इस संचालन के लिए प्रत्यक्ष एवं अप्रत्यक्ष रूप से कर्मचारियों के हितों के संबंध में आवश्यक और उपयोगी जानकारी को सहजता से उपलब्ध कराना भी है ।

इस कार्य को पूर्ण करके महाप्रबंधक महोदय के कर-कमलों से इस पुस्तिका का विमोचन करने के लिए कार्मिक विभाग के सभी अधिकारी एवं कर्मचारियों को मैं हार्दिक बधाई देता हूं।

हार्दिक शुभकामनाओं सहित ।

(मिलिन्द देऊस्कर)

प्रफुल्ल चन्द्रा (भा.रे.वि.इं.से.)
अपर मंडल रेल प्रबंधक

PRAFULLA CHANDRA (IRSEE)
Additional Divisional Railway Manager

सत्यमेव जयते

मंडल रेल प्रबंधक कार्यालय
पुणे मंडल, मध्य रेलवे, पुणे 411 001.
Office of the Divisional Railway Manager
Pune Division, Central Railway, Pune - 411 001.
Tel (BSNL) : 020 - 26141100 | Rly.: 55002

संदेश

किसी भी संगठन के लिए उसका मानव संसाधन ही उसकी सबसे बड़ी संपत्ति होती है। मुझे प्रसन्नता है कि पुणे मंडल की कार्मिक शाखा द्वारा एक नई पहल करते हुए सेवारत एवं सेवानिवृत्त कर्मचारियों के हित में 'अस्थापना प्रश्न संच', 'स्वागत पुस्तिका' 'सेटलमेंट पुस्तिका' एवं 'वरीयता सूची' का प्रकाशन किया जा रहा है।

डिजिटल इंडिया अभियान तथा कागज रहित कार्यालय की संकल्पना को लागू करने के लिए सभी पुस्तिकाएँ कार्मिक विभाग द्वारा विकसित किए गए 'railkarmikseva' App एवं 'www.railkmarmikseva.in' पोर्टल पर उपलब्ध कराने के यशस्वी कार्य के लिए मैं कार्मिक विभाग के सभी अधिकारी एवं कर्मचारियों की सराहना करता हूं एवं हार्दिक शुभकामनाएँ देता हूं।

31/12/18

(प्रफुल्ल चंद्रा)
अपर मंडल रेल प्रबंधक, पुणे

भारत सरकार/Government of India
रेल मंत्रालय/Ministry of Railways

डॉ. शिंदे तुशाबा, आय.आर.पी.एस.
वरिष्ठ मंडल कार्मिक अधिकारी

Dr. Shinde Tushaba, I.R.P.S
Sr. Divisional Personnel Officer

मध्य रेल कार्यालय
पुणे मंडल

Central Railway Office
Pune Division

मनोगत

श्री देवेंद्र कुमार शर्मा जी, महाप्रबंधक महोदय द्वारा वार्षिक निरीक्षण के दौरान नव-नियुक्त कर्मचारियों के लिये 'स्वागत पुस्तिका', 'स्थापना प्रश्न-संच', 'सेटलमेंट पुस्तिका' एवं 'वरीयता सूची' का विमोचन करने के लिए आपको सौंपने का हमें सौभाग्य मिला है इसलिए हम महाप्रबंधक महोदय के अत्यंत आभारी है।

हमारे प्रधान मुख्य कार्मिक अधिकारी श्री एन. स्वामिनाथन सर हर समय हमें मार्ग दर्शन करते हैं। इस कार्य के लिए भी उन्होंने हमें मार्गदर्शन एवं प्रेरणा दी है। इसलिये कार्मिक विभाग की तरफ से सर का हम आभार व्यक्त करते हैं।

साथ में श्री मिलिन्द देऊस्कर, मंडल रेल प्रबंधक का मार्गदर्शन हमारे लिए सदैव प्रेरणादायी होता है। इन पुस्तिकाओं के प्रकाशन में भी उनका अमुल्य मार्गदर्शन एवं सहयोग मिला है। इसके लिये हम मंडल रेल प्रबंधक के आभारी है।

अपर मंडल रेल प्रबंधक का मार्गदर्शन पुस्तिकाएँ पूर्ण करने में बहुमूल्य रहा। इसके लिये हम अपर मंडल रेल प्रबंधक के भी हम कृतज्ञ है।

'स्थापना प्रश्न-संच' के प्रकाशन में श्री यू. सी. बोडके, मंडल कार्मिक अधिकारी, 'वरीयता सूची' के प्रकाशन में श्री एस. वी. ठाकूर, सहायक कार्मिक अधिकारी, 'स्वागत पुस्तिका' एवं 'सेटलमेंट पुस्तिका' के प्रकाशन में श्री सुनिल ठाकूर एवं श्री रमेंश अय्यर, सहायक कार्मिक अधिकारी का विशेष योगदान प्रशंसनीय है।

इन पुस्तिकाओं के प्रकाशन के लिए श्री विश्वामित्र वरिष्ठ राजभाषा अधिकारी का अमूल्य योगदान रहा है जिसके लिए उनके प्रति भी हम आभार व्यक्त करते हैं।

कार्मिक विभाग के सभी कर्मचारियों के प्रत्यक्ष या अप्रत्यक्ष दिये गये योगदान के लिए मैं आभारी हूँ।

यह सभी पुस्तिकाएं **'railkarmikseva' App** एवं **'www.railkmarmikseva.in'** पोर्टल भी उपलब्ध कराई गई है जिससे इन पुस्तिकाओं का उपयोग संपूर्ण रेल के कर्मचारी कर सकते हैं।

धन्यवाद,

Tshinde 31/1/18

डॉ. शिंदे तुशाबा
वरिष्ठ मंडल कार्मिक अधिकारी, पुणे

मध्य रेल

पुणे मंडल

“स्थापना प्रश्न - संच”

संरक्षक

श्री मिलिन्द देऊस्कर

मंडल रेल प्रबंधक

मार्गदर्शक

श्री प्रफुल्ल चंद्रा

अपर मंडल रेल प्रबंधक

संपादक

डॉ. शिंदे तुशाबा

वरिष्ठ मंडल कार्मिक अधिकारी

सह संपादक

श्री उत्तमराव बोडके

मंडल कार्मिक अधिकारी

विशेष सहयोग

श्री सुनिल ठाकूर

सहायक कार्मिक अधिकारी (यांत्रिक)

सहयोग

कार्मिक विभाग के समस्त कर्मचारी

एवं अन्य सहयोगी कर्मचारी

Signalling

1	क्षेत्रीय रेलवे में सिग्नलिंग तथा टेलिकॉम विभाग के प्रमुख _____ है। ____ is the head of Signal and Telecom department in the Zonal Railway. **PCSTE**
2	एम ए सी एल एस (मल्टी आस्पेक्ट कलर लाइट सिग्नल) स्टॉप सिग्नल में न्यूनतम द्रश्यता_____ आवश्यक है | The maximum visibility required to MACLS (Multi aspect color light signal) stop signal is _____. **200 meter**
3	जब ट्रेन कॉलिंग ऑन सिग्नल पर पर रिसिव होती है, तो ट्रेन की गति _____ होनी चाहिए । When the train is received on Calling On signal, the speed should be _____. **10 KMPH.**
4	टंग और स्टॉक रेल के बीच _____ गैप होने पर पॉइंट फेल होना चाहिए | Point should fail with a gap of _____ in between tongue and stock rails. **5 mm.**
5	यदि ब्लाक इंस्ट्रूमेंट फेल होता है तो ट्रेन ब्लाक सेक्शन में _____की सहायता से जा सकती है | If block instrument fails, train can go in block section with the help of _____. **PLCT**
6	स्टेशन पर अधिकतम गति 150 Kmph है | यह _____ स्टैण्डर्ड की इंटरलॉकिंग है | Maximum speed at station is 150 Kmph. The interlocking is of _____ standard. **III(R)**
7	एल ई डी सिग्नल्स के लिए _____ वोल्टेज की आवश्यकता होती है | The voltage required for LED signals is _____ **110V AC**
8	आई पी एस के लिए उपयोग होने वाली वी आर एल ए बैटरीज की कैपेसिटी _____ में मापी जाती है | The capacity of VRLA batteries used in IPS are measured in _____. **AH**
9	भारत में पुश बटन टोकन लेस ब्लॉक्स _____ वर्कशॉप में निर्माण किया जाता है

	Push button token less blocks are manufactured in India by _____ workshop. **Podanur**
10	पॉइंट मशीन के लिए 230 वोल्ट एसी की आवस्यकता होती है | Voltage required for point machine to operate is 230V AC. **False**
11	यदि आटोमेटिक सिग्नल क्षेत्र में ड्राईवर को सिग्नल मिलता है तो उसे रुकने की जरुरत नहीं होती है | If a driver encounters Red signal in automatic signal territory he will not stop the train. **False**
12	पॉइंट मशीन द्वारा पॉइंट को लॉक, होल्ड, डिटेक्ट व सेट किया जाता है | Point machine holds, detects, locks and sets the points. **True**
13	पॉइंट के सेट होने पर क्लोज स्विच में 3 एम एम से ज्यादा गैप नहीं होना चाहिए | In set condition, maximum gap in closed switch should not be more than 3mm. **True**
14	यदि लाइन क्लियर न लिया हो तो एडवांस स्टार्टर ऑफ नहीं होगा | If line clear is not taken, then advance starter cannot be taken off. **True**
15	ट्रेन वाहन की उपस्थिति का पता लगाने के लिए ट्रैक सर्किट का इस्तेमाल किया जाता है । Track circuit is used to detect presence of train vehicle over it. **True**
16	सिग्नल बल्ब के लिए 12 वोल्ट डी सी की आवस्यकता होती है | Signal bulb requires 12V DC to glow. **False**
17	जब ब्लाक स्टेशन में ट्रेन प्रवेश कर जाये, उसके बाद भी एडवांस स्टार्टर पुनः दिया जा सकता है | When the train is entered in block section, the advance starter can be taken off (lowered) again. **False**
18	सर्विस से निष्कासन एक छोटी शास्ति है । Removal from service is a minor penalty. **False**
19	बैल बीट मिसिंग होना एक सामान्य फेलियर है, जो की केबल के टूटने/डैमेज होने से हो सकता है | Bell beat missing is general failure of Block instrument which may

	occur during cable cut/damage. **True**
20	सिग्नल ब्लेंक होने पर, उससे जुड़े सिग्नल (पीछे वाला) लाल आस्पेक्ट अवस्था में आ जाते है । In case of Signal blanking, the associated (following) signal goes back to restrictive (Red) aspect. **True**
21	डिस्टेंट सिग्नल का नार्मल आस्पेक्ट पीला होता है । The normal aspect of distant signal is yellow. **True**
22	आई पी एस में लगे सर्ज प्रोटेक्शन डिवाइस आग से बचने का कार्य करते है । Surge protection devices in IPS are used to protect any damage from Fire. **False**
23	वी आर एल ए बैटरीज से सामान्यतः एसिड फ्यूम्स निकलते है । Acid fumes are generally released from VRLA batteries. **False**
24	स्टील स्लीपरों का इस्तेमाल ट्रैक सर्किट क्षेत्र में करंट के लीकेज से बचने के लिए किया जाता है । Steel sleepers are used in track circuited area to avoid leakage of currents. **False**
25	कमरे में धुआँ या आग का पता लगाने के लिए फ्यूज अलार्म सिस्टम का उपयोग किया जाता है । Fuse alarm system is used to detect any smoke or fire in rooms. **False**
26	आईपीएस का एसएमआर पैनल बैटरी बैंक को चार्ज करने के लिए लगभग 110 व्होल्ट एसी आउटपुट देता है । The SMR panel of IPS gives AC output of approximately 110V to charge the battery bank. **False**
27	एमएसडीएसी द्वारा ट्रैक सर्किटिंग को पानी युक्त क्षेत्र / मडी (मिट्टी युक्त) क्षेत्रों के लिए इस्तेमाल किया जा सकता है । Track circuiting by MSDAC can be used for water logged / muddy areas. **True**
28	ब्लॉक खंड में किसी भी वाहन का पता लगाने के लिए बीपीएसी (ब्लॉक प्रूव्हिंग एक्सल काउंटर) का उपयोग किया जाता है । BPACs (Block proving axle counters) are used to detect any left out vehicle in the block section. **True**

29	केबल रूट ट्रैसर (लोकेटर) का उपयोग पांईट फेलियर के दौरान स्टाक तथा टंग रेल की बीच की दूरी नापने के लिए किया जाता है । Cable route tracers (locators) are used to detect the gap between stock and tongue rail during point failures. **False**
30	सामान्य तौर पर, स्वचालित संकेत क्षेत्र में दो संकेतों के बीच की दूरी लगभग 2 किलोमीटरहोती है। In general, the distance between two signals in automatic signaling territory is approximately 2 kms. **False**
31	रेक्टीफाइर्स का उपयोग ____ कन्वर्ट करने के लिए किया जाता है (क) डीसी से एसी, (ख) एसी से डीसी, (ग) उच्च वोल्टेज से कम वोल्टेज, (घ) कम वोल्टेज से उच्च वोल्टेज । Rectifiers are used to convert: (a) DC to AC, **(b) AC to DC,** (c) High voltage to low voltage, (d) Low voltage to high voltage.
32	धातु बिजली के अच्छे कंडक्टर हैं क्योंकि (क) उनमे मुक्त इलेक्ट्रॉन होते हैं ।(ख) इनमे परमाणु लाईटली पैक्ड होते हैं । (ग) उनकी उच्च पिघलन बिंदु होती है ।(घ) उपरोक्त सभी । Metals are good conductors of electricity because: **(a) they contain free electrons,** (b) the atoms are lightly packed, (c) they have high melting point (d) All of the above
33	पुणे डिवीजन में कौन से ब्लॉक इंस्ट्रूमेंट स्थापित नहीं है? (क) निल्स बॉल टोकन (ख) एफ एम डायडो प्रकार का, (ग) पोदनुर प्रकार का (घ) एस जी ई प्रकार का Which of the block instrument is not installed in Pune division? (a)Neale's Ball token, **(b) FM Daido type,** (c) Podanur type, (d) SGE type.
34	इनमे से कौन डीसी ट्रैक सर्किट से संबंधित नहीं है । (क) कंट्युनिटी बॉड, (ख) क्युटीए2 / क्युटी2 रिले, (ग) ग्लुड जॉईट / ब्लाक जॉईट, (घ) जीएलएसआर कंडेनसर Which is not related to DC track circuit - (a) Continuity bond, (b) QTA2/QT2 relays, (c) Glued joint/block joint, **(d) GLSR condenser**
35	इनमे से कौन आंतरिक गियर की श्रेणी के अंतर्गत आता है (क) कंटीग ईन रिले (ख) सिग्नल लैंप डी ई एल / (ग) ट्रैक रिले (घ) आईपीएस का वितरण पैनल Which comes under category of Indoor gears:

	(a) Cutting in relays (b) Signal lamps/LEDs, (c) Track relays**, (d) Distribution panel of IPS**
36	निम्नलिखित में से कौन सा स्टेशन पुणे मंडल के अंतर्गत आता है ? (क) लोनावाला, (ख) दौंड, (ग) कुर्दुवाडी, (घ) बारामती Which station comes under Pune Division - (a) Lonavala, (b) Daund, (c) Kurduvadi, **(d) Baramati**
37	ब्रॉड गेज में स्विच के टो (अंगूठे) पर ओपनिंग जब स्विच ओपन हो तो कितना एम एम होना चाहीए । (क) 260, (ख) 115, (ग) 160, (घ) 220 The opening at the toe of the switch in mm in the case of an open switch in broad gauge is _____ (a) 260, **(b) 115,** (c) 160 (d) 220
38	भारतीय रेलवे सिविल इंजीनियरिंग संस्थान (आई.आर.आई.सी.ई.एन.) कहां स्थित है ? (क) नाशिक, (ख) मुंबई, (ग) सिकंदराबाद, (घ) पुणे Where is Indian Railway Institute of Civil Engineering (IRICEN) located (a) Nasik, (b) Mumbai, (c) Secunderabad **(d) Pune**
39	पॉईट टेस्टींग मे ऑबस्ट्रक्शन करंट की रेंज ------ होती है ? (क) मिली एम्पीअर, (ख) मायक्रो एम्पीअर (ग) किलो एम्पीअर, (घ) एम्पीअर The obstruction current in point testing is generally in range of _____ a) mili-amperes b) micro-amperes c) Kilo-amperes **d) Amperes**
40	फोर आसपेक्ट सिगनल मे आसपेक्टस् को उपर से निचे के क्रम मे जमाए । (क) लाल, हरा, पीला, पीला, (ख) हरा, लाल, पीला, पीला (ग) पीला, हरा, पीला, लाल (घ) हरा, पीला, पीला, लाल The display of aspects in a four aspect signal from top to bottom is a) Red, Green, Yellow, Yellow b) Green, Red, Yellow, Yellow **c) Yellow, Green, Yellow, Red** d) Green, Yellow, Yellow, Red
41	आउटपुट गियर की श्रेणी के अंतर्गत कौन सा उपकरण आता है? (क) सिग्नल ग्रुप, (ख) फ्यूज विफलता अलार्म सिस्टम, (ग) पैनल और क्रैंक हैन्डल बॉक्स (घ) एलईडी सिग्नल Which of the equipment's comes under category of outdoor gears? a) Signal Group b) Fuse failure alarm system c) Panel and crank

	handle box **d) LED Signal.**
42	कौन सा स्टेशन टर्मिनल नहीं है । (क) बारामती, (ख) कोल्हापुर, (ग) सातारा, (घ) फलटण Which one is not the terminal station- a) Baramati b) Kolhapur **c) Satara** d) Phaltan
43	पी.टी.ओ. के 4 सेट निम्नलिखित में से किसे मिलते है? (क) सभी समूह, (ख) समूह "क" और "ख" अधिकारी केवल, (ग) समूह "क", "ख" और "ग" कर्मचारी केवल, (घ) उपरोक्त में से कोई नहीं 4 sets of PTO are admissible to **a) All groups** b) Group "A" & "B' Officers only. c) Group "A" , "B" & "C" only d) None of these
44	सौर मॉड्यूल का उपयोग सूर्य की प्रकाश ऊर्जा (photons) के माध्यम से बिजली उत्पन्न करना है । **सही** Solar modules use light energy (photons) from the sun to generate electricity. (True/False) **Answer - True**
45	मेंटेनेंस फ्री RDSO प्रकार की अर्थिंग हमेशा 1 ओह्म्स के नीचे होना चाहिए । **सही** Maintenance free RDSO type earthing must always be less than 1 ohms. (True/False) **Answer - True**
46	धरती एक आदर्श equipotential सतह की तरह काम करती है, जो की बिजली चमकने (lightening) के दौरान current के प्रवाह को धरती में सम्मिलित कराने में मदद करती है । **सही** Earth act as ideal equipotential surface, therefore used to divert flow of current to earth during lightening. (True/False) **Answer - True**
47	हिंदी में प्राप्त पत्रादि का उत्तर हिंदी में देना अनिवार्य है । **सही** The letters issued in Hindi are required to be compulsorily replied in Hindi language. (True/False) **Answer - True**
48	हिंदी भाषा को राजभाषा का दर्जा प्राप्त है । **सही** Hindi language has been given official status of Rajbhasha. (True/False) **Answer - True**
49	मैटरनिटी छुट्टी (Maternity leave) 120 दिनों के लिए ली जा सकती है और इन्हें मेडिकल सर्टिफिकेट देकर 2 साल तक बढाया जा सकता है ।

	गलत Maternity leave can be taken for 120 days and can be extended up to 2 years with medical certificate. (True/False) **Answer - False**
50	पेटरनिटी छुट्टी (Paternity leave) एक बार में 15 दिनों की अवधि के लिए 6 महीने में 2 बार ली जा सकती है | **(गलत)** Paternity leave can be taken in a span of 15 days for 2 times in 6 months duration. (True/False) **Answer - False**
51	LAP के संचय के लिए अधिकतम सीमा ..... दिन है| Maximum limit for accumulation of LAP is_____ days. **Answer - 120 days**
52	सेवा से बर्खास्तगी सामान्यतया रेलवे प्रशासन या सरकार के अंतर्गत भविष्य के रोजगार के लिए अयोग्यता के रूप में माना जा सकता है | **गलत** Dismissal from service shall ordinarily be treated as disqualification for future employment under the Government or Railway Administration. **Answer – False**
53	SF-5 is Memorandum of charge for Imposing minor penalties (True/False) **Answer – False**
54	रिमूवल एक मेजर (major) पेनल्टी है | **सही** Removal is a major penalty. (True/False) **Answer - True**
55	राष्ट्रपति द्वारा दिए किसी आर्डर के लिए, कोई भी अपील उसके खिलाफ नहीं की जा सकती | **सही** If any order is made by the President, no appeal can be made against it. (True/False) **Answer - True**
56	संविधान की आठवीं अनुसूची में ..... (20/22/24) भाषाओं को शामिल किया गया हैं | There are _____ numbers of languages included in eighth schedule of constitution. (20/22/24) **Answer - 22**
57	स्कूल अकाउंट पर जारी किये पास, सुविधा पास के अंतर्गत आते है | **गलत** Privilege Passes includes passes issued on School account. (True/False) **Answer - False**

58	किसी को जारी किया चेक पास, सुविधा पास के खाते से काटे जाते है | **गलत** Whenever cheque pass is issued to individuals, it is debited from privilege pass. (True/False) **Answer – False**
59	प्रशासनिक कार्यालयों में काम कर रहे Ministerial कर्मचारियों को HOER नियमो के ..... (Intermittent/Essentially Intermittent/Continuous) श्रेणी में रखा गया है | Ministerial staff working in administrative offices comes under_____ category of HOER rules. (Intermittent/Essentially Intermittent/Continuous) **Answer - Intermittent**
60	आकस्मिक अवकाश एक विशेष प्रकार की छुट्टी है | **गलत** Casual Leave is special type of Leave. (T/F) **Answer – False**
61	Which one is not used as component in D.C track circuit- a) QT2 Track relay b) Continuity bond c) B-Type choke d) Alpha bond निम्नलिखित में कौन डीके सर्किट ट्रैक .सी. घटक के रूप में उपयोग नहीं किया जाता - क) QT2 ट्रैक रिले ख) निरंतर (Continuity) बांड ग) B-प्रकार चोक घ) अल्फा बॉण्ड **Answer – d) Alpha bond**
62	ऑडियो आवृत्ति (फ्रीक्वेंसी) ट्रैक सर्किट इस्तेमाल किया जा सकता - क) ए.सी. विद्युतीकृत सेक्शन में ख) डी.सी. विद्युतीकृत सेक्शन में ग) गैर विद्युतीकृत सेक्शन में घ) ऊपर के सभी जगहों पर Audio Frequency Track Circuits can be used in a) AC electrified b) DC electrified c) Non- electrified sections d) all of the above **Answer – d) all of the above**
63	पॉइंट मशीन में, ऑब्सट्रकसन करंट नार्मल वर्किंग करंट से _____ ज्यादा होता है | क) 2 times ख) 0.5 times ग) 100 times घ) 4 times In point machines, Obstruction current shall not be more than _____ of normal working current. a) 2 times b) 0.5 times c) 100 times d) 4 times **Answer – a) 2 times**
64	पॉइंट मशीनों का नोमिनल ऑपरेटिंग वोल्टेज आमतौर पर कितना रहता है- क) 110 वोल्टAC ख) 110 वोल्टDC ग) 110वोल्टAC/DC घ) इनमे से कोई नहीं The point machine (IRS/Siemens) are generally rated for nominal operating voltage of – a)110 VAC b) 110 VDC c) 110VAC/DC d) none of the above **Answer – b) 110 V DC**

65	एल.ई.डी (LED) सिग्नल का नार्मल ऑपरेटिंग वोल्टेज रहता है- क) 110 वोल्टAC ख) 110 वोल्टDC ग) 230वोल्टAC घ) इनमे से कोई नहीं Normal operating/working voltage of LED signal unit is / are ---------- a) 110 volt AC b) 110 volt DC c) 230 AC d) None **Answer – a) 110 V AC**
66	एल - है रहता कितना लगभग कंसम्पशन करंट का सिग्नल्स डी.ई. Amperes ख (Mili-amperes ग(Micro-amperes घ(Kilo amperes The current consumption of LED aspect signals is generally in – Amperes b) Mili-amperes c) Micro-amperes d) Kilo amperes **Answer – b) Mili-amperes**
67	बैटरियों के सेल्स)cells की (क्षमता बताई जा सकती है ____x____ से | The capacity of cells (batteries) is expressed in terms of _____x_____. **Answer – Ampere x Hour (AXH)**
68	जब पॉइंट मध्य स्थिति में हो पोजीशन मेड" कॉन्टेक्ट्स डिटेक्शन तथा कंट्रोल तब , "(हुए बने)में रहने चाहिए) |सही(गलत/ When point is in mid position, then all control and detection contacts must be in "made position" in Point machine. (True/False) **Answer - False**
69	मशीन द्वारा चालित पॉइंट के ऑब्सट्रकसन टेस्ट में 5mm टेस्ट पट्टी से - पॉइंट लॉक नहीं होगा ख जायेगा हो स्लिप क्लच फ्रिक्शन (ग) डिटेक्शन कॉन्टेक्ट्स मेक नहीं होगे घ) ऊपर के सभी During obstruction test of machine operated point with 5mm test piece ---------- a) Point shall not lock b) Friction clutch shall slip c) Detection contacts shall not make d) all of the above **Answer – d) All of the above**
70	जब पॉइंट नार्मल में सेट तथा लॉक्ड हो तब | है होते मेक कांटेक्ट _____ ND&NC ख (NC&RC ग (RD&RC घनहीं भी कोई (When point set and locked in normal _____contact make a) ND&NC b) NC&RC c) RD&RC d) None of the above **Answer – d) None of the above**
71	निम्नलिखित में से कौन पॉइंट मशीन के ट्रांसमिशन असेंबली का हिस्सा नहीं है - मुख्य गियर रिम खक्लच फ्रिक्शन (गडिस्क कंट्रोल (घ स्लाइड्स डिटेक्शन (Which one of the following is not part of transmission assembly in point machines- Main Gear Rim b) Friction clutch c) Detection slides d) Control disc **Answer – c) Detection slides**
72	एस) ई.जी.SGE) ब्लॉक इंस्ट्रूमेंट उपयोग किया जाता है - केवल गैर-विद्युतीकृत सेक्शन में

	ख केवल (विद्युतीकृत सेक्शन में ग (गैर-विद्युतीकृत तथा विद्युतीकृत दोनों में घ दोनों (गैर-विद्युतीकृत तथा विद्युतीकृत कुछ मॉडिफिकेशन के साथ SGE type Block instrument can be used in a) Only in Non-RE b) Only in RE c) Both in Non-RE and RE d) Both in Non-RE as well as in RE with some modifications **Answer – d) Both in Non-RE as well as in RE with some modifications**
73	कोई ब्लॉक इंस्ट्रूमेंट अगर है यह मतलब इसका तो है में कंडीशन "क्लोज्ड लाइन") | है में सेक्शन ब्लॉक ट्रेन किसही(गलत/ When any block instrument is at Line closed condition that means train is in block section. (True/False) **Answer - False**
74	आखिरी को सिग्नल "ऑन कालिंग" स्टॉप सिग्नल या एडवांस स्टार्टर और होम सिग्नल के नीचे लगाया जा सकता है) |सही(गलत/ "Calling On" signal can be placed below last stop signal or advance starter and Home signals. (True/False) **Answer - False**
75	डाटा लोगर्स को मानव विफलताओं त्रुटियों/जैसे कि ड्राईवर द्वारा पास्ड सिग्नल" "डेंजर एटका पता लगाने के लिए उपयोग नहीं किया जा सकता) |सही(गलत/ Data loggers could not be used for detecting the human failures/errors such as drivers "signal passing at danger" (SPAD). (True/False) **Answer - False**
76	भारतीय रेल में ब्रॉड गेज किया प्रयोग लिए के (बीजी)जाने वाला गेज डायमेंशन है - 1610mm ख (1762mm ग (1000mm घ (1676mm The gauge dimension used for broad gauge (BG) in Indian railways is- 1610mm b) 1762mm c) 1000mm d) 1676mm **Answer – d) 1676 mm**
77	वर्ग 1मिमी तांबे के तार की करंट)carrying कि जाने ले (क्षमता सामान्यतः होती है - 1 to 2 A ख (2.5 to 3 KA ग (2.5 से 3 A घ(1 to 2 KA The current carrying capacity of single strand 1 square mm copper wire is approximately- 1 to 2 A b) 2.5 to 3 KA c) 2.5 to 3 A d) 1 to 2 KA **Answer – c) 2.5 to 3 A**
78	आईपीएस सिस्टम में इन्वर्टर 1-आउटपुट विफल होने पर स्वचालित रूप से इन्वर्टर2- पर आ जाता है) |सही (गलत/ In IPS system Inverter-2 will be automatically connected to the load, when Inverter-1 output is failed. (T/F) **Answer - True**
79	पूरी तरह चार्ज्ड लीड एसिड सेल कि स्पेसिफिक ग्रेविटी हाइड्रोमीटर में देखने पर

	| है मिलती _____ 1180 ख (1200±5 ग (1210±5 घ (1240±5 Specific gravity of the fully-charged Lead Acid cell is _____ in terms of Hydrometer reading. 1180 b) 1200±5 c) 1210±5 d) 1240±5 **Answer – c) 1210±5**
80	केच साइडिंग | है बचाता को..... साइडिंग स्लिप तथा है बचाता को..... Catch siding protects ..... and Slip siding protects ..... सिग्नल्लिंग प्लान| है जाता दिया अनुमोदन द्वारा .....टेबल सिलेक्शन तथा टेबल लॉकिंग , Signalling Plans (IP), Locking Tables (LT) and Selection Tables are approved by ..... **Answer - CSTE**
82	NNCR है..... जब है होती ड्राप यह तथा ..... NNCR is .....and drops when .....
83	फुटप्लेट इंस्पेक्शन की सेडूल अवधि JE के लिए तथा .....SSE के लिए | है ..... Periodicity of footplate inspection by JE is ..... and by SSE is ..... **Answer – Once in a month, once in three months**
84	स्पेशल क्लास लेवल क्रासिंग गेट्स के TVU's होना ज्यादा से ..... चाहिए | For special class LC gates the TVU's are said to be more than ..... **Answer - 50000**
85	ओपन स्विच के | है होता ..... क्लीयरेंस का बीच के रेल स्टॉक तथा toe Minimum clearance between toe of open switch and stock rail is ..... **Answer – 115 mm**
86	एक ले अधिक से एक लिए के आउट-ZDUCR relays हो सकती है) |सही(गलत/ There may be more than one ZDUCR relays for one layout. (True/False) **Answer - False**
87	ट्रॉली सप्रेसन ट्रैक सर्किट का मुख्य उद्देश्य ट्राली व्हील की वजह से डीप के रूपांतरण को पल्सेस में करने से रोकने के लिए होता है (गलत/सही) | Main purpose of trolley suppression track circuit is to prevent the conversion of pulses from the dip caused by trolley wheel. (True/False) **Answer - True**
88	लगाये गए एक्सल काउंटर में प्रिपरेटरी रिसेट)Preparatory reset ..... (| है सकता जा किया उपयोग में सेक्शन मेन लाइन ख तथा स्टार्टर एडवांस (IBS के बीच ग तथा इंस्ट्रूमेंट ब्लॉक (BPAC घ(ऊपर के सभी जगहों पर Preparatory reset can be used in case of the _____sections provided with axle counters. a) Main line b) Section between Advance starter and IBS c) Block Instrument and BPAC d) all of these. **Answer – d) all of these**
89	सौर मॉड्यूल का उपयोग सूर्य की प्रकाश ऊर्जा)photons) के माध्यम से बिजली

	उत्पन्न करना है जो कि - क) फोटोइलेक्ट्रिक इफ़ेक्ट है ख) फोटोवोल्टिक इफ़ेक्ट है ग) दोनों क) तथा ख) घनहीं दोनों (Solar modules use light energy (photons) from the sun to generate electricity through the a) Photoelectric effect b) Photovoltaic effect c) Both a) and b) d) None of a) and b) **Answer – b) Photovoltaic effect**
90	बिजली के सबसे मौलिक कानून/रूल ओहम कानून/रूल (Ohm's law) या R=VI है जिसमे R - प्रतिरोध, V - वोल्टेज तथा I - करंट/प्रवाह है | (सही/गलत) The most fundamental law in electricity is Ohm's law or R=VI (where R is resistance, V is voltage and I is current). (True/False) **Answer – False**
91	धरती एक आदर्श equipotential सतह की तरह काम करती है, जो की बिजली चमकने (lightening) के दौरान current के प्रवाह को धरती में सम्मिलित कराने में मदद करती है | (सही/गलत) Earth act as ideal equipotential surface, therefore used to divert flow of current to earth during lightening. (True/False) **Answer – True**
92	मध्य रेलवे के पुणे मंडल का मुख्यालय मिरज में स्तिथ है | (सही/गलत) The Headquarter office of Pune division is located at Miraj. (True/False) **Answer – False**
93	न्यूटन दुसरे नियम के हिसाब से, *m* - वजन, a - गति तथा *F* - बल के बीच सम्बन्ध है ..... According to Newton's second law of motion, the relationship between an object's mass *m*, its acceleration a, and the applied force *F* is ..... **Answer – ma**
94	सुप्रीम कोर्ट भारत की सर्वोचम न्यायलय है | (सही/गलत) Supreme court is Apex court of India. (True/False) **Answer – True**
95	भारत की राजधानी नई दिल्ली को यूनियन टेरिटरी का दर्जा प्राप्त है | (सही/गलत) New Delhi, the capital of India is Union territory. (True/False) **Answer – True**
96	महाराष्ट्रा राज्य की राजधानी ..... है| **Answer - Mumbai** ..... is the capital of state of Mahrashtra.
97	महाबलेश्वर जो कि एक महत्वपूर्ण हिल स्टेशन है, मध्यप्रदेश में स्तिथ है | (सही/गलत) Mahabaleshwar, one of the important hill station is situated in Madhya Pradesh. (True/False) **Answer – False**

98	पुणे ..... मीन सी लेवल (MSL- mean sea level) पर स्तिथ है | **Answer – around 559 meters** Pune is situated at ..... above MSL (mean sea level).
99	भारतीय रेलवे के मध्य रेल जोन में .....डिवीज़न है | Central Railway zone of Indian Railways consists of ..... divisions. **Answer – 5 (five)**
100	भारतीय रेलवे के अंतर्गत MCM/signal की पोस्ट का ग्रेड पे ..... है | The grade pay of MCM/signal post under S&T department of Indian Railways is ..... **Answer – 4200**
101	Voltage का मानक Amperes है | (सही/गलत) Amperes is the unit of Voltage. (True/False) **Answer – False**
102	भारत से गुजरने वाली रेखा का नाम| (कर्क रेखा/ मकर रेखा) Which one of the following passes through India. (Tropic of Cancer/Tropic of Capricorn) **Answer – Tropic of cancer**
103	इरिसेट ..... शहर में स्तिथ है | IRISET is located/situated at ..... city. **Answer – Secunderabad**
104	निम्नलिखित स्टेशनों में से कौन सा स्टेशन पूर्व विक्टोरिया टर्मिनस के रूप में जाना जाता था? चर्चगेट रेलवे स्टेशन मुंबई सेंट्रल लोकमान्य तिलक टर्मिनस छत्रपति शिवाजी टर्मिनस Which of the following stations was formerly known as Victoria Terminus? Churchgate Railway Station Mumbai Central Lokmanya Tilak Terminus Chhatrapathi Shivaji Terminus **Answer – d) Chhatrapathi Shivaji Terminus**
105	निम्नलिखित में किसके प्रशासन में माथेरान हिल स्टेशन आता है ? कोंकण रेलवे पश्चिम रेलवे मध्य रेलवे दक्षिण रेलवे Which of the following zones administers the Matheran Hill Railway? Konkan Railways Western Railways Central Railways Southern Railways **Answer – c) Central Railways**
106	चित्तरंजन लोकोमोटिव वर्क्स रेलवे की मैन्युफैक्चरिंग यूनिट कहा स्तिथ है ? Where is the Chittaranjan Locomotive Works manufacturing unit of

	Railways situated? Answer – **Chittaranjan, West Bengal**
107	विश्व प्रसिद्ध अजंता गुफाए किस राज्य में स्तिथ है - गुजरात ख) मध्यप्रदेश ग) ओडिशा घ) कोई नहीं The world famous Ajanta Caves are located in which Indian state? Gujarat b) Madhya Pradesh c) Odisha d)None of these **Answer – d) None of these**
108	इंटरनेशनल योग डे कब मनाया जाता है - 18th जून ख) 19th जून ग) 20th जून घ) 21st जून 'International Yoga Day' is celebrated on which date? 18th June 19th June 20th June 21st June **Answer – d) 21st June**
109	कोंकण रेलवेज किन किन राज्यों से होकर गुजरता है - महाराष्ट्र-कर्नाटक-आंध्रप्रदेश-केरल महाराष्ट्र-कर्नाटक-गोवा-केरल महाराष्ट्र-कर्नाटक-केरल-तमिलनाडु कर्नाटक-गोवा-केरल-तमिलनाडु Through which of the following group of states does the Konkan Railways run? Maharashtra - Karnataka - Andhra Pradesh - Kerala Maharashtra - Karnataka - Goa - Kerala Maharashtra - Karnataka - Kerala - Tamil Nadu Karnataka - Goa - Kerala - Tamil Nadu **Answer – b) Maharashtra - Karnataka - Goa – Kerala**
110	भारतीय रेलवेज का सबसे पूर्वोत्तर डिवीज़न है - तिनसुकिया ख) लमडिंग ग) रंगिया घ) कटिहार Which of the following is the eastern-most division of the Indian Railways? Tinsukia b) Lumding c) Rangiya d) Katihar **Answer – a) Tinsukia**
111	मोहनदास करमचंद गाँधी को महात्मा का खिताब किसने दिया - बाल गंगाधर तिलक ख) मोतीलाल नेहरु ग) जवाहर लाल नेहरु घ) रबिन्द्र नाथ टैगोर Mohandas Karamchand Gandhi was called as Mahatma by Bal Gangadhar Tilak Motilal Nehru Jawaharlal Nehru

	Rabindra Nath Tagore **Answer – d) Rabindra Nath Tagore`**

1	रेक्टीफायर किस उपयोग के लिए होते है - डायरेक्ट करंट से आल्टरनेटिंग करंट के लिए आल्टरनेटिंग करंट से डायरेक्ट करंट के लिए हाई वोल्टेज से लो वोल्टेज के लिए लो वोल्टेज से हाई वोल्टेज के लिए Rectifiers are used to convert a) Direct current (DC) to alternating current (AC) **b) Alternating current (AC) to Direct current (DC)** c) high voltage to low voltage d) low voltage to high voltage
2	बिजली के सबसे मौलिक कानून/रूल ओह्म कानून/रूल (Ohm's law) या V=IR है जिसमे R - प्रतिरोध, V - वोल्टेज तथा I - करंट/प्रवाह है	(सही/गलत) The most fundamental law in electricity is Ohm's law or V=IR (where R is resistance, V is voltage and I is current). **True**
3	ब्लॉक के लिए उपयोग किया गया अर्थ रेजिस्टेंस (कन्वेंशनल) _____ से ज्यादा नहीं होना चाहिए | The block earth (conventional) resistance should not be more than _____ 10 Ohms
4	ट्रांसवर्स बांड _____ डिपार्टमेंट द्वारा लगाये जाते है तथा नॉन-इंसुलेटेड रेल की पहचान _____ डिपार्टमेंट द्वारा की जाती है | एस.एंड.टी, इलेक्ट्रिकल ख) एस.एंड.टी, एस.एंड.टी ग (इलेक्ट्रिकल ,एस.एंड.टी घ (इलेक्ट्रिकल ,इलेक्ट्रिकल Transverse Bond is provided by _____ department and identification of non-insulated rail is done by _____ department. a) S&T, Electrical b) S&T, S&T **c) Electrical, S&T** d) Electrical, Electrical
5	हिंदी भाषा को राजभाषा का दर्जा प्राप्त है	(सही/गलत) Hindi language has been given official status of Rajbhasha. **True**
6	पेटरनिटी छुट्टी (Paternity leave) एक बार में _____ दिनों की अवधि के लिए 6 महीने में _____ बार ली जा सकती है | Paternity leave can be taken in a span of _____ days for _____ times in 6 months duration. **15 दिनों, 1 बार, 15 days, 1 times.**
7	LHAP के संचय के लिए अधिकतम सीमा ..... दिन है| 240 days ख) 310 days ग) 300 days घ) No limit Maximum limit for accumulation of LHAP is_____ days. 240 days b) 310 days **c) 300 days** d) No limit
8	नॉन-गजेटेड स्टाफ 3 सेट प्रिविलेज पास के लिए कब योग्य होते है - सर्विस के पहले साल में **सर्विस के पांच साल होने के बाद** सर्विस के तीन साल होने के बाद सर्विस के एक साल के बाद Non-Gazetted staff is eligible for 3 sets of privilege passes- In the first year of service

	After completion of 5 years of service After completion of 3 years of service After completion of 1 year of service
9	सस्पेंशन के लिए निम्नलिखित में से कौन सा फॉर्म दिया जाता है - SF-1 ख) SF-5 ग) SF-9 घ) SF-11 For suspension the following form is issued- **a) SF-1** b) SF-5 c) SF-9 d) SF-11
10	रिमूवल फ्रॉम सर्विस एक ..... पेनल्टी है | Removal from service is a ..... penalty. मेजर, Major
11	कमिश्नर ऑफ़ रेलवे सेफ्टी किस मिनिस्ट्री के अंतर्गत आते है - रेलवे ख) **सिविल एविएशन** ग) सरफेस ट्रांसपोर्टेशन घ) लेबर Commissioner of Railway Safety (CRS) belongs to the ministry of:- a) Railways **b) Civil Aviation** c) Surface Transportation d) Labour
12	भारतीय रेलवे में वर्तमान में ..... संख्या में जोन है | Number of zones (at present) in Indian Railways are सतराह, 17
13	एक साल में दो सेट प्रिविलेज पास कम करने की पेनल्टी ..... पेनल्टी है | Cutting of two sets of privilege passes in a year comes under ..... penalty. माइनर, Minor
14	आकस्मिक अवकाश आकस्मिक/तात्कालिक नहीं लिया जा सकता | (सही/गलत) Casual Leave can't be applied during emergencies/urgencies. **False**
15	QTA2 रिले में कितने फ्रंट तथा बेक कॉन्टेक्ट्स होते है - 1 फ्रंट/1 बेक ख) 2 फ्रंट/1 बेक ग) 1 फ्रंट/2 बेक घ) 2 फ्रंट/2 बेक The Number of front and back contacts in QTA2 relay is:- a) 1F/1B **b) 2F/1B** c) 1F/2B d) 2F/2B
16	ऑडियो फ्रीक्वेंसी ट्रैक सर्किट्स के लिए ग्लूड जॉइंट्स की आवश्यकता नहीं होती | **सही** Audio frequency track circuit does not require glued joints. **True**
17	आय.आर.एस () टाइप पॉइंट मशीन का स्ट्रोक होता है - Both a & b d) Stroke can be between 110 mm to 220 mm **143mm** ख) 220 mm ग) क तथा ख दोनों घ) स्ट्रोक 110 mm to 220 mm के बीच में हो सकता है Stroke of IRS type point machine is - **a) 143 mm** b) 220 mm c) Both a & b d) Stroke can be between 110 mm to 220 mm
18	आय.आर.एस पॉइंट मशीन में थ्रो रॉड, डिटेक्शन रॉड तथा लॉक रॉड की संख्या होती है- **क) 1, 2 and 2** ख) 2, 1 and 2 ग) 2, 2 and 1 घ) 2, 2 and 2 Number of throw rod, detection rod and lock rod in IRS type point machine are- **a) 1, 2 and 2** b) 2, 1 and 2 c) 2, 2 and 1 d) 2, 2 and 2
19	एल.ई.डी (LED) सिग्नल का रेटेड (rated) ऑपरेटिंग वोल्टेज तथा पॉवर है- 230V, 15W ख) 110V, 50W **ग) 110 V, 15W** घ) 230V, 50W

	Rated Voltage and Power of an AC LED signal is:- a) 230V, 15W b) 110V, 50W **c) 110 V, 15W** d) 230V, 50W
20	डिपेंडेंट शंट सिग्नल में ऑन आस्पेक्ट नहीं होता है | **सही** A depended shunt signal has no ON aspect. **True**
21	पुणे डिवीज़न में आय.पी.एस में लगने वाले यूनिट सेल (बैटरी) की सामान्यतः रेटेड कैपेसिटी को लिखिए | Write the general rated capacity of unit cell (battery) installed over Pune division for IPS (Integrated Power System). 2V/300AH or 2V/200AH or 2V/120AH
22	SL-35B ट्रिपल पोल लैम्प्स की रेटिंग है - **क) 12 V/24W, 24W** ख) 12V/24W, 18W ग) 24 V/24W, 24W घ) 24V/12W, 12W Rating of SL-35B triple pole lamps is:- **a) 12 V/24W, 24W** b) 12V/24W, 18W c) 24 V/24W, 24W d) 24V/12W, 12W
23	पॉइंट मशीन के ऑबस्ट्रकसन टेस्ट में, टेस्ट पीस को _____ के टो (toe) से _____ दूरी पर रखना होता है| For obstruction test of a point, test piece is to be kept at _____ distance from the tow of _____ Tongue rail, 150 mm टंग रेल, 150 मी.मी.
24	जब पॉइंट नार्मल में सेट तथा लॉक्ड हो तब _____ कांटेक्ट मेक होते है | ND&NC ख) NC&RC ग) RD&RC घ) कोई भी नहीं When point set and locked in normal _____contact make a) ND&NC b) NC&RC c) RD&RC **d) None of the above**
25	ट्रैक क्रासिंग में सिग्नलिंग केबल की गहराई 1 मीटर ..... से नीचे होनी चाहिए- गिट्टी लेवल ख) उपरी रेल लेवल से ग(स्लीपर के निचले लेवल से **घ (रेल के निचले लेवल से** Track crossings of signaling cables are done at a depth of 1meter below _____ a) Ballast Level b) Top Level of Rail c) Bottom Level of Sleeper **d) Bottom Level of Rail**
26	एस.जी.ई. (SGE) टाइप ब्लॉक इंस्ट्रूमेंट सिंगल तथा डबल लाइन दोनों के ब्लॉक सेक्शन के लिए उपयोग में लाये जा सकते है | **गलत** SGE type Block instrument can be used for both double as well as single line block sections. **False**
27	कोई ब्लॉक इंस्ट्रूमेंट अगर "लाइन क्लियर" कंडीशन में है तो इसका मतलब यह है कि ट्रेन ब्लॉक सेक्शन में है | **गलत** When any block instrument is at Line clear condition that means train is in block section. **False**
28	कालिंग-ऑन सिग्नल सफ़ेद रंग (चंद्रमा की तरह) होता है | **गलत** Calling –on signal is of lunar white colour.

	False
29	पुणे डिवीज़न में लगे डाटालागर ..... कंपनी / उत्पादक द्वारा बनाये गए है | The data loggers installed over Pune division are of ……..…….. make company/manufacturer. M/s Efftronics Ltd.
30	ट्रैक के केंद्र से कलर लाइट सिग्नल के न्यूनतम आरोपण की दूरी ..... होना चाहिए | The minimum implantation distance of a colour light signal from the centre of the track should be …… 2.36 Meter
31	डैडो (Diado) टाइप टोकन लेस ब्लॉक इंस्ट्रूमेंट रेलवे इलेक्ट्रिफाइड एरिया में उपयोग नहीं किये जा सकते | **गलत** Diado type token less block instrument cannot be used in RE area. **False**
32	आईपीएस सिस्टम में, इन्वर्टर ए.सी. डिस्ट्रीब्यूशन पैनल में होता है तथा सी.वी.टी डी.सी.-डी.सी. पैनल में होता है | **गलत** In IPS system, Inverter comes under AC distribution panel whereas CVT comes under DC-DC converter panel. **False**
33	पूरी तरह चार्ज्ड लीड एसिड सेल कि स्पेसिफिक ग्रेविटी हाइड्रोमीटर में देखने पर _____ मिलती है | Specific gravity of the fully-charged Lead Acid cell is _____ in terms of Hydrometer reading. **1215 (1210 ± 5)**
34	कालिंग ऑन सिग्नल का बटन लाल कलर पर सफ़ेद डॉट होता है | **गलत** Calling- on signal button is of red colour with white dot. **False**
35	ट्रैक सर्किट की पॉवर सप्लाई आई.पी.एस के इनमे से किस कॉम्पोनेन्ट / मॉडयूल से आती है - रेक्टीफायर डी.सी.कनवर्टर इन्वर्टर **ट्रांसफार्मर** The power supply for track Circuits are taken through which of the following Components / modules of the IPS? a) Rectifier b) DC-DC converter c) Inverter **d) Transformer**
36	पैनल पर शंट सिग्नल बटन का कलर _____ होता है | **पिला** The colour of shunt signal button on the panel is _____ **Yellow**
37	आम तौर पर क्लास-डी स्टेशन नॉन-इंटरलॉक्ड स्टेशन होते है | **सही** Class "D" stations are generally non-interlocked stations. **True**
38	सभी समपार फाटक जो कि स्टेशन लिमिट में होते है उन्हें ..... समपार फाटक बोला जाता है | All gates within station limit are called …… gates. WSL Gate

39	आटोमेटिक सिग्नल के लाल होने पर भी ड्राईवर बिना अथॉरिटी के पास कर सकता है | **सही** Driver can pass an Automatic signal in red without any authority. **True**
40	एस.एम की बाहर होने पर कोई भी ऑपरेशन नहीं हो सकता है | **गलत** When SM key is out, no operation can be done from the panel. **False**
41	मेस्सर्स सेल (सेंट्रल इलेक्ट्रॉनिक्स लिमिटेड) इनमे से किसी का उत्पादन करने वली कंपनी में से एक है - एनालॉग एक्सल काउंटर्स केवल इंटीग्रेटेड पॉवर सप्लाई इलेक्ट्रॉनिक इंटरलॉकिंग उपकरण **एनालॉग तथा डिजिटल एक्सल काउंटर्स दोनों ही** M/s CEL (Central Electronics Limited) is one of the manufacturers for: a) Analog Axle Counters only b) Integrated Power Supply c) Electronic Interlocking Equipment **d) Both Analog and Digital Axle Counters**
42	एंट्री-एग्जिट सिद्धांत रूट सेटिंग टाइप रिले इंटरलॉकिंग में उपयोग किया जाता है| **गलत** Entry-Exit principle is used in route setting type of Relay Interlocking. **False**
43	धरती एक आदर्श equipotential सतह की तरह काम करती है, जो की बिजली चमकने (lightening) के दौरान current के प्रवाह को धरती में सम्मिलित कराने में मदद करती है | **सही** Earth act as ideal equipotential surface, therefore used to divert flow of current to earth during lightening. **True**
44	किसी को जारी किया ड्यूटी पास, सुविधा पास के खाते से काटे जाते है | **गलत** Whenever duty pass is issued to individuals, it is debited from privilege pass. **False**
45	Which one is not used as component in D.C. track circuit- a) QT2 Track relay b) Continuity bond c) B-Type choke **d) All of them** निम्नलिखित में कौन डी.सी .ट्रैक सर्किट के घटक के रूप में उपयोग नहीं किया जाता - QT2 ट्रैक रिले ख) निरंतर (Continuity) बांड ग) B-प्रकार चोक **घ) सभी किये जाते है**

1	Newton's laws of motion states that for every _____ there is equal and _____ reaction. **Action, opposite**
2	In D.W. Signalling. Signals are operated by _____Transmission. **Wire**
3	Super elevation is necessary for track on a _____path. **Curved**
4	The distance between gauge face of a B.G. track is _____. **5ft6in**
5	_____means the mark at which infringement of fixed _____ Dimension occurs, where two lines cross or _____ One another. **Fouling Mark, Standard, Join**
6	The _____ resistance plays important Role in _____ of a track circuits. **Ballast,** F**unctioning**
7	The minimum clearance between two standards/Rollers in rodding run is _____ meters. **1.8 to 2.2**
8	Ohms law states that whenever a _____is passed through a resistance, there is a _____drop across it. **Current, Voltage**
9	The voltage of a fully Charged _____ cell is _____ volts. **Secondary, 2.2**
10	60 V modules in an IPS system are used to fed _____ as well as external. **Internal, Circuits**
11	Broken wire _____must be carried out once in_____. **Test, A YEAR.**
12	Coil of L/Lock & C/Controller works on either _____ AC. or 12 V_____ . **110 v, D.C**
13	Picking of _____ relay in the point group confirmed that point is _____ Set and lock. **WKR-1, Correctly**
14	Axle counters can be used in place of _____ circuits. **Track**
15	Provision should be made to interlock the last stop signal with the _____Indication. **Line-Clear**
16	TSR in DC Track circuit _____ **0.5 Ohms**
17	Resistance of BPR in SGE, block instrument _____ **77 Ohms**
18	Block overlap in MAUQ _____ **180 meter**
19	In Electrified & Non AC Area trck circuit used. **AFTC**
20	Overhauling of D/L – Block Instrument **7 Years**
21	Key locked in proving Relay

	KLCR
22	Route permissibility checking Relay. **ZDUCR**
23	Electromagnetic Induction. **A.C. Electrified area**
24	Neal's Ball token Instrument. **Safety Catch**
25	Loose & tight locking. **Double wire signalling**
26	_____ means the intersection of road with Railway track at the same Level. **LEVEL X-ING**
27	The signals are placed at_____ Eye level. **DRIVERS**
28	The imprest stores should be used to replace _____gears due to accidents. **DAMAGED**
29	The block overlap in 2Aspect signalling is _____ meters. **400**
30	Creep is the _____ movement of rails in a track. L**ONGITUDNAL**
31	Census of token is done once in **_____** months. **SIX**
32	The material in the depot are_____ once in a year and all tools and plants, forms and stationary once in _____ years **VERIFIED, THREE**
33	All receipts an _____ of stores pending their transfer to their _____ ledgers, should entered in DTR. **ISSUES, APPROPRIATE**
34	Catch and Slip sidings provided for _____ purpose only. **ISOLATION**
35	The Calling on Signal must not be_____ of being worked at the same time as the _____ above. **Capable, Stop signal**
36	The Home Signal must be placed in rear of all_____, if any, on the line to which it_____. **Connections, Rafers**
37	The distance at which the points may be _____ By double wire must not exceed _____Meter. **Worked, 730**
38	In order to maintain_____ For through running, points for trap sidings must not be_____ In the main or through line. **Safety, inserted**
39	Where feasible, point must be _____as to avoid any _____ movement. **Interlocked, Conflicting**
40	The use of the _____ or other apparatus for operation should disconnect the power supply to the motor. **Crank, Emergency**
41	A Control to ensure that_____. last stop signal of the block section

	cannot be taken off at _____ And the same time. **Opposing, One**
42	The last crank in a run of _____ Operating a unit must be an _____ crank. **Rodding, adjusting**
43	An inside lock bar lies_____ below the top of the rail and that the bar doesn't _____ away from the rail. **38mm, Lean**
44	Where D.C. track circuits are _____ the polarity on the rails should be_____.as for as possible. **Adjacent, Opposite**
45	Where two or more block instruments are _____in the same room, they must be fitted with gongs of _____tones. **Located, distinctive**
46	Where more than one earth has been installed, they should be _____ by a distance of not less than _____ from each other. **Separated, 2.5 meter**
47	When _____. On a given sloted signal is put back _____ goes back to 'ON' position. **Slot, Signal**
48	Each_____. must record the time of rectification and his _____ as to the cause of failures. **Maintainer, Remarks**
49	Accumulation of track dust and _____ of burr at an _____ joint should be removed. **Formation, insulated**
50	The distance between the running faces in broad gauge is (a) 1225 mm (b) **1670mm** (c) 1570mm
51	The TGT and TCF lock coils in Neal's ball token works on current (a) **160ma** (b) 175 ma (c) 140 ma
52	Maximum permitted resistance of back contact in DC Relays initially. (a) 0. 05 Ohms (b) **0.03 Ohms** (c) 0.04 Ohms
53	In AC Electrified section, the type of track circuits used are (a) AC Single Rail (b) AC Double Rail (c) **AFTC**
54	In signalling cable the screening factor is (a) 0.5 (b) 0.6 (c) **0.4**
55	The minimum permissible TSR for conventional AC track circuit is (a) **0.15 Ohms** (b) 0.5 Ohms (c) 0.30 Ohms
56	Insulation resistance of a Glued Joint in dry condition when Meggered with 100 Volt Megger (a) 50 M.Ohms (b) 100 M.Ohms (c) **25 M. Ohms**
57	The TGT Code in a Podunur single line Token less block instrument is (a) - + - **(b) - - +** (c) - + +
58	In order to keep the main filament at correct Focal point , 3 pin caps are used in signal bulbs. The pins are kept at degree apart. (a)120 deg,120deg,120deg. (b)**135 deg.,135 deg,90 deg**. (c)120 deg,150deg,90 deg.
59	The overhauling of single line block instrument should be once in (a) 7 Years. (b) 12 Years (c) **10 Years.**
60	The Imprest store shall be kept _____ from other stores and a

	sign board marked Imprest store there. **Separate, Exhibited**
61	Separate requisition shall be _____ For each class of material. **Prepared**
62	No trolley or lorry shall be placed on the line unless it is fitted with **Efficient Hand Brakes**
63	Interlocking frames shall be tested _____ and overhauled at the_____ not exceeding 3 years. **Annually, Interval**
64	Train shunt test must be taken every time a track circuit in _____- It should be taken at parallel _____ of the track also. **Adjusted, Portions**
65	A Railway class 'C' employee gets _____ set of passes after completion of regular _____of Five years. **Three, Service**
66	_____ means the length of track in advance of a stop signal, which must be kept cleat for granting _____to approach. **Overlap, Permission**
67	The day and _____aspect of the _____ Light signal are the same. **Night, Colour**
68	A Calling on Signal is a _____ And has no. _____Existence. **Subsidiary, Independent**
69	No Train shall be allowed to leave a _____ station unless line clear has been _____ from the block station in Advance. **Block, Received**
70	How many slides are there in GRS Electrical detector when used with FPL? (2, 3, 4).
71	Signal Maintainer should test the Point with obstruction test gauge. (3mm, 5mm, 10mm).
72	Inside lock bar lies underneath the top of Rail surface. (42mm, 35mm, 38mm).
73	Track locking is provided on the lever. (Signal, Point, Lock).
74	Lever frame overhauling is to be done after. (1Year, 2 Year, 3 Year).
75	Rotary detector is used in signalling. (Single wire, Double wire, CLS).
76	Overhauling of Single Line Token Block Instrument is to be done once in:- (12 year, 7 Year, 10 Year).
77	Distant signal is provided at a distance from home signal. (400 meter, 1000 meter, 1400 meter).
78	Clear aspect of calling on signal is. (White, Yellow, Green).
79	Clearance between leading William stretcher & bottom of stock rail should not be more than. (1.5 mm, 3.25 mm, 5 mm).

80	The two filament of SL-35 'A' are rated as……Volt……watt & ……..Volt……watt.
82	Coil resistance of BPR in SGE block is …….
83	No load current of signal transformer should not be more than……
84	Whenever green aspect bulb is fused in a three aspect colour light stop signal, the signal turns to ……. aspect.
85	For 100 meter length DC track circuit …….. Ohm shelf type track relay is used.
86	Length of lock bar is ……
87	Main colour of calling on signal arm is ……..with ……..colour strip.
88	Relief crank can be used up to ……..degree diversion in Roding run.
89	Roding operated single end point can be operated up to ……meter length.
90	In lever frame, colour of point lever, gate lock lever & lock bar lever is ……., …….. & ……respectively.
91	The distance between the OHE _____and the point rod shall not be less than _____mm. **Mast, 40**
92	Where a number of _____are run together, it is _____to earth each cable separately. **Cables, preferable**
93	The inspector shall carry out _____inspection of all signals by day and _____in both up and down direction once a month over his _____ jurisdiction. **Footplate, night, entire**
94	Creep is the _____ Movement of rails in a track. **longitudinal**
95	Level crossing means _____ of road with railway _____ at the same level. **Intersection, track**
96	The _____ of goods reception line from _____ is considered desirable. **Isolation, siding**
97	Voltage reading at lamp, must be taken each time _____ is replaced. **Lamp**
98	Operation of the track circuit is influenced by the _____ which is dependent on _____ conditions. **Ballast, atmospheric**
99	Shunt being a subsidiary signal _____respective main signals on the same line in the same or _____directions. **Locks, opposite**
100	_____- remains picked up until the operation of G (R) LR when _____ are released to lock route. **GLSR, buttons**
101	The length of direct feeding of signal using a _____ cable shall not exceed _____ mtrs. **Screened, 600**
102	Applied voltage must not be more than the _____ voltage of the length and should not be more than _____volts.

	Rated, 10.8
103	_____ lines should be _____ from all connected goods lines and _____ whatever the speed may be. `**Passenger, isolated, siding**
104	GR 1 has a _____ discharged circuit across its coil to prevent its dropping in time of momentary failure of _____ and track circuits. **Condenser, power**
105	In double wire installations point can be operated by _____ transmission using)_____facing point mechanism. **Wire, economical**
106	Minimum horizontal distance from Centre of Track to any structure from 355mm. above Rail level. (a) 7′ (b) 7′-6″ **(c) 7′-9″** (d) 15′-6″
107	The 'TCF & TGT lock coils in Neal's ball Token works on current **a) 160 ma** (b) 175 ma (c) 152 ma (d) 140 ma.
108	In A.C. Electrified section, the type of Track Circuits used are (a) A.C. Signal Rail (50Hz.) (b) A.C. double rail (50 Hz.) **(c) AFTC**
109	Maximum permitted resistance of back contact in DC. Relays Initially is. (a) . 05 Ohms (**b) . 03 Ohms**. (c) .04 Ohms.
110	In Signaling cable the screening factor in (a) 0.5 **(b) 0.4** (c) 0.7
111	The TGT code in Podnur S/Line Token less block Instt. Is (a) - + - **(b) - - +** (c) - + +
112	Insulation resistance of a Glued Joint in dry condition when meggered with 100 DC. Megger is (a) 50 M Ohms. (b) 100 M Ohms **(c) 25 M Ohms**
113	In order to keep the main filament at correct focal point, 3 Pin caps are used in signal bulbs. The pins are kept at Degree apart. (a) (120d,120d,120d) **(b) (135d, 135d, 90d)** (c) (120d,150d,90d)
114	The Coil resistance of a polarized relay in SGE double line Block Instrument is (a) 277 Ohms. (b) 140 Ohms. **(c) 77 Ohms.**
115	Minimum no. of lamps which should remain lit on the route indicator, for Relay to remain in picked up condition. a) 4 Lamps. (b) 5 Lamps (c) 2 Lamps **(d) 3 Lamps**
116	In D.W. installations point can be operated by_____. transmission using _____ Facing point mechanism. **Wire, Economical**
117	No automatic signal assumes _____ Unless line is clear not only up to the stop signal ahead, but an _____ beyond it. **'off', adequate distance**
118	Creep is the _____ movement of Rails in a track. **Longitudinal**
119	The inspector shall carryout _____ inspection of all signals by day and _____ in both up and down direction ones a month over his _____jurisdiction. **Foot Plate, Night, Entire**
120	_____lines should be _____from all connected goods lines and _____whatever the speed may be.

	Passenger, Isolated, Sidings
121	No train shall be allowed to leave a _____station unless. **Block**
122	_____ has been received from the block stn in_____. **Line Clear, Advance**
123	_____remain picked up until the operation of G(R) LR when Buttons are released to lock route. **GLSR**
124	Operation of the track circuit is influenced by the _____ which is depended on _____conditions. **Ballast, Atmospheric**
125	In double wire installation point can be operated by Wire transmission using _____facing point mechanism. **Ecomical**
126	Voltage reading at lamp, must be taken each time _____ is replaced. **Lamp**
127	The length of direct feeding of signal using a _____ cable shall not exceed _____ meters. **Screened, 600**
128	_____ means the mark at which _____ of join one fixed standard dimensions occurs, where two lines _____ or join one another. **Fouling mark, Infringement, Cross**
129	Shunt being a subsidiary signal _____respective main signals on the same line in the same or _____ directions. **Locks, Opposite**
130	Applied voltage must not be more than the _____ voltage of the length and should not be more than _____volts. **Rated, 10.8**
131	GR 1 has a _____ discharged circuit across its coil to prevent its dropping in time of momentary failure of _____ and track circuits. **Condenser, Power**
132	The 'TCF & TGT lock coils in Neal's ball Token works on current **(a) 160 ma** (b) 175 ma (c) 152 ma (d) 140 ma.
133	In A.C. Electrified section, the type of Track Circuits used are (a) A.C. Signal Rail (50Hz.) (b) A.C. double rail (50 Hz.) **(c) AFTC**
134	Minimum no. of lamps which should remain lit on the route indicator, for Relay to remain in picked up condition. a) 4 Lamps. (b) 5 Lamps (c) 2 Lamps **(d) 3 Lamps**.
135	Maximum permitted resistance of back contact in DC. Relays Initially is. (a) 05 Ohms **(b) 03 Ohms.** (c) .04 Ohms.
136	The minimum permissible TSR for Conventional A.C. circuit is. **(a) 0.15 Ohms**. (b) 0.5 Ohms (c) 0.25 Ohms
137	Insulation resistance of a Glued Joint in dry condition when meggered with 100 DC. Megger is (a) 50 M Ohms. (b) 100 M Ohms (**c) 25 M Ohms**
138	The Coil resistance of a polarized relay in SGE double line Block Instrument is. (a) 277 Ohms. (b) 140 Ohms. **(c) 77 Ohms.**
139	The overhauling of Double line block inst. Should be carried out once in.

	(a) 10 Years. **(b) 7 years**. (C) 12 Years.
140	Minimum horizontal distance from Centre of Track to any structure from 355mm. above Rail level should be. (a) 7" (b) 7'- 6" **c) 7'-9"** d) 15'-6"
141	In order to keep the main filament at correct focal point, 3 pin caps are used in signal bulbs. The pins are kept at Degree apart. (a) (120d, 120d, 120d) **(b) (135d, 135d,90d)** (c) (120d,150d,90d)
142	In IRS & Siemens point machine rotary type locking is provided.
143	Periodicity of RG bulb replacement is 45 days.
144	SGE block working line current is 17mA.
145	In Siemens point group, point operation & detection is separated by W(R)R & W(N)R relays.
	Train shunt resistance for DC track circuit should not be more than 0.15 Ohms.

1	BLOCK BACK IS APPLICABLE IN ..... **D/ L AND S/L BOTH SECTION**
2	SWR OF SPECIAL CLASS STATION IS APPROVED BY ..... **CRS**
3	STATION LIMIT IS SITUATED BETWEEN OUTER MOST..... **SIGNAL OF STATION**
4	THE NAME OF RELAY IN SIGNAL GROUP PROOVES THE CONDITION OF ONE SIGNAL ONE TRAIN IS ..... **GLSR**
5	FORMULA FOR CALCULATING BALLST RESISTANCE IS..... PER KM **Rb=(Vf+Vr)/2(If-IR)**
6	FORMULA FOR CALCULATING RAIL RESISTANCE IS..... PER KM **Rr=2(Vf-Vr)/(If+IR)**
7	VALUE OF TSR FOR DC TRACK CIRCUIT SHALL NOT BE .....THAN 0.5 OHM **LESS**
8	AS THE LENGHT OF TRACK CIRCUIT INCREASES VALUE OF BALLST RESISTANCE..... **DECREASE**
9	THE RELATION BETWEEN BALLAST RESITANCE AND TSR IS ..... **INVERSALY PROPORTIONAL TO EACH OTHER**
10	NORMAL ASPECT OF CALLING ON SIGNAL IS ..... **BLANK**
11	TO ATTEND THE FAILURE OF BLOCK INSTRUMENT ..... IS NECESSARY **DISCONNECTION MEMO**
12	CURRENCY OF DCN ..... **90 DAYS**
13	HQ OF CCRS IS AT ..... **LUCKNOW**
14	CCRS IS RELATED WITH .....DEPARTMENT **CIVIL AVIATION**
15	MAXIMUM LENGTH OF DC TRACK CIRCUIT IN BLOCK SECTION WITH PSC/WOODEN SLEEPER WITH USING QTA2 RELAY----- **450 METER**
16	MINIMUM ENERSISAITON OF QBAT REALY IS LIMITED TO ..... **122% RATED PICKUP VALUE**
17	MAX ENERSISAITON OF QBAT REALY IS PERMITTED UP TO ..... **235% RATED PICKUP VALUE**
18	..... % OF CONDUCTOR ARE KEPT SPARE AT STATION BEFORE LAST POINT OF STATION **20%**
19	..... % OF CONDUCTOR ARE KEPT SPARE AT STATION AFTER LAST POINT OF STATION **10%**
20	THE DISTANCE BETWEEN LSS OF OPPOSITE DIRECTION AND INNER DISTANT SIGNAL . ..... **1180 METER**

21	D/ DISTANT SIGNAL IS PROVIDED IF SECTION SPEED IS ..... **120KMPH OR MORE**
22	SANCTION OF CATCH SIDING OR SLIP SIDING IS GIVEN BY..... **RAIWAY BOARD**
23	SLIP SIDING PROTECT ..... **BLOCK SECTION**
24	IN SGE BLOCK WHEN BLOCK HANDLE IS TURNED FROM LB TO TOL ..... POLARITY GOES ON LINE **POSITIVE**
25	IN SGE BLOCK WHEN BLOCK HANDLE IS TURNED FROM LB TO LC ..... POLARITY GOES ON LINE **NEGATIVE**
26	DAC WORKS ON THE PRINCIPLE OF ..... **PHASE REVERSAL**
27	IN RE AREA ..... IS PROVIDED IN LINE CIRCUIT TO PROTECT THE B/INST FROM INDUCED VOLTAGE **FILTER UNIT**
28	PERCETNTAGE REGULATION OF TRACK RELAY SHALLNOT BE LESS THAN **68%**
29	ESSENTIAL OF INTERLOCKING IS RELATED WITH SEM PARA **7.82**
30	SWR IS REVISED AFTER ISSUING OF ..... CORRECTION SLIP **5**
31	PASSING OF IBS AT ON IS RELATED WITH GR PARA ..... **GR 3.75**
32	FACILITY FOR ISSUING DISCONNECTION MEMO IS IN .....LANGUAGE **THREE**
33	ACCORDING TO STANDARD OF INTERLOCKING 2004 (R) MAX SPEED IN Std III **UP TO 140 Kmph**
34	LEVEL CROSSING GATE WHICH ARE SITUATED IN STATION LIMIT ARE TERMED AS ..... **ENGG GATE**
35	CROSSING ANGLE OF ROAD AT RAIL SHALL NOT BE LESS THAN ..... **45 DEGREE**
36	OBSTRUCTION TEST OF POINT IS DONE WITH ..... MM TEST GAUGE **5**
37	DURING REVERSE OPERATION OF POINT ..... AND ..... CONTACT ARE MAKE **NC AND RC**
38	DURING NORMAL OPERATIONF POINT ..... SUPPLY IS PROVED IN CH **N110**
39	'ON ' ASPECT OF AUTO MATIC SIGNAL IS ..... **RED**
40	' NORMAL ' ASPECT OF AUTO MATIC SIGNAL IS ..... **GREEN**
41	IF HOME SIGNAL IS DISPLAYING YELLOW WITH ROUTE THEN ASPERCT OF D/DISTANT SIGNAL .....

	DOUBLE YELLOW
42	SPECIFICATION OF BATTERY CHARGER IS ------- **IRS-S-86/2000**
43	TERMINAL VOLTAGE DURING BOOST CHARGING IS KEPT ------- **2.4 V/CELL**
44	IN COLOUR LIGHT SIGNALING VISIBILITY OF DISTANCE SIGNAL IS CONSIDERED FROM------- **400 METER**
45	POSITIVE TERMINAL OF LEAD ACID CELL IS------ **LEAD PER-OXIDE**
46	NEGATIVE TERMINAL OF LEAD ACID CELL IS----- **SPONGY LEAD**
47	ELECTROLYTE OF LEAD ACID CELL IS----- **DILUTE H2SO4**
48	TO CALCULATE THE LENGTH OF PARALELLISM THE VALUE OF POWER FACTOR IS CONSIDER----- **1.5**
49	IN RE AREA INDUCED VOLTAGE IN SINGLE LINE SECTION IS CONSIDER **116 VAC/KM**
50	IN RE AREA INDUCED VOLTAGE IN DOUBLE LINE SECTION IS CONSIDER **95 VAC/KM**
51	THE DIFFERENCE BETWEEN NORMAL OPERATING CURRENT AND DECLUTCHING CURRENT SHALL NOT BE LESS THEN **0.5A**
52	FRICTION CLUTCH DECLUTCH BETWEEN-------- % OF NORMAL OPERATING CUURENT **150% TO 250%**
53	MOTOR USED IN IRS POINT MACHINE IS----- **DC SERIES SPLIT FIELD MOTOR**
54	MAXIMUM CURRENT THAT CAN BE PROVIDED TO IRS POINT MOTOR **8.5A**
55	WHEN 3.25 MM TEST PIECE IS KEPT AT 150 MM FROM TOE BETWEEN TONGUE RAIL & STOCK RAIL DETECTION CONTACT SHALL BE **JUST BREAK**
56	WHEN 1.6 MM TEST PIECE IS KEPT AT 150MM FROM TOE BETWEEN TONGUE RAIL & STOCK RAIL DETECTION CONTACT SHALL BE **JUST MAKE**
57	CALLING ON SIGNAL IS ------ **SUBSIDARY SIGNAL**
58	GAP BETWEEN TOP OF FIRST WILLIUM AND BOTTOM OF RAIL IS MAINTAINED------- **1.5 TO 3 MM**
59	THROUGH OF IRS POINT MACINEE IS------ **143MM**
60	NAME OF POINT OPERATION SWITCHING RELAY IS ------ **WR**
61	NAME OF POINT END OPERATION PROVING RELAY IS ------ **WKR3**
62	NAME OF POINT OPERATION TIME LIMITING RELAY IS ------

	W(R)R/W(N)R
63	RELAY -----PROVES THE PURPOSE OF SUPER IMPOSED DETECTION CIRCUIT **W(R)R/WNR**
64	DURING AUTOMATIC ROUTE RELEASE -------RELAY PROVES THE POWER SUPPLY AVAILABILITY **ZR**
65	TO OPERATE THE POINT IF POINT ZONE TRACK IS FAILED ------AND -----BUTTONS ARE PRESSED TO OPERATE THE POINT **EWN & CORRESPONDING POINT BUTTON**
66	THE ARRANGEMENT TO PREVENT THE POINT OPERATION IF POINT ZONE TRACK IS FAILED IS CALLED ------ **TRACK LOCKING**
67	UNIVARSAL TRACK CIRCUIT IS TERMED AS ----- **AFTC**
68	SIZE OF TRACK LEAD CONDUCTOR IN DC T/CIRCUIT------ **2.5 SQUARE MM**
69	LEVEL CROSSING GATE SITUATED BETWEENOUTER MOST STOP SIGNAL ARE TERMED AS **TRAFFIC GATE**
70	TO PREVENT THE SIGNAL TO GOING DANGER DURING POWER SUPPLY FLUCTUATION GR1 IS MADE ------ **SLOW TO RELEASE**
71	IN INDIA FIRST AC TRACTION WAS STARTED IN ----- **1960**
72	RESISTANCE OF BLOCK PROVING RELAY IS------- **77 OHM**
73	OVERHAULING OF BPR IS DONE AFTER ------ **7 YEARS**
74	TO INCREASE CURRENT TO A CIRCUIT BATTRIES ARE CONNECTED IN ---- **PARALLEL**
75	TO INCREASE VOLTAGE TO A CIRCUIT BATTRIES ARE CONNECTED IN ---- **SERIES**
76	STAGE 1 SPD IS CONNECTED BETWEEN ------AND ------- **PHASE & NEUTRAL AND NEUTRAL& EARTH**
77	STAGE 2 SPD IS CONNECTED BETWEEN ------AND ------- **PHASE & NEUTRAL**
78	AS THE SURGE VOLTAGE APPEARS ACROSS SPD IT SHOWS ------- EFFECT **CLAMPING**
79	IF ACTUAL NUMBER OF SMR IS NEEDED ' N' THEN NUMBER OF SMR PROVIDED IN IPS SYSTEM IS ..... **N+2**
80	THE VALUE OF MAINTAINANCE FREE EARTH SHALL BE------- **UP TO 1 OHM**
81	IN EI APPLICATION SOFTWERE IS RELATED WITH PARTIULAR ……. **YARD LAY OUT**
82	IN EI EXECUTIVE SOFTWERE IS ……. TO ALL LAY OUT

	COMMON
83	TO CLEAR THE CALLING SIGNAL …. ….. …. ARE PRESSED **GN, COGGN,UN**
84	ISOLATION IS PROVIDED IF TRAIN SPEED IS MORE THAN…… **50 KMPH**
85	K-50 RELAY ARE ……TYPE RELAY **PROOVED**
86	METAL TO CARBON CONTACT RELAY ARE CALLEED….. **NON PROVED TYPE RELAY**
87	WORKING FREQUENCY OF SIEMENS DAC IS…… **43 KHz**
88	WORKING FREQUENCY OF ELDYNE DAC IS…… **28 KHZ AND 30 K H z**
89	IF TVU IS BETWEEN 25000 TO 30000 THEN GATE IS CLASSIFIED AS ….. **B 1 CLASS**
90	IBS IS EQUIVALENT TO ……..STATION **C-CLASS**
91	AS DECR DROPS DR RELAY DROPS **F**
92	AS BLOCK HANDLE TURNED FROM LC TO TOL BLOCK HANDLE LOCKS THEN AFTER TOL CIRCUIT COMPLETED **True**
93	Z1NWR AND Z1RWR ARE INTERLOCKED RELAY
94	WKR2 RELAY IS CALLED CROSS PROTECTION RELAY **True**
95	FOR STRAIGHT ROUTE A U(R)S IS SET **True**
96	POLARITY ON EITHER SIDE OF G/JOINT IS SAME IN CONTINUOUS TRACK CIRCUITING **False**
97	LED OF HG ASPECT IS KEPT IN BLANKING MODE **True**
98	IN PROOVED TYPE RELAY BACK CONTCT PROVING IS COMPULSORY **True**
99	BREAK CONTACT OF NOMALLY PICK UP RELAY IS BACK CONTACT **True**
110	AFTER REMOVING CRANK HANDLE KEY FROM CH BOX POINT CAN BE OPERATED FROM PANEL **True**

State True or False

1	DG sets are used as Emergency source of supply in Non – RE area. **True**
2	It is possible to take off two signals at the sometime which lead to any conflicting movement. **False**
3	The tripping of clutch driven lever shall not cause a vidiual induction to be displayed in the cabin thus repeating the faulty condition of the transmission. **False**
4	The compensator should transmit working stroke unchanged although it must reverse the direction. … **True**
5	When the track circuit is occupied just ahead of the cleared signal, the signal turns yellow. **False**
6	There are three types of Standards of Interlocking, Std-1,Std-2,Std-3. **True**
7	The maximum distance by which a point can be operated by Power is limited to 1 K.M. **False**
8	Relays CR-1, CR-2 & CR-3 are used as Coding Relays in Podnur S/L token less block instrument. **True**
9	Disconnection /Reconnection need not be given when any repair or alteration is necessary in a Point or signal. **False**
10	Signal Overlap of 120 mtrs. must be kept clear in advance of a signal before signal in rear can change to caution aspect. **False**
11	DTR should be written up daily **TRUE**
12	Detailed estimate should not be prepared for works **FALSE**
13	In double wire system Push – Pull and Pull – Pull systems is used. **TRUE**
14	The tripping of Clutch driven lever shall not cause a visual indicator to be displayed in the cabin thus repeating the faulty condition of the transmission. **FALSE**
15	The maximum distance by which a point can be operated by power is unlimited **TRUE**
16	The staggering between the rails indicators in axle counter fixed to the two rails is adjusted to be not less than 160mm and not more than 185. **TRUE**
17	The time set for back lock is 120secs for home signals in a panel interlocking station.

	FALSE
18	Gate signals (Stop) are provided with letter 'C' in black on yellow **FALSE**
19	The length of track in advance of a stop signal, which should be kept clear before the signal next in rear can be taken 'Off" is known as the signal overlap. **TRUE**
20	It is possible to take 'Off' at the same time any two fixed signal which may lead to any conflicting movements. **FALSE**
21	Picking up of WKR2 relay in signals point group proves correct setting and locking. **FALSE**
22	Failure of indication lamp does not affect the signal lamp voltage **TRUE**
23	There are three types of standards of Interlocking Std – I, Std – II & Std – III. **True**
24	In double wire system "push-pull" and "pull-pull" system is used **True**
25	The maximum distance by which a point can be operated by power is unlimited **True**
26	The staggering between the rails indictors in axle counter fixed to the two rails is adjusted to be not less than 160 mm and not more than 185mm. **True**
27	The length of track in advance of a stop signal, which should be kept clear before the signal next in rear can be taken 'Off" is known as the signal overlap. **True**
28	Picking up of WKR2 relay in signals point group proves correct setting and locking. **False**
29	The time set for back lock is 120secs for home signals in a panel interlocking station. **False**
30	Gate signals (Stop) are provided with letter 'C' in black on yellow circular disc. **False**
31	When GR 1 and GLSR picks-up, signal clears to yellow aspect **False**
32	Failure of indication lamp does not affect the signal lamp voltage **True**
33	In fully charged condition specific gravity of electrolyte should be more than 1180. – **True**
34	Humming is observed during speech due to earth fault on line. **True**
35	PC starts with the help of operating System.

	True
36	Bell/Buzzer used in telephone may be AC/DC. **True**
37	D-8 cable is used for microphone cord. **False**
38	Aviation lamp is lighted during entire day. **False**
39	Radio patching system only speech is transmitted. **False**
40	NMS used for OFC Maintenance **True**
41	Charcoal and salt are commonly used for preparation of earth. **True**
42	E-mail can be send by Internet. **True**

Audio Frequency Track Circuit (AFTC)

1	AFTC is not suitable for non-traction area. **False**
2	For longer length of track sections centre fed version of AFTC is to be used. **True**
3	"S" bond is used in Siemens AFTC. **True**
4	ABB AFTC is coded type. **False**
5	In AFTC, ordinary line relay works as track relay. **True**
6	Before replacing any card of Siemens AFTC, **A) Remove the concerned card, clean its connector and re-insert.** B) Replace the card with another card C) Repair the card and re-insert it.
7	For separation between two Siemens AFTCs, the bond used is A) Shunt bond B) Terminal bond **C) S bond**
8	In Siemens AFTC, components failures are taken care of by A) dual channel design of receiver equipment B) Parallel movement (Synchronism) of track circuit relays **C) Both of the above.**
9	Siemens AFTC have **A) 10 different bit code patterns** B) 15 different bit code patterns C) 20 different bit code patterns
10	In Siemens AFTC FTG 46 has **A) 4 channel frequencies** B) 6 channel frequencies C) 8 channel frequencies
11	Minimum length of Siemens AFTC is **A) 50 Meter** B) 40 Meter C) 30 Meter
12	Maximum length of transmitter cable of Siemens AFTC FTGS 917 with 0.5 TSR is A) 3 KM B) 4.5 KM **C) 6.5 KM**
13	Maximum length of receiver cable of Siemens AFTC FTGS 917 with 0.5 TSR is A) 7 KM **B) 4.5 KM** C) 3 KM
14	Maximum length of receiver cable of Siemens AFTC FTGS 46 with 0.5 TSR is A) 3 KM B) 4.5 KM **C) 6.5 KM**

15	Maximum length of transmitter cable of Siemens AFTC FTGS 917 with 0.5 TSR is A) 3 KM B) 7.4 KM **C) 4.7 KM**
16	ABB AFTC works on principle of **A) FSK** B) MSK C) ASK
17	In ABB AFTC when worked as low power mode. transmitter is connected to the tuning unit terminal number **A) 1 & 2** B) 4 & 5 C) 2 & 4
18	In ABB AFTC receiver is always connected on tuning unit terminal number **A) 1 & 2** B) 4 & 5 C) 1 & 3
19	In normal power mode of ABB AFTC transmitter is connected to tuning unit terminal number A) 1 & 2 **B) 4 & 5** C) 2 & 4
20	Type of Siemens AFTC is **A) coded,** B) encoded, C) both

Digital Axle Counter (DAC)

1	Transformer in the ZP43 unit combines the signal of both channels and feed them into the signalling cable. **True**
2	The information is transmitted to the interlocking via the BELA 12 board. **True**
3	The transmission process uses floating relay contacts and Optocouplers for information input and output. **True**
4	VESBA board transmit at two signal frequency **True**
5	AZ S 350 U is a comprises of two micro processors **True**
6	Az S350 U uses microprocessor 8085. **True**
7	SIMIS Fail safe microcomputer system comprises of two identically programmed microcomputers. **True**
8	In DAC data transmission procedure provides communication between- A. Az S350U B. DEK43 and ZP43 **C. Az s 350U AND ZP43**
9	In digital Axle counter, when Axle enters the double wheel detector zone **A).It increases the alternating electromagnetic field.** B). Decrease the alternate electromagnetic field. C). Electromagnetic field remains unchanged.
10	In digital axle counter when axle enters the double wheel detectors sensing range **A. It increases the magnetic coupling between transmitter receivers.** B. It decreases the magnetic coupling between transmitter receivers. C. Remains unchanged.
11	As the receiver voltage increases beyond quiescent voltage when wheel passes over detections head, the voltage frequency convert or reacts by A. Decreasing the frequency beyond lower band limit. **B. Increasing the frequency beyond upper band limit.** C. None
12	Each track vacancy detection section has A. Single channel to reset restriction. B. Reset acknowledgement. **C. Both of the above.**

13	In interlocking a dual channel reset is used via A). AZGrT B). VAZGrT **C.) AZGrT and VAZGrT**
14	Siemens Digital Axle counter system is base on. (A)Track shunt principle, **(B) Axle counting principle** (C) None
15	In digital axle counter system counting heads are provided at A. The beginning of Axle counter section. B. The end of Axle counter section. **C. Both beginning and end of the section.**
16	In digital Axle counter system incount is equal to outcount than **A. Section is indicated as clear.** B. Section is indicated as occupied. C. None
17	DAC Axle counter system can be used in A. Straight track detection. B. Point and crossover track detection. **C. Both straight and point & cross over track detection.**
18	In Digital Axle Counter evaluation computer carries out A. Evaluates the signals transmitted from the counting head. B. Compares the number of axles counted in and the number of axle counted out. **C. Both (A) & (B)**
19	In Siemens DAC valuation of evaluator computer A. Monitors track vacancy detection sections. B. Generates track clear or occupied indication. **C. Both of (A) & (B)**
20	In Siemens DAC, STEU card provided for **A). Different indications.** B). displays in count only C. displays out count only

Initial Battery Charging

1	When battery charger is in Boost mode and Lead Acid Battery voltage reaches 2.4V per cell, charger will switch back to Float mode automatically. **True**
2	Lower level of Electrolyte in Lead Acid battery will over heat battery while charging. **True**
3	Worn out plates of Lead Acid battery will lead to unequal voltage and unequal specific gravity of cell. **True**
4	Premature gassing defect of Lead Acid cell is rectified by prolonged charging at very low rate at half the freshening rate of charge. **True**
5	Electrolyte loss due to spillage should be replaced with proper amount of electrolyte of the same specific gravity. **True**
6	For preparation of solution for Lead Acid Cell the ratio of acid to distilled water is **A) 1:5** B) 2:5 C) 3:5 D) None
7	Initial Charging of Lead Acid Cell should be continues at least for **A) 12Hours** B) 20 Hours C) 40 Hours D) 60 Hours
8	The temperature of Electrolyte in Lead Acid Cell should not be allowed to rise above **A) 45 degree centigrade** B) 55 degree centigrade C) 65 degree centigrade D) 70 degree centigrade
9	The period of Initial discharging of Lead Acid Cell should not be less than A) 4 hours B) 6 hours C) 8hours **D) 10 hours**
10	Electrolyte prepared for filling in Lead Acid cell for Initial Charging must have specific gravity of **A)1.190 +/-0.005** B)1.215+/-0.005 C)1.240+/-0.005
11	Lead acid batteries to be initially charged should be of A) Same type & any AH capacity **B) Same AH capacity & type** C) Same AH capacity & Company.
12	For continuous load, the battery bank should be on **A)"FLOAT CHARGE" working** B)"TRICKLE CHARGE" working C))"CHARGE DISCHARGE" working
13	During initial charging if temperature of electrolyte rises above 45

	degree centigrade charging current should be reduced to A) 1/2 of the rate **B)1/3 of the rate** C) 1/4 of the rate
14	It is preferable to dilute Sulphuric acid to prepare solution for filling in Lead Acid Batteries in A) Single Stage **B)Two Stage** C)Three Stage
15	During Initial charging, Mode selecter switch of Battery Charger should be kept in A) Manual mode **B) Auto mode** C) Any of these
16	Number of micro switch to be kept ON, on cell selecter switch is **A) one** B) Two C) All
17	Voltage selecter switch shall be used for adjusting cell voltages in case of A) Auto mode **B) Manual Mode** C) Both modes
18	In Lead Acid Batteries all vent caps should be kept closed and all floats are in position A)To prevent Discharging of cell **B)to check level of electrolyte** C)To prevent addition of Water
19	Positive of charger has to be connected to battery terminal **A) Positive of Battery** B) Negative of Battery C) Any where
20	Low level of electrolyte in the lead acid cell is caused by **A)Excess charging** B)Impure Distilled water C) Both of these

Electronic Interlocking –GE

1	VGPIO card provides eight vital inputs for sensing voltage. **True**
2	VGPIO provides eight vital outputs for driving cards. **False**
3	Current loop adapter module communicates serially with local control panel. **True**
4	Module RS 485 is typically used for communication between VHLC & PC **True**
5	RS 232 communicates between two VHLC units. **True**
6	Number of inputs/outputs a VGPIO card can cater is A) 6/6 B) 6/8 C) 8/6 **D) 8/8**
7	Number of inputs a VGPI card can cater is A) 8 B) 10 C) 14 **D) 16**
8	Number of inputs/outputs a NVIO card can cater is **A) 16/16** B) 16/8 C) 8/16 D) 8/8
9	LED indication showing VGPIO module healthy is A) Red B) Yellow **C) Green** D) Blue
10	Communication between CLA and CLLP I/O is **A) 128** B) 64 C) 32 D) 16

Power supply Equipment's

1	In Integrated power supply system, modules cannot be replaced when system is ON. **False**
2	On stations provided with Integrated power supply system, signal supply is assured even if all incoming supply fails. **True**
3	To dilute acid, acid is added in distilled water. **True**
4	D.C - D.C converter works on A.C supply **False**
5	Float charging is adopted where the load is of continuous type. **True**
6	Centre rod of 6 I cell consists of A) Zinc **B) Solid Carbon** C) Iron D) Lead.
7	Powder filled around carbon rod in 6I cell is A) NH4Cl B) CO2 **C) Mn02** D) Coal
8	Capacity of 6I cell is A) 20 AH **B) 40 AH** C) 80 AH D) 120AH
9	In IPS, inverters and Ferro-resonant based voltage regulators are provided in **A) AC distribution panel** B) DC distribution panel C) SMPS panel
10	IPS is suitable for use with A) VRLA batteries (IRS S93/96A) B) Low maintenance batteries (IRS S 88/93) **C) Any of these**
11	For non-RE Area, capacity of battery bank provided with IPS has a capacity of A) 120 AH B) 200 AH **C) 300 AH**
12	For RE Area capacity of battery bank provided with IPS is **A) 120 AH** B) 200 AH C) 300 AH
13	Maximum AC power (Current) required at 230V by IPS in RE Area is A) 6KVA **B) 3KVA** C) 2.5KVA
14	Maximum AC power (current) required for IPS designed for MACLS with end cabins is A) 6KVA B) 3KVA **C) 2.5 KVA**
15	In IPS, "Start generator" indication is displayed and resettable alarm sounds when **A) Battery discharges to 50%** B) Battery discharges to 75% C)

	When incoming power supply fails.
16	In IPS, System shutdown indication and non-resettable alarm sounds when **A) Battery discharges to 70%** B) Battery discharges to 90% C) When power supply given to IPS fails.
17	Positive terminals of batteries, which are to be charged, should be connected to A) Negative terminal of battery charger B) Positive terminal of "LOAD "on charger **C) Positive terminal of battery charger**
18	Electrolyte in VRLA cell is absorbed in A) PVC B) Wood **C) Absorptive Glass Mat**
19	Negative plate of VRLA cells is **A) Lead Cadmium Alloy** B) Patented MFX Alloy C) Lead peroxide
20	VRLA cell supplied by the firm is **A) Fully charged** B) Partially charged C) Un-charged

Basic Concept of Signalling

1	When calling ON signal is taken OFF, the driver is authorized to resume full sectional speed. **False**
2	After granting line clear in class "A" station, shunting can be permitted in face of an approaching train. **False**
3	Multiple aspect signalling a signalling arrangement in which signals display at any one time any one of the three or more aspects. **True**
4	For protecting the obstruction only one man is sufficient **False**
5	Breaking distant should not be less than 1000 meter. **True**
6	Route indicators are treated as A.Stop signals **B. Signal device** C. Subsidiary signal D. None
7	Visibility of main line starter in MACLS is **A.400 mtrs** B. 600 mtrs C 200 mtrs. D. None
8	Hand flag is not available in A) Red colour B) Green colour **C) Yellow colour D) None**
9	The colour of light used during night to show hand signal in case of emergency is **a) Red colour** b) Green colour c) yellow Colour d) white colour.
10	BSLB is provided at a station on **A) D/L section** B) both single & double line station C) MA/UQ territory D) None
11	Signal overlap in 2-aspect territory is A.120 mtrs. **B. 180 mtrs.** C. 400 mtrs. D. 600 mtrs.
12	The White miniature armed signal painted with red band in Semaphore signal is called A. Shunt signal B. Co-acting signal **C. Calling on signal** D. None
13	Stations are mainly classified as **A. Block and Non-block** B. Class A & Class B C. Class C & Class D D. None
14	Shunt signal is classified as A) Receiving signals B) Departure signal C) Main stop signal **D) Subsidiary signal**
15	"P" marker is provided on A) Stop signals B) Gate signals **C) All permissive signal** D) None

16	Warner signal located below a stop signal is capable of displaying A) 3 aspect signal **B) 2 aspect signal** C) 4 aspect signal D) None
17	Calling on signal cannot be placed below a A) Stop signal B) starter signal **C) LSS** D) None
18	Co-acting signals are provided in **A) Semaphore signal territory** B) CLS territory C) PI. /RRI territory D) None
19	Example for subsidiary signal is A) Home **B) Shunt** C) Distant
20	First detonator is placed at _____m from the site of obstruction **A) 1200,** B) 600, C) 450
21	A Token may also be used as an authority to proceed. **True**
22	Where trains are worked under absolute block system, no train shall be allowed to leave a block station in advance until a line clear is received from the block station in advance. **True**
23	A driver finds an IB stop signal at ON then driver may be passed with prescribed procedure. **True**
24	When a driver finds an IB stop signal at ON he shall bring his train to a stop in rear of the signal. **True**
25	The distance between outer face of gate and gate stop signal is 180m/400m as Block .Overlap. **True**
26	The White miniature armed signal painted with red band in Semaphore signal is called A. Shunt signal B. Co-acting signal **C. Calling on signal** D. None
27	Stations are mainly classified as **A.Block and Non-block** B. Class A & Class B C.ClassC & ClassD D.None
28	In Basic concept of Signalling, SR means A.Stick relay **B. Subsidiary Rule** C. Safety rule D. None
29	Visibility of main line starter in MACLS is **A.400 mtrs** B. 600 mtrs C 200 mtrs. D. None
30	A lower quadrant signal system have (A)3 aspect signals (**B)Outer signal with Warner**(C)Home signal with route (D) None
31	Colour of Banner flag is **(A) Red colour** B) Green colour C) Yellow colour D) None
32	The colour of light used during night to show hand signal in case of emergency is **a) Red colour** b) Green colour c) yellow Colour d) white colour.

33	The colour of light used in ON position of Calling on signal is **A) No light** B) Red light C) yellow light D) Green light.
34	"P" marker is provided on A) Stop signals B) Gate signals **C) All permissive signal** D) None
35	Co-acting signals are provided in **A) Semaphore signal territory** B) CLS territory C) PI. /RRI territory D) None
36	The FSS of class 'A' station is **A) Outer** B) Warner C) Home D) None
37	Shunting in the face of an approaching train up to SLB is permitted in A) Class 'A' station **B) Class 'B' station** C) Class 'C' station D) None.
38	Example for subsidiary signal is A) Home Signal **B) Shunt Signal** C) Distant Signal
39	First detonator is placed at what distance from the site of obstruction **A) 1200,** B) 600, C) 450
40	Block overlap in LQ is A) 120 m **B) 400m**, C) 180m

Orthodox Signalling

1	Opening of rodding compensator arm should be 29 ½ inch when the lever is in reverse position. **True**
2	Following Williams stretcher is maintained by S& T staff. **False**
3	While adjusting a point, fixed heel switch is not connected with lever if it is not in centre position. **True**
4	In a single wire transmission, for wire run at long angular diversion, horizontal wheel is used. **True**
5	In a single wire transmission, due to stretch in wire, lever operation becomes hard **True**
6	Channel pitch in direct type lever frame is **A) 110 mm** B) 40 mm C) 65 mm
7	On straight rodding run, maximum distance between two adjacent roller guide is A) 6 feet B) 7 feet 9 inch **C) 7 feet**
8	Length of adjustable arm in right angle adjustable crank is **A) 18 inch** B) 16 inch C) 12 inch
9	When lever is in normal position, opening of the rodding compensator arm is A) 21 ½ inch **B) 13 ½ inch** C) 8 inch
10	Minimum number of lock bar clips provided in lock bar is A) 5 no's B) 3 no's **C) 9 no's**
11	During the adjustment of facing point lock, before connecting the lock plunger with plunger driving rod, the lock plunger should kept clear from split stretcher notch by **A) Half inch** B) 3 inch C) 1 inch
12	Minimum number of bar stop in lock bar are A) 5 B) 6 **C) 3**
13	When lock bar is operated, it should be clear from toe of switch(in BG) by A) Half inch **B) 1inch (25mm)** C) 1 1/2 inch
14	In a unit wire detector, size of notch on lock slide is A) 2 inch x 1/2 inch **B) 1 inch x 1/2 inch** C) 2 1/8 inch x 1/8 inch

15	The number of point slide in a unit wire detector is A) 5 B) 4 **C) 1**
16	In a unit wire detector, thickness of signal slide is **A) 10 mm** B) 15 mm C) 25 mm
17	Burners of signal lamp must be changed at every A) 6 months **B) 3 months** C) 12 months
18	In single wire transmission, length of long distance transmission is more than **A) 300 meter** B) 1000 meter C) 500 meter
19	In single wire transmission, size of wire rope is A) 7/17 SWG **B) 7 x 7/22 SWG** C) 7/22 SWG
20	In a single wire transmission, swing pulley is available maximum in **A) 3 way** B) 6 way C) 9 way
21	In catch handle type lever frame, conflicting notch can be avoided by use of Top piece. **True**
22	Signal Maintainer can give disconnection memo for overhauling of lever frame. **False**
23	In signal fitting, signal roundel rings are fixed in rear of "B" type spectacle. **True**
24	In semaphore arm signal, back light screen is directly connected to the spectacles casting in "A" type Spectacle. **True**
25	In a single wire transmission, draft wheel is used on signal lever tail for short distance signal. **False**
26	In catch handle type lever frame, stroke of tappet is A) 346mm B) 110 mm **C) 65 mm**
27	In catch handle type lever frame, slack locking is existing if the catch blocks is lifted above the quadrant notch by more than A) 12 mm **B) 10 mm** C) 25 mm
28	In a Catch handle lever frame, Catch handle levers are available in group of A) 5 or 7 lever **B) 8 or 10 lever** C) 3 or 1 lever
29	Maximum number of channels in Catch Handle type lever frame is A) 4 B) 3 **C) No limit**
30	In rodding run, maximum bend permitted in rodding is A) 60 mm **B) 90 mm** C) 25 mm
31	In rodding run, on straight rodding run, maximum distance between two adjacent roller guide is A) 6 feet B) 7 feet 9 inch **C) 7 feet**
32	In rodding run, height of low relief crank is A) 8 inch **B) 3 inch** C) 5 1/2 inch
33	In rodding run for lock operating rod, rodding compensator is not

	required for a length upto **A) 18.5 meter** B) 12 meter C) 60 meter
34	In rodding run, the crank provided at lead out is A) Adjustable arm crank B) Straight arm crank **C) Accommodating crank**
35	In rodding run, the last crank of rodding run can be A) Normal crank B) Reverse crank **C) Normal OR Reverse crank**
36	In mechanical points in BG, Lock bar is normally below the rail level by **A) 38 mm** B) 25 mm C) 44 mm
37	While testing a mechanical point, size of test piece used by S&T Staff is **A) 1/8 inch** B) 1 inch C) Half inch
38	In a unit wire detector, maximum throw of point slide is **A) 4 1/2 inch** B) 3 1/2 inch C) 21/2 inch
39	In semaphore signal, dead space in "B" type spectacle is A) 2 1/2 inch **B) 1 1/2 inch** C) 3 inch
40	In signal fitting, burners of signal lamp must be changed at every A) 6 months **B) 3 months** C) 12 months

Signal Reverser, LLCC, ALR

1	**If Signal Arm is not correctly at 'ON' and 'OFF' position, then repeating Arm of Arm and light repeater should show "wrong" position.** True
2	Lever Lock works on AC & DC supply. **True**
3	All the split pins of Lever Lock and Circuit Controller should be in open position. **True**
4	Counter weight is provided in IRS type Lever Lock. **False**
5	In IRS type Lever Lock, coil can be connected in Series/Parallel as per requirement. **False**
6	B type signal reverser is suitable for A) U.Q. B) L.Q. **C) U.Q. & L.Q.**
7	Reverser is connected with between A) Spectacle rod and coupling lever B) Operating rod and supporting lever **C) Spectacle rod & Operating rod**
8	In reverser Unauthorised operation of semaphore arm is prevented by **A) Lock pawl** B) Electro magnet C) Operating crank
9	Spectacle lever and Operating lever are coupled by **A) Coupling lever** B) Supporting lever C) Roller & bracket
10	Clearance between lock pawl and spectacle lever gear teeth of reverser should not be more than A) 3 mm **B) 1 mm** C) 5 mm
11	Minimum working voltage of a reverser is A) 10 V B) 12.5V **C) 7.5V**
12	Polarity of reverser coil should be changed once in A) Every six months **B) Every month** C) Fortnightly
13	In circuit controller of lever lock 1 number band is always **A) In inner side of the circuit controller** B) Front side of the circuit controller C) Middle of the circuit controller
14	Lever lock & circuit controller works on supply A) DC supply B) AC supply **C) Both AC or DC supply**
15	Electro- mechanical equipment's require force drop arrangement. A) For positive normalisation B) To energisation C) To make the

	back contact.
16	The edge of notch of lever lock slide should be in shape of A) Round shape **B) Square shape** C) Slopped
17	lever lock & circuit controller bands are nominated **A) As per lever position** B) As per band position C) As per requirement
18	Coil resistance of arm repeater of arm & light repeater unit is **A) 300 ohm**s B) 150+150 ohms C) 200 ohms
19	Repeating arm of Arm & light repeater unit repeats the position of **A) Signal Arm** B) Signal Lever C) SM slide
20	If the signal arm is not correctly at ON or OFF position ,then the arm of the Arm & light repeater unit should show A) ON indication B) OFF indication **C) Wrong indication**

Int. Slotting, EKT

1	**Cross protection is to be provided in all electrical circuit.** False
2	A slotted signal shall not taken off without receipt of slot. **True**
3	Dropping of concerned track circuit shall cause the slot circuit to fail. **True**
4	In RWRK circuit NWKR back contact is proved in Electrical detector. **True**
5	Cross protection is not compulsory in Electrical detector circuit. **True**
6	A slotted device is controlled by. A) more than one agency B)one agency **C) one or more agency.**
7	A slotted signal can be put back at ON by A) all controlling agency **B) any one of the controlling agency** C) none
8	One slot one signal system is worked by. **A) SR circuit** B) E type lock C) levers
9	For slotting, the device provided on semaphore arm signal is **A) Reverser** B) Electrical Key Transmitter C) Lever
10	To establish an electrical control on mechanical lever, device used is A) EKT B) Reverser **C) Electric lever lock and circuit controller.**
11	Electric lever lock is fitted with **A)Mechanical lever** B) Signal post C) Electrical detector
12	Lever position can be repeated by A) Electric lever lock **B) Circuit controller** C) Relay
13	A slot relay is a **A) line relay** B) time element relay C) PR relay
14	A slot relay picks up when slot controlling track circuit is in A)De- energised condition **B) energised condition** C) any condition
15	In a slot circuit, provision of cross protection is **A) must** B) optional C) not necessary
16	The relay ensuring one train on one slot is A) YR **B) YSR** C) SR

17	For operation of point ,signal or gate a key can be transmitted electrically by means of **A) EKT** B) Electric Lever lock C) Reverser
18	Slot indication is given by A) Reverser **B) Slot Indicator** C) Buzzer
19	In 25 KV RE Slot circuits are controlled through **A) AC immunised Relay** B) Non immunised Relay C) Track relay
20	In luminous type slot indicator rating of used bulb is A) 12 V,24 W B) 12 V,2.4 W **C) 12 V,4 W**
21	In Electrical Key Transmission, same circuit can be used for RE & Non RE area. **False**
22	As far as possible, Electrical Key Transmiter shall be fitted near to the gear, which it controls by key **True**
23	In Electrical detector, NWKR back contact is proved in RWKR circuit. **True**
24	'N' band of point lever is used in NWKR circuit of Electrical detector. **True**
25	Cross protection is not compulsory in Electrical detector circuit. **False**
26	A slotted device is controlled by. A) more than one agency B)one agency **C) one or more agency.**
27	A slotted signal can be put back at ON by A) all controlling agency **B) any one of the controlling agency** C) none
28	One slot one signal system is worked by. **A) SR circuit** B) E type lock C) levers
29	For slotting, the device provided on semaphore arm signal is **A) Reverser** B) Eleactrical Key Transmitter C) Lever
30	To establish an electrical control on mechenical lever, device used is A) EKT B) Reverser **C) Electric lever lock and circuit controller**.
31	Electirc lever lock is fitted with **A)Mechanical lever** B) Signal post C) Electrical detector
32	Lever position can be repeated by A) Electric lever lock **B) Circuit controller** C) Relay
33	A slot relay is a **A) line relay** B) time element relay C) PR relaay
34	A slot relay picks up when slot controling track circuit is in A)De- energised condition **B) energised condition** C) any condition
35	In a slot circuit, provision of cross protection is **A) must** B) optional C) not necessary
36	The relay ensuring one train on one slot is A) YR **B) YSR** C) TR
37	For operation of point ,signal or gate a key can be transmitted electricaly by means of **A) EKT** B) Electric Lever lock C) Reverser
38	Slot indication is given by

	A) Reverser **B) Slot Indicator** C) Buzzer
39	In 25 KV RE Slot circuits are controlled through **A) AC immunised Relay** B) Non immunised Relay C) Track relay
40	In luminous type slot indicator rating of used bulb is A) 12 V,24 W B) 12 V,2.4 W **C) 12 V,4 W**

Relays

1	**In self type, Track relays takes more current to pick up in comparison with line relay.** True
2	In Q style relay, same plug boards cannot be used for all type Q style relays. **True**
3	K-50 relay is non proved type relay **False**
4	'Q' style relay is a proved type relay. **False**
5	Rated voltage of QTA2 relay is 1.4 Volts. **True**
6	Contact combination of K 50 UECR is **A) 5F/1B** B) 6F/2B C) 2F/1B
7	In K 50 mini group relay, spring contact number which remains front contact always is **A) 11-12** B) 51-52 C) 91-92
8	Number of relays in Major group are A) 12 B) 15 **C) 30**
9	In 3 aspect Siemens main signal group number of K 50 relays are A) 10 **B) 13** C) 30
10	A.C immunization level of 4F/4B K.50 relay is A) 120 VAC B) 300 VAC **C) 130 VAC**
11	Maximum pick up current of shelf type AC immunized track relay is A) 39 mA. B) 10 mA. **C) 72 mA.**
12	In shelf type AC immunized relay, magnetic shunt is provided on core **A) above the copper slug** B) below the copper slug C) None
13	AC immunized shelf type Line relay can control a circuit up to a length of A) 1.6 km B) 450 M **C) 3 Km**
14	In QJ1 relay, coil resistance of thermal element is **A) 43 ohms** B) 680 ohms C) 195 ohms
15	In QL1 relay, coil resistance of releasing coil is A) 400 ohms B) 150 ohms **C) 680 ohms**
16	Rated voltage of QBAT relay is A) 1.4 V **B) 1.75 V** C) 0.5 V
17	In Siemens point group, number of K 50 relay is

	A) 11 **B) 12** C) 15
18	Minimum pick up current of QTA2 A) 105mA B) 140mA **C) 120mA**
19	Maximum pick up current of QBAT track relay is **A) 175 mA** B) 140 mA C) 120 mA
20	Q style relay is preferred because its replacement is **A) Easy** B) difficult C) none
21	Shelf type line relay coils are always connected in parallel only. **False**
22	Code pin arrangement is provided in Q style relay to prevent a wrong relay being plugged in a base of different contact combination relay. **True**
23	QSPA1 relay is a slow operating relay. **True**
24	Polarized relay is used only in Single Line Token Block Instruments. **False**
25	Realy having no testing label can be connected in circuit. **False**
26	In QL1 relay, coil resistance of releasing coil is A) 400 ohms B) 150 ohms **C) 680 ohms**
27	Rated voltage of QBAT relay is A) 1.4 V **B) 1.75 V** C) 0.5 V
28	Coil resistance of 6F / 2B K 50 relay is A) 1260 ohms B) 615 ohms **C) 1840 ohms**
29	Contact combination of K 50 ECR is A) 4F/4B **B) 3F/3B** C) 5F/3B
30	Contact combination of K 50 UECR is **A) 5F/1B** B) 6F/2B C) 2F/1B
31	In K 50 mini group relay, spring contact number which remains front contact always is **A) 11-12** B) 51-52 C) 91-92
32	Contact pin number 12 represents contact spring Number A) 31-32 **B) 81-82** C) 33-34
33	Number of relays in Siemens Major group are A) 12 B) 15 **C) 30**
34	In 3 aspect Siemens main signal group number of K 50 relays are A) 10 **B) 13** C) 30
35	AC immunisation level of shelf type track relay is **A) 50 VAC** B) 80 VAC C) 300 VAC
36	A.C immunization level of 4F/4B K.50 relay is A) 120 VAC B) 300 VAC **C) 130 VAC**
37	In shelf type AC immunized relay, magnetic shunt is provided on core **A) above the copper slug** B) below the copper slug C) None
38	AC immunized shelf type Line relay can control a circuit up to a length of A) 1.6 km B) 450 M **C) 3 Km**
39	In Siemens point group, number of K 50 relay is A) 11 **B) 12** C) 15
40	Minimum pick up currrent of QTA2

	A) 105mA B) 140mA **C) 120mA**

Track Circuit

1	In an open Track Circuit track relay is normally in de-energies position **True**
2	When TSR of 0.5 ohms is connected across a DC closed Track Circuit the track relay voltage should not be more than 85% of its drop away value **True**
3	Broken and loose rail bonds and jumpers of Track Circuit should be attended promptly. **True**
4	When 0.15 ohms TSR is connected across an AC Track Circuit, front contacts of track relay should break. **True**
5	If any positive jumper in a Track Circuit is by passed then parallel portion of the Track Circuit may not get shunted when occupied by train. **True**
6	In reactance fed AC track circuit, regulating device is variable A) Resistance B) Condenser **C) Reactance**
7	In a double rail Track circuit in non-electrified area, block joints are provided on A) Any One rail **B) Both rails** C) None
8	In Siemens type double rail AC Track Circuit impedance bond used is **A) Siemens impedance bond** B)Resonated impedance bond C) Auto coupled impedance bond
9	Maximum length of DC Track Circuit in RE Area with RCC sleepers and with 50 V AC immunized track relay is A)450M B)750M **C)350M**
10	Maximum length of DC Track Circuit in non RE with RCC sleepers in station yard is **A) 670m** B) 1000m C) 450m
11	AC immunity level of QTA1, track relay is A)100V AC B) 80V AC **C) 30V AC**
12	AC immunity level of QBAT track relay is **A)80V AC** B)50V AC C)100V AC
13	AC immunity level of QTA2 track relay is **A) 50V AC** B) 80V AC C)100V AC

14	Resistance value of 'B' type choke is. A) 120 OHMS **B) 3 OHMS** C) 100 OHMS
15	Maximum phase angle for an AC Track Circuit is **A)90 DEGREE** B)60 DEGREE C)100 DEGREE
16	Track transformer used for condenser feed Track Circuit is A)300/12V **B)110/110V** C)110/12V
17	Minimum TSR for AC Track circuit is A) 0.5 OHMS **B) 0.15 OHMS** C) 0.25 OHMS
18	Track relay used for AC condenser feed Track Circuit is. A) NON RESONATED TRACK RELAY **B) RESONATED TRACK RELAY** C) NONE
19	Value of reactance used for AC double rail reactance fed Track circuit is (A) 25 OHMS **(B) 6 OHMS** C) 10 OHMS
20	Track relay used for AC reactance fed Track Circuit is A) NON RESONATED TRACK RELAY B**) RESONATED TRACK RELAY** C) NONE
21	Phase angle of AC Track Circuit should not be less than 60 degree. **True**
22	In AC Track Circuit, Phase angle of condenser feed Track Circuit is poor. **False**
23	In condenser fed AC Track Circuit, phase angle remains constant for any change in the value of ballast resistance. **True**
24	TSR of DC Track circuit should be less than 0.5 ohm **False**
25	The value of TSR is directly proportional to the relay voltage. **False**
26	Track Circuit provided on point zone is A) Open T/Ckt B) Double rail T/Ckt **C) Multiple type Track circuit**
27	In reactance fed AC track circuit, regulating device is a variable A) Resistance B) Condenser **C) Reactance**
28	In resistance feed AC Track Circuit, regulating device is a variable A) Condenser **B) Resistance** C) Reactance
29	Maximum length of DC Track Circuit in non RE with RCC sleepers in station yard is **A) 670m** B) 1000m C) 450m
30	Maximum length of DC Track Circuit in RE area with wooden sleeprs and 50 VAC immunized track relay is **A)450M** B)350M C)1000M
31	AC immunity level of QTA1, track relay is A)100V AC B) 80V AC **C) 30V AC**

32	Impedance value of 'B' type choke is A) 100 OHMS B) 3 OHMS **C) 120 OHMS**
33	Minimum phase angle for an AC Track Circuit is A**) 60 DEGREE** B) 120 DEGREE C) 30 DEGREE
34	In resistence fed Track Circuit, regulating device is variable A)CONDENSER B) REACTANCE **C) RESISTANCE**
35	In reactance fed Track Circuit regulating device is variable. **A) REACTANCE** B) CONDENSER C) RESISTANCE
36	Track transformer used for condenser feed Track Circuit is A)300/12V **B)110/110V** C)110/12V
37	Track transformer used for reactance feed Track Circuit is **A)110/12V** B)300/12V C)110/110V
38	Minimum TSR for AC Track circuit is A) 0.5 OHMS **B) 0.15 OHMS** C) 0.25 OHMS
39	Track relay used for AC resistance fed Track Circuit is A) RESONATED TRACK RELAY **B) NON RESONATED** TRACK RELAY C) NONE
40	Local supply of AC double element track relay is A) 12V AC **B) 110V AC** C) 60V AC

Signal Machine

1	**The signal machine is suitable for working with LQ and UQ signal** True
2	In signal machine snubbing circuit 2 ohms resistance with diode is used to limit the current and direction of current. **True**
3	Signal machine cover is provided with suitable gasket. **True**
4	Blocking diode prevents the battery, discharging back through the solar cell. **True**
5	Voltage regulation avoids excess charging of battery. **True**
6	Solar panel is used only for signal lighting. **False**
7	Solar cells are coated with anti-reflecting coating. **True**
8	The K and H contacts in signal machine is normally made **True**
9	In signal machine, 'K' & 'H' contacts are normally break. **False**
10	The motor used in Signal machine is DC **A) Series** B) Shunt C) Compound d) None
11	In signal machine assembly reducing gear set is **A) 3gear** B) 4 gear C) 5gear D) None
12	In signal machine pick up coil resistance is **A) 45 ohms** B) 90 ohms C) 100 ohms D) 120 ohms
13	In signal machine hold "off" coil resistance is **A) 580 ohms** B) 700 ohms C) 900 ohms D) 100 ohms
14	In signal machine working current of pick-up coil is **A) 220mA** B) 17 mA C) 300mA D) None
15	Current of Hold off coil of signal machine is A) 220mA **B) 17 mA** C) 300mA D) None
16	In signal machine, ON position of semaphore arm is **A) 0-2 Degree** B) 10 Degree C) 45 Degree D) 90 Degree
17	In signal machine LQ semaphore arm "Off " position is A) 0-2 Degree B) 10 Degree C) 45 Degree **D) 90 Degree**
18	Open voltage of single solar cell

	A) 0.85 V B) 0.55 v C) 2V D) None
19	Load voltage of single solar cell A) 0.85 v **B) 0.55 V** C) 2V D) None
20	Solar panel is to be cleaned once in **A) 15days** B) 30 days C) 45 days D) None

Colour Light Signalling

1	Siemens "ON" Lamp checking relay cannot be converted to "OFF" Lamp checking relay. **True**
2	Colour light signal has a good visibility on curvature. **False**
3	Aspect focusing of colour light signal is done whenever a particular aspect goes out of focus. **True**
4	SL-35A signal lamp is used in "OFF" aspect of the signal. **True**
5	In Diesel Engine Cam shaft operates the valve in time. **True**
6	Diameter of outer lens of colour light signal is **A) 213 mm** B)140mm C) 100mm
7	Filament of signal lamp is **A) THICK** B)THIN C) NONE
8	Capacity of Siemens signal transformer is **A)50VA** B)40VA C) 80VA
9	Secondary load of "H" type current transformer is **A) ECR** B) SL 5 C) SL 31
10	Primary winding of "I" type current transformer connected in series with primary of signal transformer is **A) PRIMARY** B) SECONDARY C) NONE
11	Primary winding of "L" type current transformer connected in series with primary of signal transformer is **A) PRIMARY** B) SECONDARY C) NONE
12	Secondary voltage of "H" type current transformer is **A) 9V AC +/- 5%** B) 7V AC +/- 5% C) NONE
13	Primary current of "L" type current transformer is A) 2.5 A **B) 0.3** A C) 0.5 A
14	Primary current of "H" type current transformer is **A) 2.5** A B) 0.3 A C) 0.5 A
15	Voltage induced on secondary winding of current transformer is depending upon the primary A) VOLTAGE **B) CURRENT** C) NONE
16	In R E, minimum distance of signal post in rear of mast shall be A) 10 M B) 7 M **C) 30 M**
17	The maximum length of signal aspect controlling cable with

	110/12V signal transformer on single line is A) 605 M **B) 180 M** C) 495 M
18	The maximum length of signal controlling cable with 300/12V signal transformer on single line is **A)495 M** B) 220 M C) 605 M
19	Cable should cross the track at an angle of **A) 90 degrees** B) 60 degrees C) 45 degree D) 30 degrees
20	While laying cable, percentage of spare cable to be provided is **A) 20%** B) 30% C) 40% D) 50%
21	Focusing of Colour light signal is easy **True**
22	Distant HR and HHR is controlled by the back contact of DPR and DECR relay contacts. **True**
23	In automatic signaling interlocked gate can not be provided . **False**
24	In automatic signaling interlocked gate is provided with G board **True**
25	In Diesel Engine Lubricating oil in air cleaner is changed after 250 Hrs. **True**
26	Signal lamp prior to use in circuit is to be tested with A)12V AC **B) 10.5VAC** C) NONE
27	Capacity of workshop make signal transformer is A) 50VA **B) 40VA** C) 80VA
28	MECR unit has A) "L" type current transformer **B) "H" type current transformer** C) None
29	Signal lamp has A) 2pin B) 4pin **C) 3 pin**
30	Capacity of "H" type current transformer is A) 0.5VA **B)0.9VA** C) 2.5VA
31	Secondary voltage of "L" type current transformer is **A) 9V AC+/- 5% AC** B)7V AC +/- 5% AC C) NONE
32	Primary voltage of "I" type current transformer is A) 0.5 V AC **B) 110 V AC** C) 0.3 V AC
33	Primary current of "H" type current transformer is **A) 2.5 A** B) 0.3 A C) 0.5 A
34	Glow voltage of signal lamp is A) 12 V AC **B) 2.3 V AC** C) 10.8 V AC
35	In R E Area, no parts of signal fittings shall fall within A) 0. 2 METERS **B) 2 METERS** C) 7 METERS
36	As per revised design, cable used in RE shall be only A) SCREENED CABLE **B) UNSCREENED CABLE** C) NONE
37	The maximum length of signal controlling cable with 300/12V signal transformer on single line is **A)495 M** B) 220 M C) 605 M
38	The maximum length of signal controlling cable with 300/12V signal transformer on double line is

	A) 495 M B) 220 M **C) 605 M**
39	Signal transformer used only in RE area is A) 110/12 V **B) 300/12V** C) NONE
40	Cable should cross the track at an angle of **A) 90 degrees** B) 60 degree C) 45 degree D) 30 degrees

Point Machine

1	High speed single end point machine takes 3 seconds for complete operation. **True**
2	In M63 point machine, locking is straight-through SLM type. **True**
3	While testing point, 3.25mm test piece is placed at a distance of 150mm from toe of tongue rail. **True**
4	In Siemens Point Machine working voltage should not fall below 90 VDC. **True**
5	DC ELD is provided to detect cable failure before it occurs & reduce failure. **True**
6	In Siemens Point Machine, reduction gear ratio is **A) 20.8 : 1** B) 30 : 1 C) 20 : 1 D) 1 : 1
7	In Siemens point machine, if detector contact is made accurately, the gap between keeper and finger contact is **A) 2mm** B) 1mm C) 5mm D) 6mm
8	In Siemens point machine, friction clutch should be considered good if the difference between normal working current and obstruction current is **A) 1 amp.** B) 0 amp C) 4 amp. D) Less than 1 amp
9	In thick web point, Switch Setting Device is provided between sleepers **A) 13th , 14th** B) 1st, 2nd, C) 3rd, 4th, D) 9th 10th
10	Opening of thick web tongue rail is **A) 220mm** B) 160mm C) 115mm D) 100mm
11	Throw of thick web point machine is **A) 220mm** B) 143mm C) 115mm D) 100mm
12	Throw of Siemens Point Machine is A) 220mm **B) 143mm** C) 115mm D) 100mm
13	In Siemens Point Machine, switching unit contacts are **A) self-wiping** B) adjustable C) steady D) not steady.
14	In Siemens Point Machine super imposed circuit, out of correspondence is established by energisation of relay **A) WKR2** B) WKR1 C) WKR3 D) WJR
15	In Siemens Point Machine super impose circuit, cross protection is

	proved by energisation of relay **A) WKR2** B) WKR1 C) WKR3 D) WJR
16	In Siemens panel point group, Heavy duty contact relay is **A) WR** B) W(R)R C) W(N)R D) WJR
17	In Siemens panel Normal point operation is carried by pressing buttons: **A) WN& WWN** B)WN & EWN C)WN & OYN D)WN & EUUYN
18	Type of snubbing provided in Siemens point machine is A) electrical**, B) mechanical** C) relay
19	In Siemens Point machine in case of RH turn out RC contact is A) 1-1a **B) 2-2a** C) 3-3a
20	Point initiation relay in Siemens point circuit is A) WKR1 **B) Z1WR1** C) WKR3
21	High speed single end point machine takes 3 seconds for complete operation. **True**
22	In Siemens point machine operation, detector roller moves on detector slides for 115 mm. **True**
23	Before working on point machine, disconnection memo should be given and permission accepted from SM/ASM. **True**
24	In Siemens Point Machine working voltage should not fall below 90 VDC. **True**
25	Obstruction current of any point machine is more than the working current. **True**
26	In Siemens Point Machine, reduction gear ratio is **A) 20.8 : 1** B) 30.8 : 1 C) 20 : 1 D) 1 : 1
27	In siemens point machine rack and pinion arrangement, number of teeth in rack are **A) 6** B) 5 C) 4 D) 7
28	In siemens point machine, if detector contact is adjusted properly, the gap between keeper and finger contact is **A) 2mm** B) 1mm C) 5mm D) 6mm
29	In a point, clearance between bottom of stock rail and top of Ist William stretcher should be A) 2mm **B) 1.5 mm** C) 5mm D) 10 mm
30	Throw of thick web switch point machine is **A) 220mm** B) 143mm C) 115mm D) 100mm
31	The fuse used in operation circuit of Siemens Point Machine is A) 7amp. B) 30 amp. C) 20 amp. **D) 10 amp.**
32	In siemens point machine, for one complete operation of the point,

	Crank Handle has to be rotated A) 200 times B) 100 times **C) 87 1/2 times** D) 20.8 times
33	In Siemens Point Machine, switching unit contacts are **A) self wiping** B) adjustable C) non-wiping
34	In Siemens Point Machine super imposed circuit, out of correspondence is established by energisation of relay A) WKR3 B) WKR1 **C) WKR2** D) WJR
35	In Siemens Point Machine super impose circuit, cross protection is proved by energisation of relay A) WKR1 B) WKR2 C) WKR3 D) WJR
36	In Siemens Panel/RRI point group, heavy duty contact relay is A) WJR B) W(R)R C) W(N)R **D) WR**
37	In Siemens panel individual point operation is carried out by pressing buttons: A) WN & EWN **B) WN& WWN** C)WN & OYN D)WN & EUUYN
38	In Siemens panel when point track is down, point operation is carried out by pressing buttons A) WN & WWN **B) WN & EWN** C) WN & OYN D) WN & EUUYN.
39	Type of snubbing provided in Siemens point machine is A) electrical, **B) mechanical** C) relay
40	Initiation relay in Siemens PI point group is A) WKR1 **B) Z1WR1** C) WKR3

Relay Interlocking (Metal to Carbon)

1	Counter is provided for calling on signal **True**
2	Relay interlocking should full fill the conditions of interlocking as per SEM **True**
3	In British panel interlocking, back contact of EUUYNR is proved in UCR circuit. **True**
4	WJR relay is slow to drop relay. **True**
5	In British panel interlocking, front contact of CHR is proved in HR circuit. **True**
6	Colour of point button on British panel is A) Red **B) Blue** C) Grey
7	Colour of route button on British panel is A) Red B) Blue **C) Grey**
8	NCR relay is normally A) De-energised **B) Energised** C) none
9	ASR relay in British panel is normally A) De-energised **B) Energised** C) none
10	RJPR relay in British panel is normally A) De-energised **B) Energised** C) none
11	Track locking in British panel is achieved by A) WCR **B) WLR** C) WJR
12	NCR buzzer sounds if push button on panel is pressed for more than **A) 15 seconds** B) 30 seconds C) 25 seconds
13	In British panel Contact used of WLR in HR ckt is A) Front contact **B) Back contact** C) none
14	In British panel Route is locked by dropping of **A) WLR relay** B) ASR relay C) UCR relay
15	Type of Relay used in British Panel is A) Proved type **B) Non-proved type** C) none
16	Route setting type panel is used for A) Minor yard **B) Major yard** C) none
17	The relay which proves that all Point button relays are down is A) UNCR **B) WNCR** C) GNCR

18	In British panel Colour of shunt signal button is A) Red B) BLUE **C) Yellow**
19	Non Route setting type panel is used for **A) Minor yard** B) Major yard C) none
20	The relay which picks up proving that all signal button relays are down is A) UNCR B) WNCR **C) GNCR**

Relay Interlocking (Metal to Metal)

1	In Siemens Panel signal group, GLSR relay energizes with GZR, U(R)S front contact and signal and route button pressed. **True**
2	In Siemens Panel, 16th terminal on domino is negative. **True**
3	In Siemens Panel, for performing SI cancellation, break open seal of EUYN, insert SI key, turn to right and press EUYN and WN button of required sub route. **True**
4	In SPM point group, When W(R)R is energized, operation circuit is established. **True**
5	First give disconnection memo and after accepted by S.M. then only carry out maintenance work **True**
6	In Siemens panel, while operating a point from R to N, WKR1 is de-energized by energisation of relay A) WKR3 **B) WJR** C) W(R)R D) WKR2
7	In Siemens panel, out of correspondence of point is taken by energisation of A) WKR3 B) WJR C) W(R)R **D) WKR2**
8	Extra attachment of condenser for WJR relay in Siemens panel is provided at intermediate distribution frame terminal number **A) 8, 9** B) 9, 10 C) 10, 11 D) 8, 10
9	In Siemens panel WJR relay when energized hold for **A) 10 sec** B) 20 sec C) 4 sec D) 120 sec
10	In Siemens panel, button used to lower Calling On Signal are **A) GN, COGGN, UN** B) WN, COGGN, UN C) WN, WWN D) OYN, UN
11	In Siemens panel, when track portion is energized without route setting, track indication is displayed by **A) No light** B) White light C) Red light D) White light flashing.
12	In Siemens panel AJTR is fed with A) AJTR1 **B) AJTR2** C) AJTR3 D) AJTR
13	In Siemens panel, relay in series with the counter in SM cancellation is A) EUUYNCR B) EUUYR **C) EUYR** D) ERN
14	In Siemens panel, Overlap is cancelled after

	A) 120 sec. **B) 90 sec**. C) 60 sec. D) 5 minutes.
15	In Siemens panel single end point operation, time taken to set a point to either positions **A) 3 sec**. B) 2 sec. C) 7 sec. D) 20 sec.
16	In Siemens panel, Flasher relay flashes A) 120 sec B) 90 sec. C) 5 minutes. **D) Continuously.**
17	In Siemens panel, Coil resistance of K-50 latch relay is **A) 615 ohms** B) 700 ohms C) 800 ohms D) 1260 ohms
18	In Siemens panel, Maximum continuous load of closed contact of K-50 relay is **A) 5A** B) 10A C) 15A D) 20 A
19	In Siemens panel, Approach locking and back locking test are carried once in every **A) 3 months** B) 6 months C) 9 moths D) 1 year.
20	In Siemens panel, Testing of counter EUYN, COGGN, OYN, EWN is carried once in every **A) 1 month** B) 2 months C) 15 days D) 3 months

Axle Counter

1	In universal Axle counter track device, excess track cable should be kept in zig zag manner inside the location box. **True**
2	In an universal Axle counter, all line verification box key should have separate ward. **True**
3	In an universal Axle counter, shielded cable should be used for Evaluator and supervisory relays. **True**
4	Intermediate Block Signal is automatically replaced to "ON" by the passage of train. **True**
5	Red indication will be displayed on panel in rear station when IB signal passed at ON position. **True**
6	In an universal axle counter system, maximum loss in cable connecting evaluator and EJB is limited to **A) 20 db** B) 4 db C) 15db D) None
7	An universal axle counter system can control a section up to a length of A) 30 kms B) 20kms **C) 15 kms** D) None
8	In an universal axle counter system, one of the output of DC-DC converter is **A) Isolated 10VDC** B) 24VDC C) 60 VDC D) 100VDC
9	In an universal axel counter system, +10VDC supply of DC-DC converter should be adjusted for **A) 10.2 VDC** B) 11 VDC C) 15 VDC D) None
10	In EJB of an universal axle counter system, oscillator card output voltage is A) 70V (rms) +/- 10% B) 80V (rms) +/- 10% **C) 60V (rms) +/- 10%** D) None
11	Number of cards in an universal axle counter EJB should be A) 9 cards B) 7 cards **C) 3 cards** D) None
12	The number of cards in an universal axle counting system is A) 7 cards **B) 10 cards** C) 3 cards D) None
13	Evaluator and supervisory relay voltage in an universal axle counter system should not be less than A) 9V B) 10V **C) 11V** D) None

14	Minimum length of trolley suppression track circuit for an universal axle counter system on double line **A) 3 rail length** B) 5 rail length C) 7 rail length D) None
15	Output voltage of receiver amplifier card of an universal axle counter system EJB should not be less than **A) 0.7V** B) 2V C) 3V D) None
16	Time a driver has to wait before proceeding during day and night, when IB signal is at "ON" and all communication failed **A) 5 min.** B) 2 min C) 3 min D) None
17	Provision of IBS working increases **A)Train Frequency** B) Safety C) Bi direction D) None
18	A button to reset the axle counter failure or improper counting A) PB1 **B) PB2** C) P{B3 D) None
19	A button to give co-operation to the station in rear A) PB1 B) PB2 **C) PB3** D) None
20	A button to acknowledge the alarm of train passing IBS at ON or power failure A) PB1 B) PB2 C) PB3 **D) ACK**
21	In Electronic Junction Box, oscillator card output is fed to the receiver coil. **False**
22	In universal Axle counter, for establishing direction of train movement, each end comprises two sets of transmitters and receiver coils. **True**
23	In an universal Axle counter in non RE area, armouring of Axle counter cable shall be earthed at one end only i.e. on Evaluator end. **True**
24	Red indication will be displayed on panel in rear station when IB signal passed at ON position. **True**
25	Intermediate Block signalling is provided on double line only. **True**
26	An universal axle counter system can control a section upto a length of A) 30 kms B) 20kms **C) 15 kms** D) None
27	In an universal axle counter system, one of the output of DC-DC converter is **A) Isolated 10VDC** B) 24VDC C) 60 VDC D) 100VDC
28	In an universal axel counter system, +10VDC supply of DC-DC conveter should be adjusted for A**) 10.2 VDC** B) 11 VDC C) 15 VDC D) None
29	In EJB of an universal axle counter system, oscillator card output voltage is A) 70V (rms) +/- 10% B) 80V (rms) +/- 10% **C) 60V (rms) +/- 10%** D) None
30	Number of cards in an universal axle counter EJB should be A) 9 cards B) 7 cards **C) 3 cards** D) None

31	Evaluator and supervisory relay voltage in an universal axle counter system should not be less than A) 9V B) 10V **C) 11V** D) None
32	In an universal axle counter system, coil resistance of transmitter coil at the end of cable is A) 12 ohms B) 5 ohms **C) 2 ohms** D) None
33	Maximum counting capacity of an universal axle counter system is A) 512 B) 264 C) 128 **D) 1024**
34	Output voltage of receiver amplifier card of an universal axle counter system EJB should not be less than **A) 0.7V** B) 2V C) 3V D) None
35	Time a driver has to wait before proceeding during day and night, when IB signal is at "ON" and all communication failed is **A) 5 min**. B) 2 min C) 3 min D) None
36	The button to be pressed to reset the circuit whenever the IBS is passed at "ON" is **A) PB1** B) PB2 C) PB3 D) None
37	A button to reset the axle counter failure is A) PB1 **B) PB2** C) P{B3 D) None
38	A button to give co-operation to the station in rear in IBS is A) PB1 B) PB2 **C) PB3** D) None
39	The button to acknowledge the alarm caused by a train passing IBS at ON or power failure is A) PB1 B) PB2 C) PB3 **D) ACK**
40	Axle counter re-setting relay is **A) ACRSR** B) ACZR C) ACPR D) PBPR

Block Instruments Token

1	The Block Instrument has a capacity of 42 tokens **False**
2	Jerking contact is provided on spring clutch shaft **True**
3	Galvo indicates the presence of incoming / outgoing current **True**
4	Do not bend the contact spring specially the finger contact **True**
5	Battery must be kept sealed. **True**
6	Current of the galvo of NT B/I is **A 15- 25 mA** B) 10 -–15 mA C) 15-20 mA D) 0-25 Ma
7	Voltage of galvo of NT B/I is **A) 3 volt** B) 2 volt C) 4.5 volt D) 1.9 volt
8	Resistance of bell in NT B/I is **A) 28 ohms** B) 150 ohms C) 77 ohms D) 140 ohms
9	Current of bell in NT B/I is **A) 80 mA** B) 25 mA C) 160 mA D) 17 Ma
10	Voltage of bell in NT B/I is A) 2 v **B) 3v** C) 4.5v D) 1.9 v
11	Current of TCF/TGT lock coil in NT B/I is **A) 160 mA** B) 80 Ma C) 17 Ma D) 25 Ma
12	Voltage of TCF/TGT lock coil in NT B/I is **A) 4.5 V** B) 1.9 v C) 3.0 v DA) 2.0 v
13	Resistance of polarized relay in NT B/I is **A) 77 ohms** B) 150 ohms C) 140 ohms D) 28 ohms
14	Voltage of polarized relay in NT B/I is **A) 1.9 v** B) 2.0 v C) 4.5 v D) 3.0 v
15	Working current of NT Block Instt. Is **A 25 mA** B) 160 mA C) 80 mA C) 10 Ma
16	Token capacity of NT B/I is **A) 36 Nos Token**. B) 40 Nos Token. C 32 Nos Token. D) 42 Nos Token.
17	In RE area the bell circuit is functioning on AC supply and the frequency is **A) 150 Hz** B) 50 Hz C) 250 Hz D) 63 Hz
18	The earth resistance of NT B/I should not more than **A) 10 ohms** B) 7 ohms C) 50 ohms D) 25 ohms

19	In one complete sequence of operation of the NT B/I TCF lock is energized A) One time B) 2 time **C) 3 time** D) 0 time
20	Neal's Block is overhauled once in A) 07 years **B) 10 years** C) 15 years D) None

Block Instruments Token less

1	In Daido Single Line block Instrument Receiver receives the modulated frequency. **True**
2	In single line Daido block instrument ASR picks up after picking up of TRSR **True**
3	"TOL" code can not be received when Station master key is removed from single line Daido block instrument. **False**
4	"TOL" code can be received when Station Master key is extracted in single line Daido block instrument **True**
5	In single line token less push button B/I working principle in three step polar impulse **True**
6	The colour of TOL indicator indicating "Train on Line" indication with occupation of Block section is A) White **B) Red** C) None
7	Working current of Daido single line block instrument is A) 60mA B) 25mA **C) 110mA**
8	In Single line token less block instrument push button type, Reception code checking relay is A) TCKR **B) RCKR** C) CRR D) CTPPR
9	In Single line token less block instrument push button type Receiving delivery relay is A) TCKR B) RCKR C) CRR **D) RDR**
10	Token less Block Instrument used in AC RE area on single line is. **A) Daido S/L B/Instt** B) PTJ S/L C) Kyosan S/L
11	By use of Token less Block Instrument section capacity can A) Decrease **B) Increase** C) None
12	Carrier frequency of Daido Block instrument is A) 65 Hz B) 85 Hz **C) 1800 Hz.**
13	Daido Single Line Block Instrument works on **A) Modulated frequency** B) DC coding C) None
14	1800 Hz carrier frequency Daido Block Instrument connected with a Daido Block Instrument of carrier frequency of A) 1800 Hz **B) 2700 Hz** C) None
15	Batteries required for Daido Single line Block Instrument. is

	A) 2 sets B) 1 sets **C) 3 sets**
16	In Single line Daido block instruments Transmitter and Receiver is operated by **A) Local battery** B) Location battery C) Line battery
17	In "AC RE" in single line Daido block instrument filter unit is connected with A) Bell circuit **B) Line circuit** C) None
18	In Single line token less block instrument push button type line battery current while operation should be **A) 60mA** B) 30 mA C) 2 amp. D) 100 mA
19	In Single line token less block instrument push button type, telephone battery should be **A) 3 VDC** B) 12 VDC C) 24 VDC D) 60 VDC
20	In Single line token less block instrument push button type, line wire used are **A) 2** B) 4 C) 3 D) 1
21	In NT Block Instrument, All Block earth and their connection must be examined at interval of not less than one month **True**
22	Single line token Block Instt. are required to be overhauled once in 12 yrs **False**
23	In NT Block Instrument,If the position of commutator is normal and pressing the plunger the deflection of galvo will be RHS **True**
24	In NT Block Instrument, If the position of commutator is reverse the deflection of galvo will be LHS **True**
25	In NT Block Instrument,when a token can be taken out from instrument without proper signals being exchanged Block instrument shall be suspended **True**
26	Current of the galvo of NealsToken Block Instrument, is **A) 15- 25 mA** B) 10 -–15 mA C) 15-20 mA D) 0-25 mA
27	Voltage of galvo of NealsToken Block Instrument is **A) 3 volt** B) 2 volt C) 4.5 volt D) 1.9 volt
28	Resistance of bell in NealsToken Block Instrument is **A) 28 ohms** B) 150 ohms C) 77 ohms D) 140 ohms
29	Current of bell in NealsToken Block Instrument is **A) 80 mA** B) 25 mA C) 160 mA D) 17 mA
30	Voltage of bell in NT B/I is A) 2 v **B) 3v** C) 4.5v D) 1.9 v
31	Resistance of TCF/ TGT lock coil in NT Block Instrument, is **A) 28 ohms** B) 150 ohms C) 140 ohms D) 77 ohms

32	In NT Block Instrument, current of TCF/TGT lock coil is **A) 160 mA** B) 80 mA C) 17 mA D) 25 mA
33	In NT Block Instrument,Voltage of TCF/TGT lock coil is **A) 4.5 V** B) 1.9 v C) 3.0 v DA) 2.0 v
34	In NT Block Instrument, resistance of polarized relay is **A) 77 ohms** B) 150 ohms C) 140 ohms D) 28 ohms
35	In NT Block Instrument,c urrent of polarized relay is **A) 25mA** B) 40 mA C) 80 mA D) 160 Ma
36	In NT Block Instrument,Voltage of polarized relay is **A) 1.9 v** B) 2.0 v C) 4.5 v D) 3.0 v
37	Working current of NT Block Instt. Is **A 25 mA** B) 160 mA C) 80 mA C) 10 Ma
38	Token capacity of Neal Token Block Instrument is **A) 36 Nos Token**. B) 40 Nos Token. C 32 Nos Token. D) 42 Nos Token.
39	In RE area the bell circuit is functioning on AC supply and the frequency is **A) 150 Hz** B) 50 Hz C) 250 Hz D) 63 Hz
40	The earth resistance of NT B/I should not more than **A) 10 ohms** B) 7 ohms C) 50 ohms D) 25 ohms

Block Instruments Double Line

1	Whenever any Block Instrument is sent for overhauling its BPR should also be sent for overhauling. **True**
2	In SGE Block Instrument bell code cannot be transmitted when Station Master key is removed. **False**
3	In RE Area, TWBB unit is connected in bell circuits in SGE block Instrument. **True**
4	Output of TWBB unit is 40 to 60 volts DC. **False**
5	Output of TWBB is 60VAC, 150Hz. **True**
6	The rated current of SGE Block Instrument is A) 25 mA B) 500 mA **C) 17mA**
7	The working current of SGE Block instrument is A) 17mA B) 500mA **C) 25mA**
8	The coil resistance of BPR is A) 60 ohms **B) 77 ohms** C) 140 ohms
9	The working current of door lock coil of SGE Block is **A) 200 mA** B) 150 mA C) 70 mA
10	The working current of bell coil of SGE Block is **A) 150 mA** B) 200 mA C) 50 mA
11	The working current of bell relay of SGE Block is A) 150 mA B) 50 mA **C) 500mA**
12	The working current of BPR is A) 17mA B) 50mA **C) 25mA**
13	In indication circuit of SGE Block in RE area the protection device connected is **A) Filter unit** B) TWBB Unit C) None
14	In bell circuit of SGE Block in RE, protection device connected is. A) Filter unit **B) TWBB unit** C) None
15	The coil resistance SGE Block door lock coil is A) 140 ohms B) 500 ohms **C) 50 ohms**
16	The coil resistance of Top indicator coil of SGE Block is A) 500 ohms B) 50 ohms **C) 140 ohms**
17	The coil resistance of bell relay of SGE Block is **A) 500 ohms** B) 50 ohms C) 140 ohms

18	The coil resistance of bell coil of SGE Block is **A) 60 ohms** B) 50 ohms C) 140 ohms
19	In SGE, with pet quad cable in AC RE area, contact of bell plunger assembly is not used. A) X+, B) XL, **C) X**
20	Output of TWBB unit is A) 40-60VDC, **B) 40-60VAC**, C) 150VAC
21	In SGE for block clearance circuit two closed track circuits shall be used. **True**
22	Block Instrument cover shall not be opened without disconnection memo **True**
23	SR is a normally energized relay. **True**
24	SGE block Commutator gets locked when operated from `Line Closed` to TOL. **False**
25	In SGE block instrument, half notch is provided for force drop arrangement. **False**
26	The coil resistance of Top indicator coil of SGE Block is A) 500 ohms B) 50 ohms **C) 140 ohms**
27	The coil resistance of bell relay In SGE Block Instrument is **A) 500 ohms** B) 50 ohms C) 140 ohms
28	The coil resistance of bell coil of SGE Block is **A) 60 ohms** B) 50 ohms C) 140 ohms
29	The coil resistance of bottom indicator coil of SGE Block is A) 500 ohms **B) 140 ohms** C) 50 ohms
30	The working current of SGE Block instrument is A) 17mA B) 500mA **C) 25mA**
31	The coil resistance of BPR of SGE Block Instrument .is A) 60 ohms **B) 77 ohms** C) 140 ohms
32	The working current of door lock coil of SGE Block is **A) 200 mA** B) 150 mA C) 70 mA
33	The working current of indicator coil of SGE Block is A) 17mA **B) 25mA** C) 150 mA
34	The working current of bell coil of SGE Block is **A) 150 mA** B) 200 mA C) 50 mA
35	The working current of bell relay of SGE Block is A) 150 mA B) 50 mA **C) 500mA**
36	The working current of BPR of SGE Block Instrument is A) 17mA B) 50mA **C) 25mA**
37	In indication circuit of SGE Block in RE area the protection device connected is

	A) Filter unit B) TWBB Unit C) None
38	In bell circuit of SGE Block in RE, protection device connected is A) Filter unit **B) TWBB unit** C) None
39	In SGE block, with pet quad cable in AC RE area, contact of bell plunger assembly is not used. A) X+, B) XL, **C) X**
40	Output of TWBB unit is A) 40-60VDC, **B) 40-60VAC**, C) 150VAC

Signalling in RE (25 KV AC)

1	In 25KV RE Area, Electro static induction effect is eliminated by replacing the overhead line with underground cable. **True**
2	Cable should not be laid in concrete pipe in vicinity of substation in 25KV RE Area. **False**
3	In 25KV RE Area, insulators in Rodding run are provided to protect staff from induced voltages. **True**
4	In 25KV RE Area, 77 ohms BPR shall be used in B/Instrument. **True**
5	As per revised design in RE, only screened cable is used. **False**
6	In 25KV RE Area, as per existing design maximum induced voltage in unscreened cable is A) 35 V / km **B) 87.5 V / km** C) 116 V / km
7	In 25KV RE Area, as per revised design maximum induced voltage in double line section is A) 116 V / km B) 35 V / km **C) 95 V / km**
8	In 25KV RE Area, in the vicinity of switching station, the distance between the cable and station earthing is **A) 5 m** B) 0.5m C) 1 m
9	In 25KV RE Area, value of ballast resistance should not be less than. A) 1 ohm / km **B) 2 ohm / km** C) none,
10	In 25KV RE Area, value of rail resistance should not be more than A) 3 ohm/km B) 4 ohm/km **C) 1 ohm/km**
11	In 25KV RE Area, protective iron screen should be provided on the signal structure if the signal Fitting falls within **A) 2M** B) 7M C) none
12	In 25KV RE Area, in front of mast signal should be provided at a minimum distance of A) 20M **B) 10M** C) 30M
13	In 25KV RE Area, minimum height of Red aspect of signal above rail level is **A) 3.65M** B) 4M C) 2.35M
14	In 25KV RE Area, as per revised design maximum length of signal control circuit with unscreened cable and 110V power supply on

	double line is A) 600M B) 1.6KM **C) 220M**
15	In 25KV RE Area, with screened cable maximum length of signal control circuit with 110V Power supply is **A) 600M** B) 650M C) 495M
16	In 25KV RE Area, glow voltage of signal lamp is **A) 2.3 V** B) 4.7 V C) 12 V
17	In 25KV RE Area, impedance value of S1 choke provided with filter unit is: A) 40 ohm B) 600 ohm **C) 40,000 ohm**
18	In 25KV RE Area, test voltage of S2 is: **A) 50 V** B) 600 V C) 30 V
19	In 25KV RE Area, coil resistance of Top indicator of SGE block instrument is: **A) 140 Ohms** B) 550 Ohms C) None
20	Induced voltage on Double Line is **A) 95, V/Km** B) 116, V/Km C) 87.5 V/Km
21	In 25KV RE Area, by reducing the length of control circuits, Electro magnetic induction effect can be reduced. **True**
22	In 25KV RE Area, a siemens point machine can be operated up to a distance of 420M on double line section. **True**
23	In 25KV RE Area, cable terminals should be painted with Red paint. **True**
24	In 25KV RE Area, stabilizer is used to give variable voltage. **False**
25	As per revised design in RE, only screened cable is used. **False**
26	In 25KV RE Area, as per revised design maximum induced voltage in double line section is A) 116 V / km B) 35 V / km **C) 95 V / km**
27	In 25KV RE Area, in rocky soil depth of cable trench is **A) 0.5 m** B) 0.8m C) 1 m
28	In 25KV RE Area, in the vicinity of switching station, the distance between the cable and station earthing is **A) 5 m** B) 0.5m C) 1 m
29	In 25KV RE Area, value of ballast resistance should not be less than. A) 1 ohm / km **B) 2 ohm / km** C) none,
30	In 25KV RE Area, protective iron screen should be provided on the signal structure if the signal Fitting falls within **A) 2M** B) 7M C) none

31	In 25KV RE Area, in front of mast signal should be provided at a minimum distance of A) 20M **B) 10M** C) 30M
32	In 25KV RE Area, minimum height of Red aspect of signal above rail level is **A) 3.6**5M B) 4M C) 2.35M
33	In 25KV RE Area, as per revised design maximum length of signal control circuit with unscreened cable and 110V power supply on double line is A) 600M B) 1.6KM **C) 220M**
34	In 25KV RE Area, with screened cable maximum length of signal control circuit with 110V Power supply is **A) 600M** B) 650M C) 495M
35	In 25KV RE Area, maximum length of DC Track circuit with QBAT track relay is A) 450 B) 270M **C) 750M**
36	In 25KV RE Area, if the length of rodding run is more ,then additional insulated joint shall be provided at every: A) 400 m **B) 300 m** C) None
37	In 25KV RE Area, impedance value of S1 choke provided with filter unit is: A) 40 ohm B) 600 ohm **C) 40,000 ohm**
38	In 25KV RE Area, test voltage of S2 is: **A) 50 V** B) 600 V C) 30 V
39	In 25KV RE Area, TWBB oscillator generates a frequency of: A) 50Hz **B) 150Hz** C) None
40	In 25KV RE Area, coil resistance of Top indicator of SGE block instrument is: **A) 140 Ohms** B) 550 Ohms C) None

Auxiliary Warning System

1	In Auxiliary Warning System F1 & F4 frequencies are generated for yellow aspect when inter signal distance is more than 700 meters. **False**
2	In Auxiliary Warning System only frequencies F1 to F5 are used for oscillator. **False**
3	In Auxiliary Warning System, Emergency Brakes are applied when the train speed increases more than 10 KMPH than the required speed. **True**
4	In Indication panel of Auxiliary Warning System, Colour of Reset button is green. **True**
5	In Indication panel of Auxiliary Warning System, Colour of Vigilant button is Red. **True**
6	In Auxiliary Warning System, frequencies used for Absolute Red aspect are **A) F1 - F2** B) F3 - F4 C) F1 - F4 D) F1- F5
7	In Auxiliary Warning System, frequencies used for yellow aspect (with inter-signal distance less than 700m) are A) F1 - F2 B) F3 - F4 **C) F1 - F4** D) F1- F5
8	In Auxiliary Warning System, frequencies used for yellow aspect (with inter signal distance more than 700m) are A) F1-F2 B) F3 - F4 **C) F2 - F4** D) F1- F5
9	In Auxiliary Warning System, frequencies used for permissive Red aspect (with auxiliary signals provided below it) are A) F1-F2 B) F3 - F4 C) F1 - F4 **D) F1- F5**
10	In Auxiliary Warning System, when a yellow signal is passed, (with inter-signal distance less than 700m) speed of the train must be brought to 38KMPH within A) 120m B) 180m C) 400m **D) 290m**
11	On Indication panel of Auxiliary Warning System, Colour of reset button is A) Yellow **B) Green** C) Blue D) Red
12	On Indication Panel of Auxiliary Warning System, Colour of vigilant button is A) Yellow B) Green C) Blue **D) Red**

13	In Auxiliary Warning System, Track magnet is provided on **A) Inner gauge face on RHS** B) Inner gauge face on LHS C) Outer gauge face on RHS D) Outer gauge face on LHS
14	In AWS, track magnet is provided on Inner gauge face of RHS rail at a distance of **A) 231mm from inner gauge face** B) 213mm from inner gauge face C) 161mm from inner gauge face D) 123mm from inner gauge face
15	In AWS, the button required to be pressed to pass an automatic signal at "ON" position. A) SFBB B) Reset C) Vigilant **D) None**
16	In AWS, after passing a caution aspect signal, driver has to press "Vigilant" button to show his vigilance within A) 15 Sec B) 10 Sec **C) 4 Sec** D) 8 Sec
17	In AWS, with seven frequencies, number of information that can be transmitted using two frequencies for one information are A) 28 **B) 21** C) 14 D) 7
18	AWS system used in Mumbai suburban is designed with inter signal distance of A) 300 mtrs **B) 400 mtrs** C) 800 mtrs D) none
19	In AWS, colour code of wire used for connecting double yellow aspect to the opto coupler card is A) Yellow B) Green C) Red **D) Grey**
20	In AWS, Tacho-generator provides information about A) Distance travelled B) Speed of train C) Direction of motion of train **D) All of these**
21	In Auxiliary Warning System F1 & F4 frequencies are generated for yellow aspect when inter signal distance is more than 700 meters. **False**
22	In Auxiliary Warning System F2 & F4 frequencies are generated for yellow aspect when inter signal distance is less than 700 meters. **False**
23	In Auxiliary Warning System Track magnet works as Transmitter. **True**
24	In Indication panel of Auxiliary Warning System, White LED indicates healthy system functioning. **True**
25	In Indication panel of Auxiliary Warning System,Colour of SFBB button is red. **True**
26	In Auxiliary Warning System, frequencies used for Absolute Red aspect are

	A) F1 - F2 B) F3 - F4 C) F1 - F4 D) F1- F5
27	In Auxiliary Warning System, frequencies used for yellow aspect (with inter-signal distance less than 700m) are A) F1 - F2 B) F3 - F4 **C) F1 - F4** D) F1- F5
28	In Auxiliary Warning System, frequencies used for yellow aspect (with inter signal distance more than 700m) are A) F1-F2 B) F3 - F4 C**) F2 - F4** D) F1- F5
29	In Auxiliary Warning System, frequencies used for permissive Red aspect (with auxilliary signals provided below it) are A) F1-F2 B) F3 - F4 C) F1 - F4 **D) F1- F5**
30	When inter-signal distnace is more than 700m, additional track magnet of Auxiliary Warning System is provided in rear of the next signal, at a distance of A) 120m B) 180m **C) 400m** D) 290m
31	In Auxiliary Warning System, when a yellow signal is passed, (with inter-signal distance less than 700m) speed of the train must be brought to A) 50KMPH B) 15KMPH C) 30KMPH **D) 38KMPH**
32	In Auxiliary Warning System, when a yellow signal is passed, (with inter-signal distance less than 700m) speed of the train must be brought to 38KMPH within A) 120m B) 180m C) 400m **D) 290m**
33	On Indication Panel of Auxiliary Warning System, Colour of vigilant button is A) Yellow B) Green C) Blue **D) Red**
34	In Auxiliary Warning System,Track magnet is provided on **A) Inner gauge face on RHS** B) Inner gauge face on LHS C) Outer gauge face on RHS D) Outer gauge face on LHS
35	In AWS, after passing a caution aspect signal, driver has to press "Vigilant" button to show his vigilance within A) 15 Sec B) 10 Sec **C) 4 Sec** D) 8 Sec
36	In AWS, Oscillators provided in track magnet get power for operation from A) Signal Aspect B) Nearby location **C) From engine magnet** D) None
37	In AWS, Track magnet is a **A) Passive device** B) Active device C) Control device D) None
38	In AWS, with seven frequencies, number of information that can be transmitted using two frequencies for one information are A) 28 **B) 21** C) 14 D) 7
39	In AWS, colour code of wire used for connecting double yellow aspect to the opto coupler card is A) Yellow B) Green C) Red **D) Grey**
40	In AWS, Tacho-generator provides information about A) Distance traveled B) Speed of train C) Direction of motion of train **D) All of these**

Mechanical Interlocking

1	**Signal lock first trailing point lock bar** True
2	In route, opposite lock bar locks to each other **True**
3	Reverse notch is in the channel when the lever is in normal position **False**
4	Reverse notch come in channel when lever is operated in reverse position. **True**
5	Reverse notch can also be provided on normal conditional lever **True**
6	Function and levers are numbered with **A) Same numbers** B) Different numbers C) Mixed numbers
7	All numbers in the lever frame are numbered serially from A) Right to Left **B) Left to Right** C) none
8	Most popularly numbering of levers in a Lever frame is done by A) Geographical method B) Group method **C) Group cum Geographical method**
9	In group cum Geographical method numbering of all the function are divided in numbers of groups **A) 03** B) 02 C) none
10	For numbering, point and lock bars are grouped in A) Ist group **B) IInd group** C) IIIrd group
11	In a lever frame spare levers are left in between A) Ist and IIIrd group B) IIst and IIIrd group **C) Ist & IInd group and IInd & IIIrd group**
12	Route holding is provided when the distance between signal and the first facing point is **A) More than 180 mtrs** B) 180 mtrs C) 120 mtrs
13	For route holding in the same route the relation between two facing lockbars is A) Lock bar in advance locks the lock bar in rear **B) Lock bar in rear is released lock bar in advance** C) none
14	In a lever frame point to point locking causes **A) Economising of locking** B) It is easy C) none
15	In a lever frame slot lever having seprate overlap

	A) Released by each other **B) Locks to each other** C) none
16	For clearing a signal of when point is required in normal position the relation between signal and point is **A) Signal locks the point** B) Signal is released by point C) Signal locks point both ways
17	A tappet has Normal and Reverse Notches for A)normal locking **B) both way locking** C)released by locking
18	Conditional locking is achieve through A)cut lock B)full lock **C)swinger**
19	Swingers are types of **A) 02** B) 03 C) 04
20	No swinger should be used in A)first channel **B) first and last channel** C) last channel

Electro-Mechanical Signalling

1	**'SR' Drops when train passes the signal.** True
2	Once 'SR' is picked up, it remains in picked up position through its own front contact. **True**
3	Automatic working is introduced for diversion line. **False**
4	For diversion 'HR' pick up after 'UHR' **True**
5	NWKR' picks up when point is set and lock & lever is in 'B' position **True**
6	Indication locking on signal lever is provided for Colour Light Signal. **True**
7	ON aspect ECR front contact is proved in the indication locking circuit of Colour Light Signal. **True**
8	Track locking is effective only when point track circuit is occupied **True**
9	Approach locking is provided on Point lever. **False**
10	Once the signal lever is reversed, dead approach locking is released after the train has passed the signal or after the time delay. **True**
11	'JR' pick up when approach track circuit is occupied and signal lever is in "B" position. **True**
12	To release route locking, 'SR' back contact is proved in route locking circuit. **True**
13	Cross protection is must in 25KV RE area. **True**
14	Indication for signal is achieved through D positions of signal lever. **False**
15	Track locking on point lever for Normal to Reverse operation is provided on A) D position B) C position **C) A position**
16	Indication locking on signal lever is provided on A) A position **B) B position** C) None

17	Indication locking on point lever for Reverse to Normal operation is effective at **A) B position** B) D position C) None
18	Indication locking on point lever is provided for A) Mechanically operated point **B) Electrically operated point** C) None
19	Which locking performs the function of lock bar A) Indication locking **B) Track locking** C) None
20	Approach locking is provided on lever. **A) signal,** B) point, C) route

SSI / Data Logger

1	In Safe lock Solid State Interlocking, replacement of defective card with similar card is easier. **True**
2	In Safe lock Solid State Interlocking, wiring and relay accessory are reduced drastically. **True**
3	In Safe lock Solid State Interlocking, relay logic is used. **True**
4	In Safe lock Solid State Interlocking, power consumption is 40% less than PI. **True**
5	Safe lock Solid State Interlocking has extensive self-diagnostic features **True**
6	Safe lock Solid State Interlocking can be installed in parallel with PI **True**
7	In Safe lock Solid State Interlocking, Invalid status is displayed when each status of programmed function does not tally 100% with the present status of the function. **True**
8	In Safe lock Solid State Interlocking, Read input card acts as input interface of the system. **True**
9	In Safe lock Solid State Interlocking, EPROM programmed with principle of interlocking is called 'SYSTEM EPROM'. **True**
10	In Safe lock Solid State Interlocking, only vital relays for gear driving are used. **True**
11	In Safe lock Solid State Interlocking, input to the SSI comes from field relays and operator's panel. **True**
12	Safe lock Solid State Interlocking has got extensive self-diagnostic features. **True**
13	Failure in Safe lock Solid State Interlocking is self-annunciated on the maintainer's console.

	True
14	Uninterrupted Power supply should feed at least for 6 hrs. to data logger when no supply is available. **True**
15	Inbuilt temperature sensors are provided in Efftronics data logger **True**
16	Number of inputs that a RI card of a Safe lock SSI can accommodate is **A) 48** B) 64 C) 96 D) 56
17	Number of RI card a Safe lock SSI can accommodate is A) 9 B) 7 C) 4 **D) 6**
18	Number of output relays that a Safe lock SSI can drive is A) 48 B) 64 **C) 56** D) 96
19	In Safe lock SSI, number of output relays that a RD card can drive is A) 04 B) 05 C) 07 **D) 8**
20	The microprocessor chip used in Safe lock SSI is A) Intel 8085 **B) Intel 8086** C) Intel 8088 D) Motorola 68000
21	In Safe lock Solid State Interlocking, relay logic is used. **True**
22	Safe lock Solid State Interlocking has extensive self diagnostic features. **True**
23	In Safe lock Solid State Interlocking, Read input card acts as input interface of the system. **True**
24	In Safe lock Solid State Interlocking, input to the system is received from field gear controlling relays, field gear indicating relays and commands from operators panel. **True**
25	In Safe lock Solid State Interlocking system, there are 6 RI cards. **True**
26	The existing Safe lock Solid State Interlocking system has sufficient inputs / outputs for a four road stations. **True**
27	In Safe lock Solid State Interlocking, EPROM programmed with principle of interlocking is called 'SYSTEM EPROM'. **True**
28	In Safe lock Solid State Interlocking ,result of both the processors is compared by comparator card. **True**
29	The Safe lock Solid State Interlocking system automatically shut down in case of any un-safe failure.

	True
30	Inbuilt temperature sensors are provided in 9*+20154 make data logger . **True**
31	Maximum number of analog inputs that can be monitored by a ध)+ data logger is 96 **True**
32	Each stag box of Efftronics data logger can take 512 digital inputs. **True**
33	Each stag box of Efftronics Data Logger can accommodate 8 digital inputs cards. **True**
34	With help of data logger, signal passed at danger can be found out. **True**
35	No name or password should be put in data logger. **True**
36	Number of inputs that a RI card of a Safelock SSI can accommodate is **A) 48** B) 64 C) 96 D) 56
37	Number of RI card a Safelock SSI can accommodate is A) 9 B) 7 C) 4 **D) 6**
38	Number of output relays that a Safelok SSI can drive is A) 48 B) 64 **C) 56** D) 96
39	In Safelock SSI, number of output relays that a RD card can drive is A) 04 B) 05 C) 07 **D) 8**
40	The microprocessor chip used in Safelock SSI is A) Intel 8085 **B) Intel 8086** C) Intel 8088 D) Motorola 68000

BPAC

1	In Block Proving by Axle Counter, re-set counters are provided. **True**
2	BPAC block instrument is auto normal type. **True**
3	Axle counter proving block does not have auto TOL feature. **True**

Power supply Equipments

1	RDSO specification for Integrated power supply system is RDSO/SPN/165/2000. **True**
2	Integrated power supply system (RDSO/SPN/165/2000) is based on SMPS principle. **True**
3	Voltage of discharged Lead acid cell is 1.8v **True**
4	Specific gravity of lead acid cell is measured by lactometer. **False**
5	After giving AC supply to transformer, it gives DC out put. **False**
6	Centre rod of 6 I cell consists of A) Zinc **B) Solid Carbon** C) Iron D) Lead.
7	Zinc container used in 6I cell acts as **A) Negative electrode** B) Positive electrode C) Neutral D) None
8	In IPS, Float cum boost charger module is provided (FRBC) in A) DC distribution Panel B) AC distribution Panel **C) SMPS Panel**
9	In IPS, Status Indication and critical alarms are provided in **A) Monitoring Panel in SMs room** B) SMPS Panel C) None
10	For RE Area, normally capacity of battery bank provided with IPS is **A) 120 AH** B) 200 AH C) 300 AH
11	For non-RE, Maximum AC power (Current) required at 230 V by IPS is approximately **A) 6KVA** B) 3KVA C) 2.5KVA
12	Maximum AC power (current) required for IPS designed for MACLS with end cabins is approximately A) 6KVA B) 3KVA **C) 2.5 KVA**
13	In IPS, "Start generator" indication is displayed and resetable alarm sounds when condition of battery / power supply is **A) Battery discharges to 50%** B) Battery discharges to 75% C) When incoming power supply fails.
14	In IPS, "Start Emergency Generator" indication and resetable alarm sounds when condition of battery / power supply is A) Battery discharges to 50% **B) Battery discharges to 60**% C) When incoming power supply fails.
15	In IPS, System shutdown indication and non resettable alarm sounds when condition of battery / power supply is **A) Battery discharges to 70**% B) Battery discharges to 90% C) When power supply given to IPS fails.
16	Positive terminals of batteries, which are to be chargerd by battery charger, should be connected to A) Negative terminal of battery charger B) Positive terminal of "LOAD"on charger **C) Positive terminal of battery charger**

17	VRLA cell has separators of A) PVC **B) Absorptive Glass Mat** C) Non woven Cotton
18	Electrolyte in VRLA cell is absorbed in A) PVC B) Wood **C) Absorptive Glass Mat**
19	Type of VRLA cells are A)Flooded electrolyte type B) Saturated electrolyte type **C) Starched electrolyte type**
20	Positive plate of VRLA cells is A) Lead Cadmium Alloy **B) Petented MFX Alloy** C) Lead peroxide.

A)	निम्न संक्षिप्ताक्षरों के पूर्ण रूपों को लिखें । Write full forms of following abbreviations
	VRLA – Valve Regulating Lead Acid
	LDCE - Limited Departmental Competitive Examination
	HOER - Hours of Employment and Regulations
	RDSO - Research Design and Standard Organization
	LAP – Leave on average Pay
	a) HOER - **Hours of Employment and Period of Rest Rules**
	b) DAR - **Disciplinary appeal rules**
	c) ARME - **Accident Relief Medical Equipment**
	d) RDSO - **Research Designs and standards organization**
	e) RITES - **Rail India Technical and Economic Service**
	f) G&SR - **General and subsidiary rules**
	g) SWR - **Station working rule**
	h) IPS - **Integrated Power Supply**
	i) SEM - **Signal Engineering Manual**
	j) MACLS - **Multi aspect color light signalling**
	k) DMTR – **Daily material transaction register**
	i) MAS – **Material at site**

Telecommunications

Power plant

1	Positive plate of lead acid cell is PbO2 **True**
2	Bleeding Resistance decides Battery charger current. **True**
3	Recharging period of Battery is 8 hrs. **True**
4	Rating of transformer is represented by voltage and current **True**
5	If two cells are connected in series capacity will increase. **False**
6	Capacity of Battery is given by **A) AH** B) Watt C) Current
7	Maximum drain current from 6I cell (55 AH) is **A) 750 ma** B) 150ma C) 250 ma
8	Life of battery is given in term of A) No of cycles **B) No of years** C) Both
9	During charging of battery the direction of current in Battery is from **A) +ve** B) -ve C)Both
10	During charging of lead Acid Battery gas produced is **A) H2** B)NH3 C) N2
11	Trickle charging is used for A) Stabilized voltage **B) Compensating self leakage voltage** C)None
12	Internal Resistance of primary cell (6I) should not be more than **A) 2 Ohm** B) 5 Ohm C) Both
13	Internal short circuit effects in Battery **A) Warming of Battery** B) No O/P Voltage C) None
14	In automatic battery charger current is controlled by **A) SCR** B) Zener Diode C) LED
15	Zener diode normally works in A) Forward Bias **B) Reverse Bias** C) In Both
16	AC supply frequency in secondary winding of transformer is **A)50 Hz** B) 60 Hz C) 100Hz
17	Testing of transformer is done by applying load A) Resistive Load B) Inductive Load **C) Both**

18	No output voltage in transformer is due to **A) Secondary Coil Open** B) Secondary Coil Short C) None
19	The input voltage of Inverter is **A) DC** B) AC C) Both
20	Type of transformer used in DC-DC converter circuit is **A) Step Down** B) Step up C) None

Basic Electricity

1	For motors HRC fuses are the best **True**
2	Frequency of DC is 50 C/s **False**
3	A secondary cell produces AC with the frequency 50 HZ **False**
4	An inverter converts AC into DC **False**
5	Insulation resistance is measured by meggar. **True**
6	One kilo volt is Equal to A) 100 mV B) 1000MV **C) 1000 V**
7	To measure current the meter should always be in **A) series** B) Parallel C) series - parallel
8	According to ohms law the current is measured in **A) Amp.** B) mili amp C) None
9	According to ohms law V is equal to **A) I X R** B) I/R C) R/I
10	The insulation resistance of overhead lines must be more than A) 2 Ohm B) 1 0hm **C) 8 M Ohm**
11	The property to attract iron, is known as A) magnate B) Induction **C) magnetism**
12	A bar magnet has number of poles **A) 2** B) 1 C) 3
13	Number of winding in auto transformer **A) One** B) Two C) Three
14	A good rectifier must have **A) more efficiency and less ripple** B) less efficiency and more ripple C) both less
15	Fuse is provided in the circuit to protect from A) Fault **B) high current** C) fire
16	The lightening arrestor is a **A) Safety device** B) Measuring Instrument C) None
17	The maximum current capacity for HRC fuses is A) 1.5 KA B) 2.5 KA **C) 6 KA**
18	Loop resistance of RE cable (0.9 mm dia copper conductor) is **A) 56 ohms/km** B) 172 ohm/km C) 110 ohm/km
19	Unit of frequency is

	a) Cycle/Second b) Minute /Second c) Cycles/min
20	To maintain the constant power supply the device used is A) Inverter B) Charger **c) Stabilizer**

Overhead lines/Under Ground Cable

1	PG champ is used for non tension joint **True**
2	Earth coupling reduces noise in circuit. **False**
3	Maximum cross talk level is better than -61dbm **True**
4	Insulation test is performed by Megger. **True**
5	ACSR(6/1/1.5mm dia) wire loop resistance is 5.6 ohms/loop km. **True**
6	Loop resistance of GI Wire (300 lbs) is A) 30 ohm/Km **B) 22.2 ohm/KM** C)27 ohm/Km
7	Transmission loss of 6/1/1.96 mm dia ACSR wire is **A) 0.027 db/Km** B) 0. 023 db/Km C) 0.038 db/Km.
8	Height of over head alignment for road crossing. **A) 15 Feet** B) 18 Feet C) 23 Feet.
9	Height of overhead alignment on Railway Crossing. A) 15 Feet B) 18 Feet **C) 23 Feet.**
10	Distance of over head alignment from center of track **A) Height of post +7 Feet** B)Height of post +11 Feet C) None
11	Loop resistance of ACSR joint is **A) 0.02 ohm** B) 0.05 ohm C) 0.007 ohm.
12	Break fault is detected by using **A) Multimeter** B) Megger C) dB meter
13	T fault of line is known by using **A) Multimeter** B) Megger C) dB meter
14	Earth fault is tested by A) Multimeter **B) Megger** C) TMS Kit
15	OFC fibre is made of **A) Silica** B) Plastic C) PVC
16	Diameter of VF Quad conductor is A) 1.00mm **B) 0.9mm** C) 1.5mm
17	Cut off frequency in RE Cable is A) 3.34 KHz **B) 3.35 KHz** C) 4 KHz
18	Quad means A) Two conductor **B) 4 conductor** C) 3 conductor
19	Pair of cable means **A) Two conductor** B) 4 conductor C) 3 conductor

20	In RE cable last quad is **A) Reference** B) Marker C) General

Telephone Instrument

1	The Bell coil resistance is 1000 ohms. **True**
2	Stone transmission bridge is used in capacitive coupling **True**
3	Inspection & testing of telephone should be done by JE . **True**
4	Microphone converts sound energy into electrical energy. **True**
5	DKT Is a digital telephone. **True**
6	Line cord of Auto telephone is **A) 2 way** B) 4way C) 3 way
7	Type IL is **A) Transmitter** B) Receiver C) None
8	Frequency response of receiver is A) 1 KHz **B) 2.8 KHz** C) 3.4 KHz
9	Impedance of receiver at 1 KHz is **A) 225 ohms** B) 60 ohsm C) None
10	Type of head set used in magneto telephone is **A) 164** B) 200 C) 300
11	Resistance of induction coil for magneto telephone are A) 1.3 ohms B) 17 ohms **C) both of them**
12	Resistance of induction coil for auto telephone are A) 35 ohms B) 75 ohms **C) Both of them**
13	Anti side tone is separated by **A) Induction coil** B) Transmitter C) Receiver
14	Impedance matching of telephone instrument is done by **A) Induction coil** B) Transmitter C) Receiver
15	AC &DC supply is separated by **A) Induction coil** B) Transmitter C) Receiver
16	Speed of rotary dial is **A) 9-11 P/S** B) 10 P/S C) 9 P/S
17	Speed of dial in Push button telephone **A) 10 P/S** B) 9 P/S C) 11 P/S
18	Inspection of telephones is done by A) TCM B) JE **C) JE/SE**
19	Way station control phone introduces a loss while speaking of **A) 0.6 db** B) 1 db C) 0 db

20	Push button telephone needs supply A) 9 volts **B) 12 volts** C) 4.5 volts

PA, PRS, FAX, IVRS, MODEM

1	Talk back is duplex type of communication **False**
2	Box type speakers are used for open ground **False**
3	For commercial use, B class amplifier is used. **True**
4	Amplifier converts sound energy into electrical energy. **False**
5	Modem is not required to send FAX **False**
6	Pitch is affected by A) Voltage B) Current **C) Intensity**
7	Loudness depends on A) Acoustic feedback B) Voltage & type of Amplifier **C) Frequency**
8	Impedance of speakers depends on **A) Frequency** B) Shape of speaker C) Size of speaker
9	In marshalling yard matching is A) Impedance **B) Voltage** C) None of them
10	In voltage matching to connect more number of speakers tapping used is **A) 70 volts** B) Impedance matching with 16 ohms C) None of them
11	Gain of amplifier is expressed in A) DBM **B) DB** C) Watts
12	Battery backup for PA amplifiers. A) - 48 v B) + 48 v **C) + 24 V**
13	Talk back is a type of communication. **A) Simplex** B) Duplex C) None of them
14	For open ground type of matching used is **A) Voltage matching** B) Impedance matching C) Both
15	In closed area type of speakers used are **A) Box type** B) Horn type C) None of them
16	Talk back system is used at A) On railway platform **B) Marshalling Yard** C) None of them
17	Arrival /Departure indicators are used for A) Mail express train b) suburban train **C) both**.
18	FAX Machine in railway is used for sending A) circulars B) Important documents **C) Both.**

19	Test which can be given on modem are- A) 4- wire loop B) Digital loop **C) Both**.
20	CCTV display A) Live programme B) Video prog. **C) Both**

Electronic Exchange

1	If subscriber is getting continuous ring then his subscriber card may be faulty. **True**
2	C-DOT console will not work if key pad is faulty. **True**
3	In SLIC card no. of subscriber is 8. **True**
4	Voice mail is facility of CORAL Exchange. **True**
5	Maximum no of subscribers in CDOT-128 is 128. **False**
6	Six junction are there in junction card of C-DOT Exchange. **False**
7	C-DOT 128 is a non-blocking Exchange. **True**
8	6144 Numbers can be provided in CORAL-III Exchange. **True**
9	Voice mail is the facility of C-DOT Exchange. **False**
10	Switching speed of Electronic Exchange is in. A) Milli second **B) Micro second** C) Second
11	Maintenance in Electronic Exchange is **A) Less** B) More C) None
12	Which is not a card of peripheral shelf of coral -III exchange. A)RPS B) PPS **C) MEX**
13	Which is a card of control shelf of coral -III exchange? **A) 4GC** B) 4TEM C) PPS
14	Protective device is used on. A) MDF B)IDF **C) Both**
15	Fuse is connected in. **A) Series** B)Parallel C) Both
16	If there is no dial tone in telephone, it may be due to. A)Telephone may be faulty B) Fuse on MDF may be blown **C) Both**
17	Line faults is due to following line problem. A) Break B) Contact **C) Break, Contact & Low Insulation**
18	Lightening arrestor is a. **A) Safety device** B) Used for decoration C) Both
19	Maintenance console of exchange is used for.

	A)Giving facilities to subscriber B) Testing of line **C) Both**
20	Following connection can be given by operator console. A) STD B) Conference **C) Both of them**

Analog Microwave

1	Tower maintenance is done by BRI staff. **True**
2	Impedance at HF Trans in DTL Mux is 75 ohms. **True**
3	VHF frequency range is 3 MHz to 30 MHz. **True**
4	All channels are working during fading. **False**
5	Earth Tester is used for testing earth Resistance of Microwave Equipment. **True**
6	Microwave stations are placed after **A) HOP distance** B) 100 Km C) None
7	Stages of modulation in DTL MUX are A) One **B) Two** C) Four
8	Circulator is used for connecting **A) Equipment To Antenna** B) Equipment To Power meter C) None
9	Isolator is used as last stage of **A) Transmitter** B) Receiver C) None
10	Dehydrator is used in A) Radio Equipment **B) Wave guide** C) None
11	Dehydrator uses **A) Silica gel** B) Ammonium chloride C) None
12	BB IN level of MELCO in dbm is A) -15 B) -30 **C) -45**
13	MELTRON UHF (RF-11) power consumption is A)60 W **B)90W** C) 100W
14	White noise test set measures A) Threshold noise B) Inter modulation noise C) All type of noise.
15	For FD equipment, difference between two transmitter frequency should be A) 2% B)3% **C) 5%**
16	2nd carrier frequency in DTL MUX is A) Fix **B) Programmable** C) None
17	Deviation test is done at the time of A) Daily B) Short term **C) Line up**
18	Receiver test is done at the time of

	A) Daily B) Short term **C) Line up**
19	Transmit power of MELTRON RF-11 in dbm is **A)+37** B) +33 C) +40
20	As transmission line UHF (RF-11) uses A) Wave guide **B) RF co-axial cable** C) None

Digital Microwave

1	Input to skip MUX is VF channel. **False**
2	Aviation lamp protects tower. **True**
3	Aviation lamp is lighted during entire day. **False**
4	If earth resistance value is high then earth renovation may be done. **True**
5	Maximum 480 channels works in digital M/W. **True**
6	Digital UHF band in GHz is. **A)1.7-2.7 GHz** B) More than 3 GHz C) None
7	Modulation used in Digital Mux is. A) PPM B) PAN **C) PCM**
8	Last stage of PCM transmitter is A) Coding **B) Line coding** C) Filtering
9	Number of Voice Frequency(VF) channels combined by primary PCM MUX is **A) 30** B) 32 C) 31
10	Number of time slots in primary PCM MUX is A) 30 **B) 32** C) 31
11	Fading in digital Microwave (ITI-NEC) occurs at the level in dbm. **A) -80** B) -70 C) -65
12	Maximum separation between two Space Diversity (SD) antenna is up to. A) 10 meter B) 20 meter **C) 30 meter**
13	Fading is reception of Radio Frequency (RF) signal below **A) Threshold** B) Normal level C) None
14	Fading is due to. **A) Climate** B) Failure of power supply C) Failure of Equipment
15	Transmission line between equipment and antenna in Microwave is called. **A) Wave guide** B)Feeder cable C) Both
16	Type of wave guide in Digital Microwave is. **A) Elliptical** B) Circular C) Rectangular
17	Earth Resistance readings are taken A) Before monsoon B) After monsoon **C) Both**

18	Earth resistance is resistance of A) Plate B) connecting wire **C) Soil**
19	Frequency of radio is measured by. **A) MW Frequency meter** B) Frequency counter C) DTA
20	Condition of secondary cell is given by. A) Specific gravity B) Voltage **C) Both**

Train Traffic Control

1	Conduction test of control line should be done at Hottest period of the day **True**
2	Amplifier Gains are checked for trans/Receive signal **True**
3	Phantom voltage in 4 wire control circuit is 50 v AC **True**
4	The level of DTMF signalling is 1 dbm **False**
5	The signalling voltage of 2W control is 200V to 240.V **False**
6	Power supply used for HQ equipment. **A) +12V DC** B) -12V DC C) -48V DC
7	Speech & signalling is transmitted to control line by **A) Combiner** B) Microprocessor C) None
8	Impedance of 2-wire control line is **A) 600 ohm** B) 1120 ohm C) 470 ohms
9	Characteristic Impedance of VF Quad in RE cable is-- **A) 1120 ohms** B) 56ohms C) None
10	Insertion loss of 2 wire control phone is A) 3db **B) 0.25db** C)1db
11	Speaking loss of 2 wire control phone is **A) 3db** B) 2db C)1db
12	Receiving loss of ECP should be. **A) 0.025db** B) 0.25db C)1db
13	Transmission loss in 2-wire control line (6/1/1.5 mm ACSR)/Km. **A) 0.038db** B) 0.077db C) 0.037db
14	Earth resistance of control ckt should not be more than. A) 2 ohm B) 4 ohm **C) 5 ohm**
15	Radio patching equipment is provided at. **A) M/W Stn** B) Way Station C) HQ
16	Efficiency of 2-wire control ckt should be **A) 80%** B) 95% C)100%
17	Efficiency of 4-wire control ckt should be **A) 95%** B) 100% C) 80%
18	For Block instrument which quad is used in RE Area **A) PET Quad** B) VF Quad C) Both
19	Loading of RE cable is done to reduce.

	A) Attenuation loss B) Cross talk C) None
20	Control ckt are used as Auto Telephone line in **A) Disaster management** B) Normal working C) Both

OFC

1	Optical time domain reflector meter have dead zone section. **True**
2	One OLTE is required for terminal station **True**
3	Total bits send to check PCM equipt In telegram are 12 megabits. **True**
4	Block section can works on optical fibre cable. **True**
5	NMS used for OFC maintenance **True**
6	OFC is a made by **A) Silica** B) Mica C) Fibre
7	Diameter of core of mono mode fibre is A**) 10 micro meter** B) 75 micro meter C) 55micro meter
8	Refractive index of Core is- **A) 1.5** B) 1.4 C) 1.3
9	OFC Marker placed at distance of A) 1km **B) 50meter** C) None of above
10	Drum length of OFC is A) 6 km **B) 3 Km** C) 10 Km
11	splicing loss of OFC is **A) 0.2 db** B) 1 db C) 3 db
12	Two optical fibre are joined by **A) Splice machine** B) Soldering Iron C) Both
13	Minimum depth at OFC is buried in soil A) 2meter **B) 1meter** C) None of them
14	OTDR can be used to test ---------- A) OFC cable brake distance) OFC losses **C) Both**
15	OTDR works on A) Only on battery 12v/10 AH **B) Batt. & Main supply** C) 12VAC/15V
16	OLTE works on **A) -48VDC** B) +40VDC C) 110 VDC
17	In Branch line number of OLTE equipment's are. A) One Optical Transmitter /Receiver **B) Two optical transmitter /receiver** C) Three optical transmitter /receiver
18	LASER power for long distance OLTE is A) -16 dbm to - 35 dbm **B) -4dbm to 0dbm** C) 30 dbm

19	In block interfacing equipment Z80 CPU is used for **A) Read data from Input** B) Power supply C) Amplifier
20	EPROM stand for **A) Erasable Programmable Read only Memory** B) Programmable read only memory

Universal emergency communication

1	Gain of antenna (A) = 17.8 + 20 log D + 20 log F Db **True**
2	In Universal emergency communication two channels are used one for signalling and one for speech. **True**
3	The duration of SOS call is 30 seconds. **True**
4	UHF radio relay system is mostly used in Private sectors. **True**
5	In satellite service transmitting power is 645 mw. **True**
6	Low earth orbit & Medium Earth Orbit lie between 700Km. And 10000Km. **True**
7	In Railway VHF frequency range is 146 – 174 Mhz **True**
8	VHF range is ---------- A) 3--30 MHZ. **B) 30---300 MHZ**. C) 300---3000MHZ.
9	In Indian Rly. Microwave frequency used is------ A) 1725 TO 7125 MHZ **B) 7125 TO 7425 MHZ** C) 7125 TO 3725 MHZ.
10	Characteristic impedance of Isotropic zone is. A) 240 Ohms **B) 377 Ohms** C) 248 ohms
11	Loss of rectangular wave guide is---------- A) 0.7 db/meter **B) 0. 07db/meter** C) 0.O6 meter
12	Maximum gain of Yagi antenna is. A) 2 db **B) 9 db** C) 7 db
13	Modulation used in Universal Emergency communication (U.E.C.) System is. **A) FM** B) TDM C) AM
14	Universal emergency communication (U.E.C.) system is. A) Duplex **B) Simplex** C) One way
15	Power supply for VHF communication equipment is. A) 24 VDC **B) 12 VDC** C) 48 VDC
16	Impedance of antenna used in VHF is. A) 100 Ohm **B) 50 Ohm** C) 150 Ohm
17	Base station VHF Receiver sensitivity is. **A) 0.25 micro volt** B) 25 micro volt C) 15 micro volt

18	Types of modulation used in Train Radio communication is. A)A.M. B) F.M . C) P.M.
19	Low earth orbit & Medium earth orbit lie between. A) 500KM TO 600 KM. **B) 700 TO 10000KM**. C) 1000 TO 2000 KM.
20	Communication between the operational satellites and other provisions of mobile Phone and pager services is in the L - band which is. **A) 1616- 1625 .5 MHZ** B) 1000 -1500 MHZ C) 1800--2000MHZ

PA, PRS, FAX, IVRS, MODEM

1	Amplifier can be connected to speakers in voltage matching **True**
2	Talk back is duplex type of communication **False**
3	Speed of V.24 data interface is Lower than V.35 **True**
4	To telephony- FXO inter face Exchange is connected) **True**
5	Horn type speaker is used in outdoor area **True**
6	Mike may need A) External voltage B) No external voltage **C) Either A or B**
7	Microphone converts Sound energy into **A) Electrical** B) Mechanical C) None
8	Speakers converts A) Sound energy in to electrical energy B**) Electrical energy into sound energy** C) None of the above
9	Impedance of speakers depends on **A) Frequency** B) Shape of speaker C) Size of speaker
10	In voltage matching to connect more number of speakers tapping used is **A) 70 volts** B) Impedance matching with 16 ohms C) None of them
11	Battery back up for PA amplifiers. A) - 48 v B) + 48 v **C) + 24 V**
12	For open ground type of matching used is **A) Voltage matching** B) Impedance matching C) Both
13	In closed area type of speakers used are **A) Box type** B) Horn type C) None of them
14	Talk back system is used at A) On railway platform **B) Marshalling Yard** C) None of them
15	Remote paging is used for A) local announcement **B) CA system** C) in yard
16	Arrival /Departure indicators are used for A) Mail express train b) suburban train **C) both.**
17	FAX Machine in railway is used for sending A) circulars B) Important documents **C) Both.**
18	If there is no display on monitor it may be due to

	A) ON- OFF switch defective. B) power connector of monitor defective **C) both**
19	CCTV display A) Live programme B) Video prog. **C) Both**
20	CCTV works on **A) 230 volts** B) 110 Volts C) Both

1	The current from battery is **A) AC B) DC C) Electron.**
2	Earth fault is tested by A) Multimeter **B) Megger** C) TMS Kit
3	Quad means A) Two conductor **B) 4 conductor** C) 3 conductor
4	Input supply of PC is. **A) 230 volt** B)5 volt DC C) 12 volt DC
5	Line cord of Auto telephone is **A) 2 way** B) 4way C) 3 way
6	In closed area type of speakers used are **A) Box type** B) Horn type C) None of them
7	Line faults is due to following line problem. A) Break B) Contact **C) Break, Contact & Low Insulation**
8	Two optical fibre are joined by **A) Splice machine** B) Soldeirng Iron C) Both
9	Power supply for VHF communication equipment is. A) 24 VDC **B) 12 VDC** C) 48 VDC
10	Which system gives unreserved computer tickets for journey? A) PRS **B) UTS** C) FOIS
11	Line cord of Auto telephone is **A) 2 way** B) 4way C) 3 way
12	In closed area type of speakers used are **A) Box type** B) Horn type C) None of them
13	Power supply for VHF communication equipment is. A) 24 VDC **B) 12 VDC** C) 48 VDC
14	Earth fault is tested by A) Multimeter **B) Megger** C) TMS Kit
15	Capacity of Battery is given by **A) AH** B) Watt C) Current
16	Fuse is provided in the circuit to protect from A) Fault **B) high current** C) fire
17	Tape recorder used for A) record purpose B) play purpose **C) Both**
18	Earth resistance of control ckt should not be more than.

	A) 2 ohm B) 4 ohm **C) 5 ohm**
19	One byte is equal to A) 4bits B) 16 bits **C) 8 bits**
20	अर्थ मेजरमेन्ट का निर्धारित समय होता है अ) मानसुन के पहले ब) मानसुन के बाद क) उपरोक्त सभी
21	voltage मापने के लिये मीटर को हमेशा रखते है। (अ) श्रेणी क्रम में (ब) श्रेणी समांतर क्रम में **(क) समांतर क्रम में**
22	सबसे गतिमान पोर्ट होता है. अ) सिरीयल ब) पैरलल **क) यु एस बी**
23	IPM आर डी एस ओ के अनुसार लाइटनिंग प्रोटेक्शन लेबल है. अ) क्लास अ ब) क्लास ब क) क्लास स **ड) क्लास ड**
24	विद्युत धारा मापने के लिये मीटर को हमेशा रखते है। (अ) श्रेणी समांतर क्रम में (ब) समांतर क्रम में **(क) श्रेणी क्रम में**
25	कैट-5 केबल में अधिकतम डाटा स्पीड **MBPS** में होती है। अ**)** 10 **ब**)**100** स**)** 1000
26	E.1 में डाटास्पीड होता है एमबीपीएस में **A)** २ B) ६४ C) १२८
27	रेलनेट का निम्न के लिए इस्तेमाल होता हे A) e-mail भेजने हेतु B) सुचना सेयर करने हेतु C) पेपर लेस कार्य प्रनाली हेतु **D) सभी**
28	वाकी टोकी सेट कितने वोल्ट पर कार्यकरता हैं A) १२ B) २४ **C) ७.५**
29	पी सी की गति आजकल नापते है किस इकाई में। अ**)** किलो हर्टज ब**)** मेगा हर्टज **स**) **गीगा हर्टज**
30	अर्थिंग की आवश्यकता होती है। अ) उपकरण की सुरक्षा के लिए ब) अपनी सुरक्षा के लिए **स) उपरोक्त सभी**
31	निम्न को IP address नहीं देते A) रोउटर B)सरवर **C) हब** D) पी सी
32	रेलनेट का निम्न के लिए इस्तेमाल होता है। A) e-mail भेजने हेतु B) सुचना सेयर करने हेतु C) पेपर लेस कार्य प्रनाली **हेतु D) सभी**
33	निम्न WAN के उदहारण हे A) PRS B) Railnet C) FOIS **D) सभी**
34	IP Address होता है। A) 8 Bit B) 16Bit **C) 32 Bit**
35	OFC का सिधांत हैं

	A) TIR B) ITR C) SCATTERING
36	कम्पुटर की इनपुट डिवाइसेस के नाम अ) की बोर्ड ब) माउस **स) दोनों**
37	रेल्वे में सर्ज वोल्टेज का स्त्रोत है. a)लाइटनिंग(b) स्विचिंग transient **© सभी**
38	6 Q केबल का लूप रेसिस्टेंस होता है ओहम में **A) 56** B)65 C) 650
39	फ्यूज निम्न में किसके कारण उड़ता है | A) अधिक रेजिस्टेंस) B) अधिक वोल्टेज **C) अधिक करेंट**

State True or False

1	अर्थिंग पीट की गहराई ३ मीटर से अधिक होना चाहिए. **TRUE**
2	रेलनेट रेलवे का इंट्रानेट सिस्टम है । **TRUE**
3	VF आवृत्ति रेंज ०.३ से ३.४ किलो हटर्ज़ है। **TRUE**
4	जीनर डायोड एक SURGE प्रोटेक्शन डिवाइस है। **TRUE**
5	DTMF सिगनल में अधिकतम 99 स्टेशन को जोड़ सकते हैं। **TRUE**
6	फिक्स्ड VHF SET का पावर 25 वाट होता है **TRUE**
7	DIODE ए.सी को डी.सी में बदलता है। **TRUE**
8	5W के वीएचएफ सेट की रेंज १ किमी होती है। **FALSE**
9	अर्थिंग सर्ज धारा से उपकरणों को बचाता है। **TRUE**
10	ऑडियो आवृत्ति रेंज 20 से 200 किलो हट्स है। **FALSE**
11	सेकेंड्री सेल को सीरीज **(SERIES)** में जोड़ने **CURRENT SAME** रहता है | **TRUE**
12	कोरल एक्सचेंज-III (Tadiran)में ज्यादा से ज्यादा 6144 PORT के होते हैं । **TRUE**
13	PIJF केबल में जेली वाटर ब्लॉकिंग मटेरियल है । **TRUE**
14	OFC में कोर का रेफ्राक्टिभ इंडेक्स (R.I.)का मान 1.5 माइक्रो मीटर होता है । **TRUE**
15	टेलीफोन एक्सचेंज का वर्किंग वोल्टेज -48 V DC होता है । **TRUE**
16	MTRC में Frequncy band 380 to 410 MHZ है। **TRUE**
17	SLS 24 कार्ड में २४ पोर्ट होते हैं । **TRUE**
18	FOIS रेलवे का WAN है । **TRUE**
19	ESI एवं EMI आर ई एरीया में OFC को प्रभावित करते है। **FALSE**
20	स्टेप उप ट्रांसफोर में प्राइमरी विन्डिंग के टर्न कम होते हैं । **FALSE**

21	VHF ट्रांसमीटर में MODULATION किया जाता है । **TRUE**
22	MEGGER से इंसुलेशन नापते भेजते हैं । **TRUE**
23	फिक्स्ड VHF SET का पावर 5 वाट होता है **FALSE**
24	ट्रांसफार्मर डी.सी को ए.सी में बदलता है। **FALSE**
25	DTMF सिगनल में अधिकतम 77 स्टेशन को जोड़ सकते हैं। **FALSE**
26	रेजिस्टेंस को सीरीज में जोड़ने से मान घटता है I **FALSE**
27	इंसुलेशन टेस्ट मेगर से किया जाता है **TRUE**
28	राउटर PRS Network में रूट सेट करता हैं **TRUE**
29	LAN Extender द्वारा LAN के सदस्य को ३ किमी दूर भी लगा सकते हैं **TRUE**
30	फॉरवर्ड बायस में डायोड का resistance कम होता है| **TRUE**
31	मध्य रेल एसटीटीआय/ भायखला सर्वर का IP address 10.31.25.50 हे **TRUE**
32	स्विच का काम डाटा की स्विचिंग करना है **TRUE**
33	मोडम डाटा को टोन में बदलता हैं **TRUE**
34	MTWE उपकरण 24 वोल्ट DC पर कार्य करता है **FALSE**
35	सेकेंड्री सेल को सीरीज**(SERIES)** में जोरने पर **voltage** नहीं बदलताहै | **FALSE**
36	REकेबल vf क्वाड में ट्रांसमिशन लोस ०.25 db है । **TRUE**
37	OFC में कोर का refractive index cladding से ज्यादा होता है । **TRUE**
39	टेलीफोन एक्सचेंज का वर्किंग वोल्टेज -48 V DC होता है । **TRUE**
39	MTRC में Frequency band 380 to 410 MHZ है।

	TRUE
40	ESI एवं EMI आर ई एरीया में OFC को प्रभावित करते है। **FALSE**
41	In fully charged condition specific gravity of electrolyte should be more than 1180. **True**
42	PC starts with the help of operating System. **True**
43	Bell/Buzzer used in telephone may be AC/DC. **True**
44	Aviation lamp is lighted during entire day. **False**
45	Radio patching system only speech is transmitted. **False**
46	E-mail can be send by Internet. **True**
47	Unit of Resistance is ohm.- **True.**
48	Box type speakers are used for open ground **False**
49	Power supply of VHF equipment is 12 V DC. **True**
50	Satellite phone use in Break Down Train. **True**

1	रेलवे वी एच्एफ बैंड ----------से----------MHZ. है । **146, 174**
2	Yellow, RED, GREEN रंग के रजिस्टेंस का मान---------- है। **4.2 M**
3	CAT-5 केबल की पेच कोर्ड बनाने हेतु ---------- कनेक्टर लगता है। **RJ-45**
4	STM-1 की अधिकतम चैनल कैपेसिटी---------- होती है। **189**
5	गार्ड और ड्राईवर को दिये जाने वाले वीएचएफ सेट ---------- फ्रीक्वेंसी पर कार्य करता है। **161.15MHZ**
6	UHF बैंड ----------से----------MHZ.तक है । **300-3000 MHZ**
7	CAT-6 केबल की पेच कोर्ड बनाने हेतु ---------- कनेक्टर लगता है। **RJ-45**
8	STM-1 की अधिकतम चैनल कैपेसिटी---------- होती है। **189**
9	गार्ड और ड्राईवर को दिये जाने वाले वीएचएफ सेट ---------- फ्रीक्वेंसी पर कार्य करता है। **61.15 MHZ**
10	ART को दिये जाने वाले वीएचएफ सेट ---------- फ्रीक्वेंसी पर कार्य करता है। **147.975 MHZ.**

11	STM का वर्किंग VOLTAGE _____होता है । **-48VDC**
12	मेंटेनन्स फ्रीअर्थ रेजिस्टन्स का अधिकतम मान ---------होना चाहिए . **ONE**
13	कंडेंसर ..... पास करता है एवं ..... रोकता है। **AC,DC**
14	CAT-6 केबल की अधिकतम लम्बाई LAN में ---------- मीटर हैं | **100 METER**
15	1000 MBPS डाटा स्पीड के लिए ---------- केबल लगता हैं | **CAT-6**
16	DTMF frq. Range ----------HZ से -------- HZ है। **697-1633 HZ**
17	STM-4 की अधिकतम चैनल कैपेसिटी---------- होती है। **756**
18	OFC cable का बेन्डिंग diameter ---------- D होता हे **3**
19	लेड असिड सेल में इलेक्ट्रोलाइट----------तथा----------है **DISTILLED ATER, SULPHURIC ACID**
20	बैटरी की कैपेसिटी----------में नापी जाती है. **AH**

CHAPTER 1: ROLE OF SIGNALLING IN RAILWAY OPERATIONS

INTRODUCTION:-

Need for signals for railways: Signalling for railways has evolved out of need for ;

- ☐ Unambiguous & Timely Communication to Driver for regulating speed of train (and also to staff operating signals)
- ☐ Running trains safely by securing it`s Intended path.
- ☐ Handle more trains effectively.

The Train Driver is very much dependent on the communication which he receives, for regulating his train. Various Equipments / Systems are used for achieving above objectives. These equipments are getting modernized over time with added benefits. We are aware that at Railway Stations, there are more lines (tracks) than between stations. These stations are designed to receive, Stop & Despatch trains in accordance with a schedule / Program by prioritizing movement of some trains over other trains. This is enabled by signalling system which ensures **safety** not only at stations but also between stations. Let us see certain features which are specific to railways which are to be addressed by signalling.

Special Features of Railways vis a vis Road:

- ☐ **Movement on Fixed Track**:- Coaches / wagons are confined to move on railway Tracks (of fixed width) only.
- ☐ **Diversion from one track to another**: Since many trains have to be handled at station (where more than one train is dealt at any time), and to prioritize sending one train over another, Trains have to be admitted in different lines by suitably diverting them from one track to another . But Train has no steering for taking diversion from one track to another. Then how does a train take a turn?. Wheel Flanges have a rim which is guided along the track by a Track mechanism called Point assembly (details in other Chapter-16.) whose setting decides whether train goes straight or will be diverted. Train needs to slow down to less speed for taking diversions. Correct setting of the Points & holding it in the same position till complete passage of train is vital to Train safety.
- ☐ **Advance intimation To bring the train to a safe halt / reduce speed**:- Due to it"s massive momentum and movement on smooth rails, having less friction, a train requires considerable distance (300 Mts to 1.4 KMs) to stop or even to slow down after application of brakes. So whenever a Train has to be stopped either in normal course or out of course, Train Driver (Currently known as Loco Pilot in Indian Railways needs advance information for gradual application of brakes (as sudden application of brakes may lead to passenger discomfort or may even cause a derailment).

Thus Signalling delivers the following;

(a) Unambiguous & Timely Communication to Driver for regulating speed of train

- ☐ Information is conveyed by a signal showing various positions / colours.
- ☐ Many signals are interlinked for giving advance information.

(b) A signal (before allowing a train to move safely over on a specified path) ensures

- ☐ Physical clearance of intended path
- ☐ Secure various points in the path
- ☐ Close of Level crossing gates.
- ☐ No other train is moving in conflicting movement in it`s path.

(c) As the demand for Train Traffic (both for Passengers & Goods) continue to increase over a period of time, Signalling system has also been developed to handle increasing Train traffic.

Thus Signals play a very vital role in safe Train Operations.

EVOLUTION OF RAIL TRANSPORT

With Industrial Revolution in Europe and development of Steam Engine, Transport of Carriages on Steel Rails came in to use. The Stockton & Darlington Railway in north-east England is credited as the first Steam hauled passenger train, which opened on 27 September 1825, as Britain's first passenger train. Around the same period, the rail transport was developed all over the Europe with different gauges (gauge is the distance between the inner sides of the heads of the two rails of the track).

Sl. No.	Type of gauge	Gauge in mm	Gauge in feet	Country
		1676	5"- 6"	India , Pakistan, Srilanka, Brazil & Argentina
1	Broad			
		1524	5"- 0"	Russia & Finland
				England, USA, Canada, Turkey & China, Delhi
2	Standard	1435	4"- 8½"	
				Metro Rail Corporation
3	Cape	1067	3"- 6"	Africa, Japan, Java, Australia & New zealand
4	Meter	1000	3"- 8 ¾"	India, France, Switzerland & Argentine
		762	2"- 6"	
5	Narrow			21 other narrow gauges also exist
		610	2"- 0"	

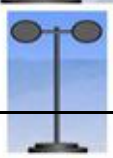
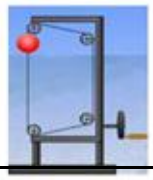
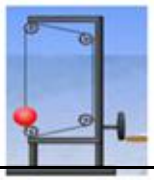
Lord Dalhousie, the then Governor General of India introduced railways in Undivided India. The first train was inaugurated in India on 16th April, 1853 at 15:35 hours from Bori Bunder (suburban of Mumbai) to Thane with the locomotives named Sindh, Sultan, and Sahib hauling 14 railway carriages and 400 guests with a 21-gun salute covering a distance of 34 KM (21 miles) in one hour and fifteen minutes, formally heralding the Birth of railways in India. Since then Indian railways has undergone transformation and became one of the leading rail transport systems in the world. Majority of track over Indian railway is broad gauge, with few Meter & Narrow gauge lines in use at some places.

EVOLUTION OF SIGNALLING

The history of signalling dates back to 1814, the year of the first practical use of a Steam Locomotive designed by George Stephenson. In the beginning of Railway, the trains were run on messages, candle light signals, free disk and crossbar signals. The trains were being run on **Train Order System** i.e. fixed crossings as per predetermined schedule. There was hardly any connection between signal and points/ switches. The correlation between correct setting of point
/ switches for a route, taking „OFF" signal for that route and maintaining point in locked condition during passage of train was at the judgment of operator of signal, thus prone to human errors. Signalling evolved over a period of time–beginning with a man on horseback for guiding a train to present day Radio based cab signalling.

SIGNALLING IN INDIAN RAILWAYS:-

In 1889, East Indian Railway appointed, the first Signal Engineer in India Mr S T Dutton. The List system of interlocking (named after British engineer Mr G H List) for signalling was introduced in 1892 at six single-line crossing stations between Lahore and Ghaziabad of the North Western Railway , using a detector and locking system for protecting facing points. The system was enhanced by A Morse and came to be known as List & Morse interlocking. The earliest full cabin interlocking arrangements were installed by the GIPR on its Bombay-Delhi route in 1893 with equipment from Saxby and Farmer of the UK. The List & Morse system was employed at 29 single-line crossing stations between Lahore and Ghaziabad in 1894.

Sl. No.	EVOLUTION OF SIGNALLING Description	On aspect	OFF aspect	
1	A man used to ride on horse back moving in front of a Locomotive			
2	Red Boards or flags were used in 1829 to control train traffic.			
3	Red Boards with candle			
4	Rotating Disc was used as a signal to the train Loco Pilot			
5	A Ball suspended from a jib arm port, raised or levered by a rope,			
6	The Disc and Cross-Bar signal were used in 1838.			
7	Semaphore Signals without Spectacle			
8	Lower Quadrant Semaphore with Spectacle			
9	Upper Quadrant Semaphore with Spectacle		 	
10	Colour Light Signal		 	

Hepper's Electric Key Transmitter, developed by Major Hepper, a signal engineer of the North Western Railway replaced manual key interlocking. By end of 1912 almost the entire Bombay-Delhi route was equipped with cabin interlocking. Syke's Lock and Block systems were introduced on the BB&CI Rly in 1910. Around this time track circuits and power signalling were also introduced for points and signals and used at Bombay, Madras, and Calcutta. Double-wire signalling, devised by E.W. Baker of the Assam Bengal Railway and used by South Indian Railway, Western Railway. Power signalling commenced in the 1930s. The use of electro-pneumatic and electromechanical systems spread widely in the 1930s. Around 1945 Bandra station got an all-electric interlocking frame. Gradually Relay Interlocking was introduced replacing Electro-Mechanical Interlocking at all Important stations. First Route Relay Interlocking was installed in 1958 at Church Gate /Mumbai. First Electronic Interlocking was installed at Srirangam (SR) in 1987 and modernisation continues.

This notes on „**Basics concepts of signal engineering'** gives an over view of Fundamental of Signalling concepts , rules and regulations as laid down in manuals such as „General Rules " „Signal Engineering Manual", etc. being followed in Indian Railways signalling. The content of the note „Basics of signal engineering" is based on some chapters of rule book G &SR (General and Subsidiary rule) and SEM (Signal Engineering Manual).

* * *

C H A P T E R 2 : DEFINITIONS (GR 1.02)

In order that interpretation of various terms remain clear and unambiguous, it is necessary to indicate their meanings precisely. This has been done in respect of common terms used in railway signalling in chapter 1 of "General rule". Some of the important definitions are mentioned below.

2.1 ACT means the Indian Railways Act, 1989
2.2 ADEQUATE DISTANCE means the distance sufficient to ensure safety.
2.3 APPROACH LIGHTING means an arrangement in which the lighting of signals is controlled automatically by the approach of a train.
2.4 APPROVED SPECIAL INSTRUCTIONS means special instructions approved of or prescribed by the Commissioner of Railway Safety**2.5 AUTHORISED OFFICER** means the person who is duly empowered by general or special order of the Railway Administration, either by name or by virtue of his office, to issue instructions or to do any other thing.
2.6 AUTHORITY TO PROCEED means the authority given to the Driver of a train, under the system of working, to enter the block section with his train;
2.7 AXLE COUNTER means an electrical device which, when provided at two given points on the track, proves by counting axles in and out, whether the section of the track between the said two points is vacant or occupied;
2.8 BLOCK BACK means to despatch a message from a Block station intimating to the Block station immediately in rear on a double line or to the next Block station on either side on a single line, that the block section is obstructed or is to be obstructed;
2.9 BLOCK FORWARD means to despatch a message from a Block station on a double line intimating to the Block station immediately in advance the fact that the block section in advance is obstructed or is to be obstructed.
2.10 BLOCK SECTION means that portion of the running line between two Block stations on to which no running train may enter until Line Clear has been received from the Block station at the other end of the block section.
2.11 CENTRALISED TRAFFIC CONTROL means a system by which the working of trains over a route, to which the system applies, is governed by fixed signals remotely controlled from a designated place.
2.12 COMMISSIONER OF RAILWAY SAFETY means an official appointed to exercise any functions under the Act, and includes a Commissioner of Railway Safety;
2.13 CONNECTIONS When used with reference to a running line, means the points and crossings, or other appliances used to connect such line with other lines or to cross it.
2.14 COMPETENT RAILWAY SERVANT Means a railway servant duly qualified to undertake and perform the duties entrusted to him.
2.15 CONTROLLER Means a railway servant on duty who may for the time being be responsible for regulating the working of traffic on a section of a railway provided with the system of speech communication.
2.16 DAY means from sunrise to sunset.
2.17 DRIVER means the engine driver or any other competent railway servant for the time being incharge of driving a train.
2.18 DIRECTION OF TRAFFIC means

(a) On a double line, the direction for which the line is signalled;

(b) On a single line, the direction for the time being established, under the system of working, to allow trains to move in that direction;

2.19 ELECTRICAL COMMUNICATION INSTRUMENT means either a telephone or a Morse Telegraph instrument;
2.20 FACING AND TRAILING POINTS Points are facing or trailing in accordance with the direction a train or vehicle moves over them. Points are said to be facing points when by their operation a train approaching them can be directly diverted from the line upon which it is running.
2.21 FIXED SIGNAL means a signal of fixed location indicating a condition affecting the movement of a train and includes a semaphore arm or disc or fixed light for use by day and fixed light for use by night.

2.22 FOULING MARK means the mark at which the infringement of fixed Standard Dimensions occurs, where two lines cross or join one another.
2.23 GANGMAN Means a railway servant employed on permanent way or works connected therewith or Means a competent railway servant posted at a Level crossing for working the gates.
2.24 GANG Means the person in charge of a gang of workmen employed on permanent way or works connected therewith.
2.25 GOODS TRAIN Means a train (other than material train) intended solely or mainly for the carriage of animals or goods.
2.26 GUARD Means the railway servant in charge of a train and includes a Brakesman or any other railway servant who may for the time being be performing the duties of a Guard.
2.27 INSPECTOR OF WAY OR WORKS means any Inspector or Assistant Inspector responsible for the construction or maintenance of permanent way, points and signals, bridges or other works connected therewith. *(This is now re-designated as Section Engineer (works)).*
2.28 INTERLOCKING means an arrangement of signals, points and other appliances, operated from a panel or lever frame, so interconnected by mechanical locking or electrical locking or by both that their operation must take place in proper sequence to ensure safety.
2.29 INTERMEDIATE BLOCK POST means a class `C' station on a double line, remotely controlled from the Block station in rear.
2.30 INTERMEDIATE BLOCK SIGNALLING means an arrangement of Signalling on double line in which a long block section is split into two portions each constituting a separate block section by providing an Intermediate Block Post.
2.31 ISOLATION means an arrangement, secured by the setting of points or other approved means, to protect the line so isolated from the danger of obstruction from other connected line or lines.
2.32 LAST STOP SIGNAL means the fixed Stop Signal of a station controlling the entry of trains into the next block section.
2.33 LEVEL CROSSING means the intersection of road with railway track at the same level.
2.34. LEVEL CROSSING GATE Means any form of movable barrier, including a chain, capable of being closed across the road at the Level crossing but does not include a wicket or a turnstile for the use of pedestrians.
2.35 LINE CLEAR means the permission given from a Block station to a Block station in rear for a train to leave the latter and approach the former; or the permission obtained by a Block station from a Block station in advance for a train to leave the former and proceed towards the latter.
2.36 LOCO PILOT Means the Loco Pilot or any other competent railway servant of the time being in charge of driving a train.
2.37 MAIN LINE means the line ordinarily used for running trains through and between stations.
2.38 MATERIAL TRAIN Means a departmental train intended solely or mainly for carriage of railway material when picked up or put down or for execution of works, either between stations or within station limits.
2.39 MIXED TRAIN means a train intended for the carriage of passengers and goods, or of passengers, animals and goods.
2.40 MULTIPLE ASPECT SIGNALLING means a Signalling arrangement in which signals display at any one time any one of the three or more aspects and in which the aspect of every signal is pre-warned by the aspect of the previous signal or signals.
2.41 NIGHT means from sunset to sunrise.
2.42 OBSTRUCTION and its cognate expressions include a train, vehicle or obstacle on or fouling a line, or any condition which is dangerous to trains.
2.43 OVERHEAD EQUIPMENT Means the electrical conductors over the tracks together with their associated fittings, insulators and other attachments by means of which they are suspended and registered in position for the purpose of electric traction.
2.44 PASSENGER TRAIN Means a train intended solely or mainly for the carriage of passengers and other coaching traffic, and includes a troop train.
2.45 POINT AND TRAP INDICATORS are not signals, but are appliances fitted to and working with points to indicate by day or by night the position in which the points are set.

2.46 RUNNING LINE means the line governed by one or more signals and includes connections, if any, used by a train when entering or leaving a station or when passing through a station or between stations.

2.47 RUNNING TRAIN means a train, which has started under an authority to proceed and has not completed its journey.

2.48 SHUNTING means the movement of a vehicle or vehicles with or without an engine or of any engine or any other self-propelled vehicle for the purpose of attaching, detaching or transfer or for any other purpose.

2.49 SPECIAL INSTRUCTIONS means instructions issued from time to time by the authorised officer in respect to particular cases or special circumstances.

2.50 STATION means any place on a line of Railway at which traffic is dealt with, or at which an authority to proceed is given under the system of working.

2.51 STATION LIMITS means the portion of a railway, which is under the control of a Station Master and is situated between the outermost signals of the station or as may be specified by special instructions.

2.52 STATION MASTER means the person on duty who is for the time being responsible for the working of the traffic within station limits, and includes any person who is for the time being in independent charge of the working of any signals and responsible for the working of trains under the system of working in force.

2.53 STATION SECTION: Pl see Chapter No- 14.

2.54 SUBSIDIARY RULE means a special instruction, which is subservient to the General Rule to which it relates and shall not be at variance with any General Rule.

2.55 SYSTEM OF WORKING means the system adopted for the time being for the working of trains on any portion of a railway.

2.56 TRACK CIRCUIT means an electrical circuit provided to detect the presence of a vehicle on a portion of track, the rails of the track forming part of the circuit.

2.57 TRAIN EXAMINER Means a railway servant duly qualified to examine trains and certify their fitness for safe running and includes and their railway servant who may for the time being be performing the duties of Train Examiner.

2.58 TWO-ASPECT SIGNALLING means a Signalling arrangement in which each signal displays at any one time either of the two aspects.

2.59 CLASSIFICATION OF STATIONS

(a) Stations, shall for the purpose of these rules, be divided into two categories - Block stations and non-Block stations.

(b) Block stations are those at which the Driver must obtain an authority to proceed under the system of working to enter the block section with his train; and under the Absolute Block System consist of three classes viz. `A', `B', `C', etc (see Chapter 14).

2.60 COLOUR LIGHT SIGNAL A fixed signal in which the indications are given by the colour of a light only.

2.61 EMERGENCY BRAKING DISTANCE is the distance travelled by train before coming to a stop by sudden application of brake at one stretch.

2.62 IN REAR OF A SIGNAL means the territory over which an approaching train has to pass before reaching the signal location.

2.63 IN ADVANCE OF A SIGNAL A term used in defining a territory beyond a signal as seen from the approaching train.

2.64 LINE CAPACITY means the maximum number of trains that can be run on any given section during a calendar day of 24 hours.

2.65 OVERLAP means the length of track in advance of a stop signal, which must be kept clear, either for clearing the stop signal next in rear or for the purpose of granting permission to approach.

2.66 `ON' ASPECT means the most restrictive aspect of the signal.

**2.67 `OFF' ASPECT** means any aspect other than the `ON' aspect of a signal.

2.68 POSITION LIGHT SIGNAL A fixed signal in which the indications are given by the position of two or more lights.

2.69 SEMAPHORE SIGNAL A signal in which the day indications are given by the position of a semaphore arm.

2.70 SERVICE BRAKING DISTANCE is the distance required to stop the train running at maximum permissible speed of the line, not suffer discomfort or alarm. the at such a rate of deceleration that the passengers do

CHAPTER 3: SIGNALLING CONCEPTS

3.1 INTRODUCTION

Railway vehicles move on Steel Rail Track and are provided with flanged steel wheels. The rolling of the steel wheel on steel rail has the least friction and it is, therefore, one of the most efficient means of locomotion.

3.2 CONTROL OVER MOVEMENT OF TRAINS

Running of flanged vehicles on the steel track has its own inherent problems unlike the road, sea or air transport where the movement is not confined to a particular track. Since the vehicles are constrained to move in a fixed Railway track, they cannot be steered away as in the case of other transports. They are required to follow one another in the same direction on the length of track, as otherwise for every vehicle separate parallel paths are to be provided. This is not practicable. If vehicles are expected from the opposite direction another set of diversion track is required to be provided either for overtaking vehicles moving in the same direction or for crossing the vehicles from the opposite direction. Railway locomotion, therefore, though more efficient, brings in problems of "Control over movement of Trains".

Basically, two types of controls could be catered for. If two separate tracks are provided for trains running in opposite directions, then one set of control can be provided to space the movement of trains running in the same direction so that adequate "interval" is available between two consecutive trains. On the other hand, if a single track is used for movement of trains in both directions, then another set of control is required to prevent a train in the opposite directions from coming on the same track when a train is already occupying it.

3.3 TIME INTERVAL METHOD

Let us take the first case of spacing of trains in the same direction. The spacing should be such that if a train stops, then, the following train driver should be able to notice it and apply brakes to his train so that it stops short of the preceding train. The most important aspect is bringing to a stop from the speed at which the train is running. Where the speeds and weights are low, it is not difficult for a following train to stop short of the train ahead, which has stopped. This is how tramways operate even today, as the speed and weight are low and a tram can be stopped from its running speed without colliding with a tram in front. With higher speeds and heavier loads, as in the case of Railway train, the distance required to stop a train is longer, and at this longer distance, the driver cannot definitely decide whether a train in front has actually stopped or not. This is the case when trains follow one another in quick succession. In actual practice, where interval between trains is longer, a following train does not see the earlier train, and the driver has to continuously guess as to where the earlier train will be. If all trains run at the same speed and are required to stop at the same place for the same duration, a certain amount of control can be exercised by having a definite time lag between the trains from one stopping place to another. This time lag should be such that the train, which has a stop, is able to reach the next stop within this time. Thus by having a time interval between trains, a certain amount of control can be achieved. But, in the case of Railway, this is not practicable, as -

(a) Different types of trains are operated like, Express/Mail, passenger, high-speed freight and low speed freight shunting trains etc.

(b) speed of trains Vary

(c) terrain of the country is not same throughout the country

(d) brake power, hauling capacity, load of train is not same for all trains; and

(e) stopping places of all trains are not the same.

Hence, it is not possible to control the movement of trains under the "Time interval method". A better method of control is called the "Space Interval Method" is adopted.

3.4 SPACE INTERVAL METHOD

In this method of "Control over movement", the length of track is divided into sections called "Blocks". The entry of a train into the „block“ is controlled in such a way that only when it is free, a train can be allowed to enter it. This means that between two consecutive trains, there is a definite space interval.

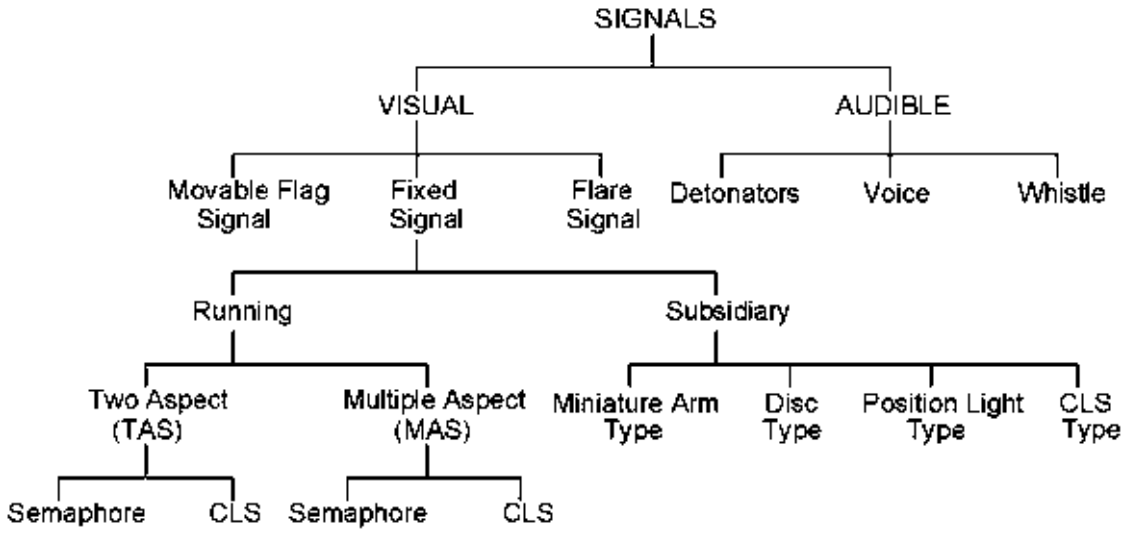
This space interval or block is controlled at the entry. This controlling point should know whether the train, which had entered this space, vacated it so that another following train can be sent. Since the length of a block is beyond the normal visual range, another controlling point is set at the end of the block. This point can know whether the train has arrived and advise the controlling point at the entry. So, with the two controlling points and intercommunication, it is possible to control the entry of a train into a block only when it is vacant.

The information about the condition of this block is given by the exit point to the entry point, and the entry point transmits this information to the driver of a train. The driver of the approaching train must be able to know whether the next block is not clear, he should stop and wait. Here is where "signal" comes in to picture.

Note: Block means Block Overlap.

3.5 SIGNALS

A "Signal", therefore, is a medium to convey a particular pre-determined meaning in non-verbal form. Various methods are used to convey the meaning by "Signals" in a non-verbal form as are used by Scouts, Policemen, road signs, Navy and Air Traffic Control, etc., which convey a definite information. The chart below gives the various forms that could be adopted.



3.6 BLOCK WORKING

As explained earlier, the space interval system uses the block working wherein the entry of train onto the “block section” is jointly controlled by the entry and exit points of the block section. The driver is authorised to proceed into a section by the signal controlling the entry to the section. This working could be a manual block system or automatic block system. In any type before the train could be allowed to enter a section "PERMISSION" is required to be obtained from the Exit end to the effect that the section is "CLEAR" of trains and the train could be permitted. Different systems of working for getting this “PERMISSION TO APPROACH” have been evolved on Indian Railways and are classified as "Systems of Working". The details of systems of working are explained in Chapter 13.

3.7 Thus it can be concluded from the above the general description regarding the concept of Signalling is that the main purpose of Railway Signalling Systems is to maintain a safe distance between trains on the same track.

* * *

CHAPTER – 4: FIXED SIGNALS, ASPECTS & INDICATIONS (GR.3.02-3.08)

4.1 In Chapter 3, a mention was made about the use of different types of visual and audible signals, for controlling the movement of trains in all cases. No exceptions are allowed by approved special Instructions in the following:

(a) Fixed Signals (b) Hand Signals (c) Detonating Signals (d) Flare Signals

4.2 The definition of "Fixed Signals" as given in the General Rules is "a signal of fixed location indicating a condition affecting the movement of a train and includes a semaphore arm or disc or fixed light for use by day and a fixed light for use by night".

4.3 Semaphore signals used on the Railways are in the form of a rectangular or fish tailed arm fixed to a vertical post. The arm is kept horizontal to the post to be easily distinguishable. By this arrangement the arm can be seen from a longer distance on a clear day. Whenever the signal is required to convey certain information:-

The arm can altogether be removed from the view of the driver by making the arm to disappear in a slot provided on the post; or

(a) The arm can be made to assume a mid-way position below horizontal; or

(b) To assume a mid-way position above horizontal; or

(c) To assume a vertical position parallel to the extended line of the post.

4.4 Method (a) was adopted in the early days and subsequently given up as the absence of arm due to some reason other than it"s entering the slot in the post conveyed wrong information. Methods (b) and (c) above could be on the Right hand side or on the left hand side of a Quadrant as shown below in (Fig. 4.4). Fixed Signals can be operated on any one of the four quadrants of a circle as shown. Since `Left hand' rule is followed in India, the "lower quadrant" and "Upper quadrant" of the left hand side is utilised in Indian Railways. Based on this principle, signals are also generally located on the left hand side of the track.

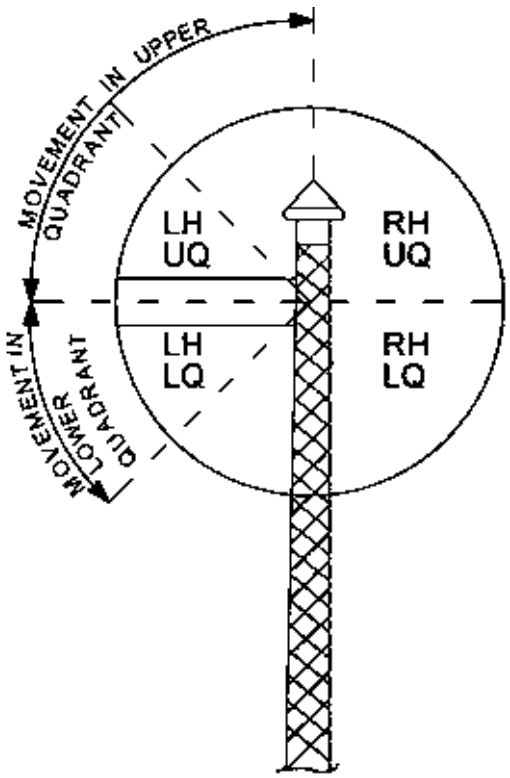


Fig. 4.4 Use of Quadrant

4.5 It can be seen in the figure above that an arm in a lower quadrant can have only two positions, one at horizontal position and the other at midway position on the left-hand side. In Upper Quadrant, three positions can be obtained, i.e. one at horizontal position, one at midway position and the 3rd at vertical position in parallel with the extended line of post. Hence, we have two systems of signalling, one called "Lower Quadrant Signalling" and the other called "Upper Quadrant Signalling".

4.6 TWO ASPECT LOWER QUADRANT SIGNALLING

(a)STOP-SIGNAL (reference SEM 17.115.1)

The semaphore arm of the stop signal is square ended, painted Red with White bar parallel to the square end in front and painted white with black bar in rear. As explained, a lower quadrant signal can show only two different positions. One is horizontal and the other lowered to midway position. They are called "aspects" of the signals. The movement of the signal arm in lower quadrant is generally adopted by countries where there is no snowfall or other external conditions which can result in the arm remaining lowered without being operated. The arm in the horizontal position will convey an aspect "stop" indicating "Stop dead". The arm lowered to midway position in the lower quadrant will convey an aspect "proceed", indicating Proceed. Semaphore arm can be seen during day and so can convey information during daytime. At night the arm will not be visible. Hence, to convey information during night, fixed light signals are used. Right from the early days, red lights were used to denote "Stop" and green lights were used for "Proceed". Red light should, therefore, be exhibited when the arm is horizontal and green light when the arm is inclined midway. A semaphore signal is a combined integrated unit with an arm and light. The horizontal position of the arm during daytime is considered as the `ON' aspect and the inclined position is the "OFF" aspect of the signal. The corresponding light Red & Green during nighttime are `ON' and `OFF' aspects respectively. The `ON' aspect of a signal is also referred to as the most restrictive aspect. The figure 4.6(a) shown below will give the details of the aspect and indications for two-aspect semaphore signal.

ASPECT & INDICATION FOR TWO ASPECT LOWER QUADRANT STOP SIGNAL

ASPECT	STOP	PROCEED
INDICATION	STOP DEAD	PROCEED

Fig. 4.6 (a) Two-Aspect Semaphore Stop Signal (Lower Quadrant (reference SEM I7.115.2)

(b) WARNER SIGNAL

Two-aspect stop signal as explained above is the minimum required to safely space the trains. This is adequate for low speeds and low density of traffic. Safety depends on the driver seeing the signal in time under all conditions. This imposes an enormous strain on the driver who has to be constantly on the lookout, to pick up the signals. Any mistake or loss of attention can lead to serious consequences. Otherwise drivers will have to run at lower speeds so that he can stop at the signal even if he sees it at the last minute. With such low speeds, the time of occupation of the block sections by the trains will increase, thereby reducing the number of trains per day that can be run between the Block stations.

One method of overcoming this problem will be to give advance information, or "WARNING" to the driver about the presence of stop signal ahead and the aspect displayed by the stop signal. This can be achieved in the form of another signal. This signal can precisely inform the driver that he is approaching a stop signal and also informs that he is required to stop or proceed. The signal which gives such warning about the condition of the stop signal ahead is called a "WARNER SIGNAL".

Since the driver is not required to stop at the Warner Signal, as it is only giving an advance warning about the presence of the stop signal ahead, this signal has to be different from the stop signal. The day aspect, therefore, is characterised by a fish tailed arm instead of a square ended arm. This is also a two aspect Lower Quadrant Signal.

Since the Warner Signal is not a stop signal and is exhibiting Red Light when `ON" this should be distinguishable from a Stop Signal during night. This is done by mounting the arm at a lower level in the post and providing a separate additional fixed Green Light at 1.5 to 2.0 Mts above the arm. This combination of Green Light above a Red Light distinguishes a signal as a Warner Signal in the `ON' position. When the signal is lowered to midway position, the Red Light changes to green and the Driver sees two green lights one above the other. The aspect and indications of the Warner Signal on a post by itself is shown in Fig. 4.2 (b). Two precise informations are given to the driver by the Warner Signal. When the arm is at horizontal during day and showing of a Green Light and Red Light below during night time indicates to the driver that he can proceed, but must be prepared to stop at the next Stop Signal. Similarly, the lowering of arm during day and showing of two Green Lights one below the other during night indicates that he can proceed and can expect all the stop signals ahead of Warner for that direction are OFF and he can run through main line.

4.7 A Warner signal must not be capable of being taken `OFF' for any line other than that over which the highest speed is permitted (i.e. main line) and not until all the relevant signals have assumed `OFF' aspect. The last of the stop signals will be the one controlling the entry of the train in to the block section ahead. Even if any one of the stop signals ahead is at `ON", the Warner cannot display `OFF' aspect.

4.8 Under certain circumstances a semaphore Warner signal is required to be placed on the same post of a stop signal. In such cases, the Warner signal is placed below the Stop Signal, and the fixed green light is dispensed with.

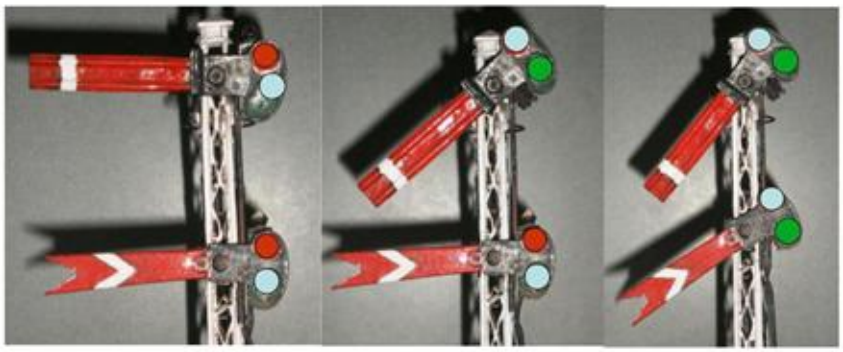
ASPECT AND INDICATION OF LOWER QUADRANT SEMAPHORE

WARNER SIGNAL

Fig. 4.6 (b) Semaphore Two-Aspect - Warner Signal on a Post by Itself (Lower Quadrant)

4.9 The combination of two arms (Stop and Warner) on the same post gives the driver three indications in the Two aspect lower quadrant signalling. When both the Stop Signal and the Warner Signal arms are at horizontal position and the showing of two Red Lights one below the other gives an indication to the driver that `Stop dead' at this signal. The lowering of the Stop Signal above the Warner or showing of a Green Light above a Red Light indicates that he can proceed past the signal with caution and be prepared to stop at the next stop signal. A third condition exists when both the arms are lowered to give two Green lights one below the other. This indicates to the driver that he can proceed and can expect all the stop signals for that direction are `OFF' and that the block section ahead is also clear. It is also made mechanically impossible to lower only the Warner Signal when the stop signal above it is at `ON'. In this way showing of Green Light below a Red light is eliminated. The details of the signals and aspects are shown in figure 4.9 below.

ASPECT AND INDICATION OF WARNER BELOW STOP SIGNAL



Aspect	Stop	Proceed with caution	proceed
Indication	Stop dead	Proceed with caution & be prepared to stop at next stop signal	proceed

Fig.4.9 Semaphore Two-Aspect - Warner below a Stop Signal

4.10 A comparison between a Warner Signal on a post by itself and a Warner Signal below a Stop Signal is as follows

(a) The night aspect of a separate Warner when `ON' is a green light above a Red Light. If the Red Light gets extinguished for some reason or other, it will give only a Green Light to a approaching driver and he can mistake the signal to be a stop signal in the `OFF' position and can `Proceed' with section speed instead of going cautiously.

(b) On the other hand if the fixed green light gets extinguished, the night aspect will only be a "RED" light exhibited which can be mistaken for a "Stop Signal" in `ON' position. This will be noticed only when the driver comes nearer to the signal and he sees a Fish tailed semaphore arm instead of a square ended arm.

(c) Pre-warning to the driver of an approaching train can be given only when a Warner Signal is placed on a post by itself and this will enable the driver to control his train suitably.

(d) In the case of a Warner Signal placed below a Stop Signal the night aspect in the `ON' position is showing of two Red Lights one below the other. Even if any one of the lights gets extinguished, the other Red light will be available which will still indicate to the driver that it is a stop signal. If the stop signal above the Warner, is lowered and the green light gets extinguished then a Red Light of Warner will be visible. However, he could be governed by the stop signal arm above the Warner arm as he comes near the signal, and be guided by it.

(e) In the case of a Warner Signal placed below a Stop Signal, no pre-warning is available for the stop signal.

As explained earlier, the `ON' aspect of a Warner signal on a post by itself, tells the driver that he should proceed cautiously and can expect the next stop signal is in the `ON' or `OFF' position. Hence he is required to pass the signal at a reduced speed (when at `ON').

4.11 From the point of view of the driver, therefore, the `ON' aspect of Warner does not signify positively anything about the signals ahead whereas if such information is available, he can confidently approach the signal ahead. A system of warning about the condition of each signal by a signal in rear is, therefore, very much necessary. This leads to the concept of more than 2 aspects called "MULTIPLE ASPECT SIGNALLING".

4.12 MULTIPLE ASPECT UPPER QUADRANT SIGNALLING

a) **Stop Signal**: It has been mentioned in previous para that the semaphore arm can be made to assume a midway position above horizontal and also another position in parallel with the extended line of the post on the left hand Upper Quadrant. In this way, it is possible to obtain more than 2 aspects in the Upper Quadrant region and hence, it is called "Multiple Aspect (more than 2 aspects) "Upper Quadrant" signalling as distinct from "two aspect Lower Quadrant Signalling" mentioned in previous paras.

The Semaphore Arm in Upper Quadrant is similar to Two aspect lower quadrant square ended arm, painted Red with white bar in the front and painted white with black bar in rear. Since the signal is required to convey 3 aspects, the arrangements in the "spectacle" are such that 3 different colour glasses, namely, Red, Yellow and Green ROUNDELS can be fixed to convey the night aspects of the signal. The arm in the horizontal position in day will convey `ON' aspect indicating "Stop Dead". The night aspect of the horizontal position of the arm by showing of a Red light.

The raising of the semaphore arm to "45º above horizontal" in the left hand Upper Quadrant region will convey an aspect "Caution" indicating "Proceed with caution and be prepared to stop at the next stop signal". The night aspect of the mid-way position is by showing of a yellow light. The raising of the arm to 90º above horizontal in parallel with the extended line of post in a vertical position will convey an aspect "Clear" indicating "Proceed" and the next stop signal is also `OFF'. The corresponding night aspect is the shown with a Green Light. The aspects and indications of a Multiple Aspect Upper Quadrant Stop signal are shown in figure 4.12(a) below:

FIG. 4.12(a) MAUQ - STOP SIGNAL

(b) Distant Signal

As discussed in the case of Two aspect signalling when a driver approaches the first stop signal he should be warned about its condition. Therefore, a signal similar to the Warner Signal in the Two aspect signalling is also having a necessity in Multiple Aspect Upper Quadrant signalling. This pre-warning signal is called a "DISTANT" signal. The term `Distant' is used here, as this is the farthest signal from the station on the approach side. The semaphore arm will have 3 positions - horizontal, 45º above horizontal and 90º above horizontal. The arm is fishtailed similar to lower quadrant Warner signal. The front side facing the train is coloured yellow with a black bar and the backside is coloured white with a black bar, both bars are parallel to the ends of the arm. According to the convention adopted that the night aspect in the `ON' position should correspond with the colour of the arm the distant signal exhibits a yellow light in the `ON' position during night time. The yellow colour and the fish tailed shape of the arm facilitates the driver in distinguishing a `Distant' signal from a "STOP SIGNAL" from a longer distance.

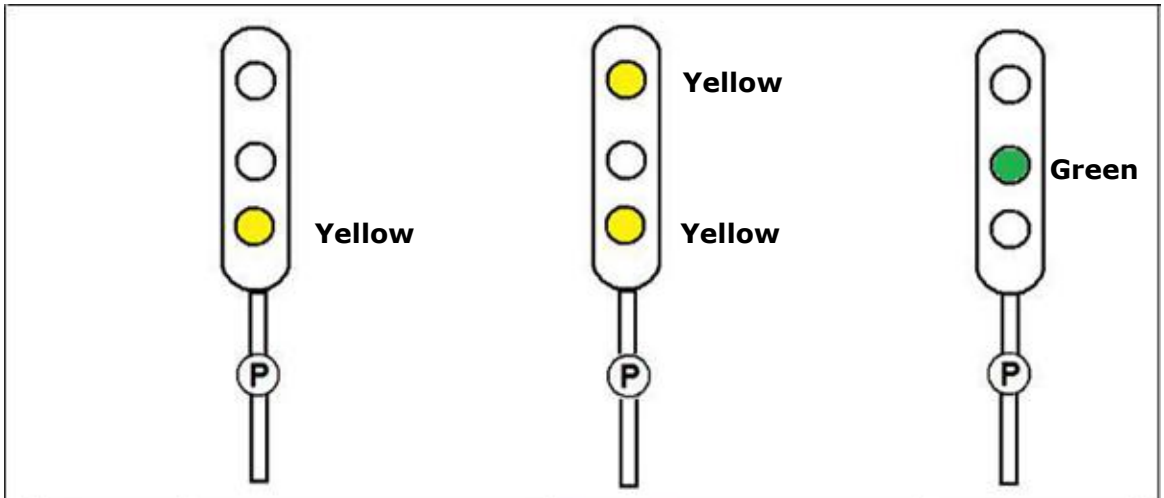
The second aspect that is given by the distant signal is the arm raised to 45º during day time. But for the night aspect, since the yellow aspect is already used for the `ON' aspect of the signal, a special aspect is given by having `two yellow lights one below the other. This second yellow light is fixed below the yellow aspect of the arm should not be made visible in any position other than the 45º position. Hence, a mechanical arrangement is made in the working of this signal such that the fixed yellow light gets `blanked out' in all other positions. In this way 2 yellow lights one below the other is exhibited in the 45º position only.

The Indications conveyed to the driver are that the next stop signal is `OFF', but he should pass the next Stop Signal at a restricted speed. This aspect of raising the distant arm to 45º position in day time or showing of two yellow lights is the aspect called "ATTENTION". The third aspect given by the distant signal is by raising the arm vertically to 90º position, the night aspect being "GREEN" light, which indicates to the driver that he can proceed and can expect the next signal in the `OFF' is given in Fig. 4.12 (b) below:

ASPECT AND INDICATION M.A.U.Q. DISTANT SIGNAL

Aspect	Caution	Attention	Proceed
Indication	Proceed and be prepared to stop at next stop Signal	Proceed & be prepared to pass next stop Signal at such a speed as prescribed by special instruction	Proceed

Fig. 4.12 (b) MAUQ - DISTANT SIGNAL



Aspect	Caution	Attention	Proceed
Indication	Proceed & be prepared to stop at next stop signal	Proceed & be prepared to pass next stop signal at such a speed as prescribed by special instruction	Proceed

Fig. 4.12 (c) MACLS - DISTANT SIGNAL

4.13 The three positions of a Multiple Aspect Upper Quadrant both of a stop signal and a distant signal are horizontal for the `ON' position, raised to 45º above horizontal and raised to 90º above horizontal are the `OFF' positions.

4.14 It has been mentioned earlier as to how a two aspect stop signal and a Warner can be combined to give 3 aspects. A similar case may occur in Upper Quadrant Signalling also where a signal may have to exhibit 4 aspects, i.e. those of a stop and distant signal. However, the need for such 4-aspect semaphore signals had not been felt very much and no design for such signals had been evolved. With the usage of light signals, it is possible to provide a signal exhibiting 4 aspects by combination of lights, which are used in colour light signalling area.

4.15 So far we have discussed two types of signals i.e. Lower Quadrant Two aspect and Multiple Aspect Upper Quadrant. The Warner/Distant Signals are not stop signals and, therefore, "Permit" the approaching driver to pass the signal in the `ON' position. Hence they are called "Permissive Signals". The stop signals in the 2 aspect and Multiple aspect can not be passed by the approaching driver in the `ON' position unless and until he is specially authorised. Hence, these signals are called "Absolute Signals".

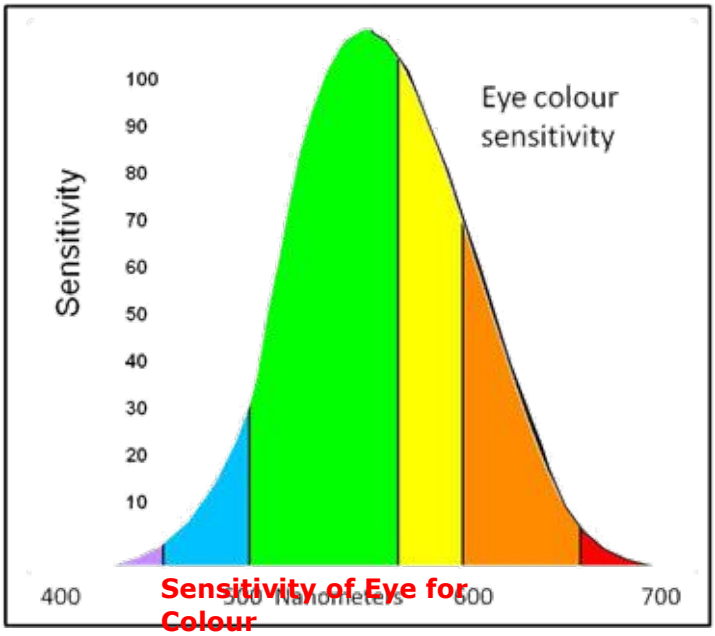
4.16 The above two types of semaphore signals are Two aspect lower quadrant and 3-aspect Upper Quadrant whether Permissive signals or absolute signals. The lights exhibited in the night time are lighted by "Kerosene Wick Lamps" or by electric lamps and they are lit only during the night time. In some areas, where the visibility of arm is very poor due to snow or fog, the night aspects are required to be lit in the day time also. The lighting of the lamps is left to the operating staff.

Note on Colours used in Signalling: -

- ☐ Sensitiveness of eye for various colours is depicted on the right side. Green & Yellow colours have high sensitivity over other colours. Since light has to travel some distance through air (from signal to Driver /Loco Pilot), scattering effect in various weather conditions also matters.
- ☐ Red colour has least scattering (it is inverselyproportionalto wavelength to the power of 4) and red has highest wavelength in visible spectrum. So it is able to travel the longest distance through fog, rain, Particulates, haze etc. Red colour is also associated with Danger.
- ☐ In 1912, Interstate Commerce Commission /USA came up with these three colours for road users

  which were later adopted for in Railway signalling also.

  Thus three colours are used for Signals - Red for danger, Yellow for caution, and Green for all clear.



Sensitivity of Eye for Colour

4.17 MULTIPLE ASPECT COLOUR LIGHT SIGNALS

Gradually Semaphore signals gave way to Colour Light signals which indicate one of three colours irrespective of day / Night, such signals are called Colour Light Signals. These are mainly used in busy suburban sections and main trunk routes, as these require electric power to operate them. Use of colour light signals is essential in the Electrified sections.

Some of the advantages of Colour Light Signals over the semaphore signals are:

(a) The day and night aspects are the same, therefore no confusion to the Driver.

(b) The visibility can be obtained for longer range and the natural background adds to improve the visibility, especially it is excellent in the nights.

(c) The signals are placed at driver's eye level.

(d) The drooping of signal arm due to snow or external force is completely eliminated.

(e) A combination of 4 aspects can be obtained.

(f) No mechanical transmission, no moving parts, so no wear and tear, and long range of operation is feasible.

(g) No kerosene is required and no necessity to depend on Operating Staff for lighting lamps.

Further details may be seen in S-10 of IRISET notes on Colour Light Signalling

The details of the aspects and indications of a Multiple Aspect Colour Light Stop Signal are as shown in Fig. 4.17 (a) and Fig. 4.17 (b).

ASPECT & INDICATION OF MULTIPLE ASPECT COLOUR LIGHT SIGNAL

ASPECT	STOP	CAUTION	PROCEED
INDICATION	STOP DEAD	PROCEED & BE PREPARED TO STOP AT THE NEXT STOP SIGNAL	PROCEED

Fig.4.17(a)

NO	ASPECT	INDICATION
1	STOP	STOP DEAD
2	CAUTION	PROCEED & BE PREPARED TO STOP AT NEXT STOP SIGNAL
3	ATTENTION	PROCEED & BE PREPARED TO PASS NEXT STOP SIGNAL AT RESTRICTED SPEED
4	PROCEED	PROCEED

ASPECT AND INDICATION FOR 4 ASPECT COLOUR LIGHT STOP SIGNAL

Fig.4.17 (b)

Note: *Where "Distant" and "Inner Distant" signals are provided the Distant shall display only "attention" or "proceed" aspect. (Ref.GR.3.07 & BD"s L.68/W3/SG/5/4 of 5/2/70)*

4.18 Similarly the lower quadrant semaphore signals can also be replaced by colour light signals. The aspects and indications in such cases are shown in Figure 4.18 (a), (b) and (c).

Fig.4.18 (a) Two aspect Colour Light Stop Signal

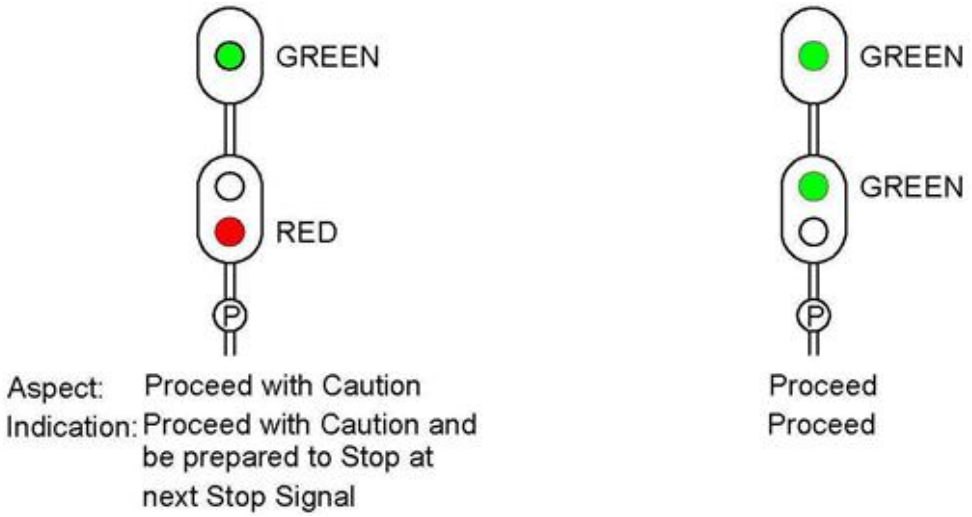


Fig. 4.18 (b) Two aspect Colour Light Warner on a Post by Itself

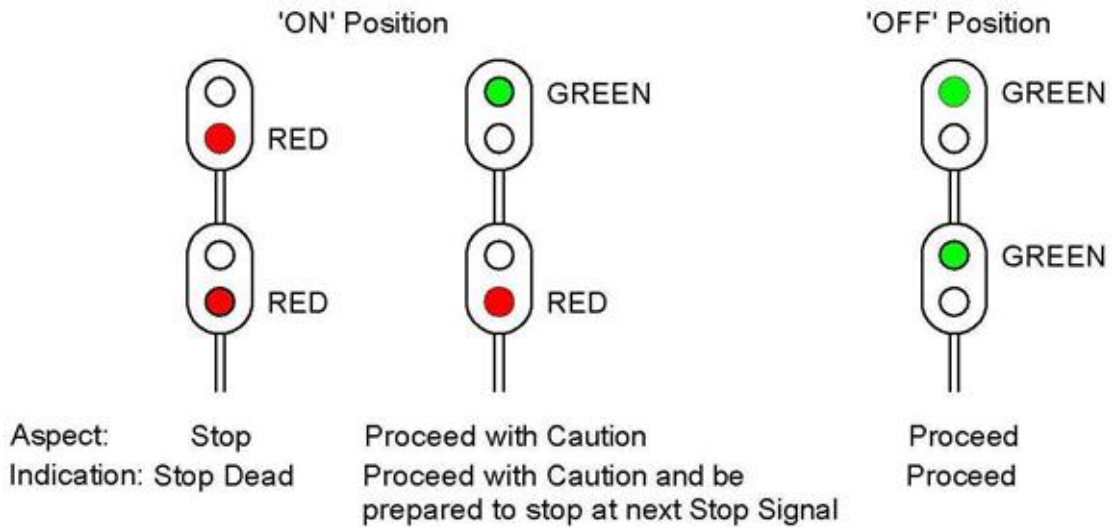


FIG. 4.18 (c) Two aspect COLOUR LIGHT WARNER BELOW A STOP SIGNAL

4.19 From the above, the aspect displayed by these signals and the indication given to the approaching driver, it can be seen that

(a) In the case of Two aspect lower quadrant, the driver is given only two precise informations at the approach of a station. A Warner Signal at Green (OFF) indicates that he can proceed (run through) at the normal speed and a Warner at `ON' indicates that he has to approach the next signal cautiously, preparing to stop.

RED

(b) Initially in the case of Multiple aspect signalling, the driver is not given any precise information about run through at the approach of a station. The distant signal at Green (OFF) indicates that he can proceed and expect the next stop signal to be OFF and further Stop Signals ahead of this may or may not be OFF but as per new rules distant signal GREEN aspect indicate run through on main line.

(c) 4-Aspect Colour Light Stop Signal at `OFF' with green light, indicates the driver to proceed, next stop signal is also `OFF.

Yellow aspect indicates caution and tells the driver to proceed with caution and be prepared to stop at the next stop signal.

In addition to the above aspects, a 4 - Aspect Stop Signal has an attention aspect by showing of two yellow lights one above the other informs driver to proceed and be prepared to pass the next stop signal at restricted speed. This may be on account of either the train has to negotiate a turn-out ahead or the braking distance is not being available between next signal at caution and the signal in advance at Red, so that he can control the speed of the train.

4.20 So far we have seen that a minimum of one stop Signal and a Permissive Signal is necessary to provide the requisite space interval between the trains. Trains are normally dealt with at stations for different purposes such as stopping for passengers, for loading, for servicing etc., in which case the stop signals are required to be located at different locations to cater to the needs. Stop signals could be provided at the approach end of a station and/or at the departure end of the station and/or at converging or diverging junction points at a station. This involves the introduction of calling the stop signals by different names depending upon the location and hence we will be discussing the details of "DESIGNATION OF SIGNALS" in the next chapter.

Review questions

Subjective Questions

1. Write down difference between Warner signal and Distant signal.
2. Write down the advantages of Colour Light Signals over the Semaphore signals.

Objective Questions

State true OR false

1. Indications for caution aspect is proceed and be prepared to pass next stop signal at restricted speed. (False/ True)
2. OFF aspect of a Warner signal is attention. (False/ True)
3. Name of aspect and indication of MAUQ signal and MACL signal are not same. (False/ True)
4. UQ distant signal cannot combine with a stop signal. (False/ True)
5. Warner signal at OFF indicate run through condition on Loop Line. (False/ True)
6. A "P" maker shall be provided below UQ distant signal. (False/ True)
7. A Warner signal and a distant signal perform same function. (False/ True)
8. A Warner signal (semaphore) is permissive signal and provided with a "P" marker. (False/ True)
9. A Warner signal on an independent post at ON provides information regarding aspect of signal in advance (False/ True)

Fill up the blanks

1. If distant signal in single distant territory display proceed aspect then it indicates _____

   a) Run through on main line b) Run through on loop line

   c) Train is going to be received on Main line d) all a,b &c

2. The maximum possible number of aspects in LQ signal with combination of signal is/ are _____

   a) Stop b) proceed with caution c) proceed d) all a,b,&c

3. Total aspects in distant signal of double distant signal territory is/ are

   a) Attention b) a &c c) proceed d) caution

* * *

CHAPTER 5: DESIGNATION OF SIGNALS

5.1 At a Block station it is obligatory to provide certain number of signals for controlling the movements of trains. There we require some signals to deal with the trains approaching the station and some to deal with departure of trains from the station. When more than one stop signals are used, it is difficult to identify them from each other. Hence it is necessary to give some name to these signals.

5.2 SIGNALS FOR RECEPTION: Signals, which are governing the approach and entry of trains into a station, are,

(a) PERMISSIVE SIGNALS: A "WARNER' in case of Two aspect signalling can be placed below the first stop signal or below the Last Stop Signal or can be on a post by itself with fixed green light above. It is to warn the driver that he is approaching a stop signal or to warn him about the condition of block section ahead. In multiple aspect signalling a "DISTANT" signal is provided to indicate the driver about the condition of the stop signal ahead. If the sectional speed is 120 KMPH or above, two "DISTANT" signals shall be provided. In such cases, these signals are called
„DISTANT“ and „INNER DISTANT“ respectively. Of late DISTANT signal in single distant territory also indicate RUN through on main line condition.

(b) STOP SIGNALS: Minimum one permissive and one stop signal are sufficient for trains approaching a station. When stop signal is taken 'OFF' it permits the train to enter the station, this is called "HOME" signal of the station. At a station where two stop signals are provided in the approach, the first one shall be called "OUTER" and the next shall be "HOME". In some cases where the distance between the Home signal and the Reception lines of the station is far away, one more stop signal may be provided, as One Home signal will not be sufficient to facilitate the reception. So a stop signal provided between Home and the Reception lines shall be called a "ROUTING HOME".

5.3 SIGNALS FOR DEPARTURE OF TRAINS

At the departure end of the station, the stop signals controlling the movement of trains leaving the station are;

(a) STARTER SIGNAL: Where the departure of trains is controlled by only one stop signal, it is called Starter Signal and is the Last Stop Signal of the station. If two or more converging lines are there, the Starter shall be placed outside all connections on the line to which it refers. Where advanced starter is also provided, the starter referring to any line is placed so as to protect the facing point or fouling mark and shall not be less than 400 Mts in advance of the Home signal.

(b) ADVANCED STARTER: Where departure of trains is controlled by more than one Stop Signal, the Outer most starter signal shall be the Last Stop Signal of the station and is called "Advanced Starter". Unless approved under special instructions an "Advanced Starter" shall be placed outside all connections on the line to which it applies. It shall be placed at not less than 180 Mts in the case of two aspect and 120 Mts in multiple aspect signalling from the outermost point on single line and outside all point connections. This distance shall be reckoned from the starter on double line. On special nominated sections where frequent shunting involving main line takes place the "Advanced Starter" signal may be placed at a distance of full train length beyond the trailing point and the track between trailing point and the Advanced starter shall be track circuited (Ref. C.slip No.2 for para 7.16.6 & 7.27.5 of 1988 SEM). Where an advanced starter is provided, the starter referring to any line shall be placed so as to protect the first facing point or fouling mark; and shall not be less than 400 Mts in advance of Home Signal.

(c) INTERMEDIATE/ROUTING STARTER: Intermediate Starter is provided between starter & advanced starter where necessary, and is placed in rear of the point, which it protects. (Refer Figs. 6.2, 6.3, 6.4 and 6.5 of the next chapter)

5.4 We have seen the aspects and indications of an individual signal. The following aspect sequence charts give us the various combinations of signals, their aspect and indications conveyed to the driver of an approaching train. (Using light aspects)

(a) Approaching Signals used in Two aspect Signalling

Warner	Outer	Home	Indication
R	R	R	Stop at Outer signal
R	G	G	Enter the station. Stop at Starter of concerned line if 'ON"
G	G	G	Run through via main line all signals ahead are 'OFF'

(b) Approaching signals used in MAUQ/MACL

Version	Distant	HOME	Indication
existing	Y	R	Train is required to stop at Home signal
revision			Same as above
Existing & revision	YY	Y with Route	Reception on Loop Line. Stop at Starter
existing	G		Reception on main line
revision	YY	Y	Reception on main line
existing	G	Y	Reception on main line
revision	G	G	Run through on main line

Revised aspects as per Railway board letter No 2009/safety (A&R)/19/24 Dated 6-
12-2010. This makes aspects of distant (after revision) to same as aspects of Inner
Distant of double distant territory shown at table (c).

The above change in aspect control is due to amendment to the rule GR 3.07 „description of distant signal and their indication" and will be come in force after necessary changes in signalling circuit of distant signal.

(c) Using two Distant Signals in approach (MACL).

Distant	Inner Distant	Home	Indication
YY	Y	R	Stop at Home
YY	YY	Y	Enter on Loop Line. Stop at Starter if 'ON"
G	YY	Y	Enter on Main Line. Stop at Starter
G	G	G	Run through via main line

5.5 Aspect sequence chart of Stop signals used for departure of trains

(a) Departure signals in Two aspect signalling

Starter	Advanced Starter	Indication
R	R	Stand in rear of starter
G	R	Shunt up to adv. Starter
G	G	Proceed line is clear

(b) Departure signals in M.A Signalling

Starter	Advanced Starter	Indication
R	R	Stand in rear of starter
Y	R	Shunt up to adv. Starter
Y/G	G	Proceed line is clear

5.6 To control the through movement of trains to and from a station, it is sufficient to have reception and despatch signals as explained above. But in some major yards, other special type of signals and indicators are provided, (a) to control shunt movements within the yard; and (b) to convey certain information to the driver (They are discussed in Chapter.7).

Review questions

Subjective Questions

1. Write down aspect control chart of distant signal in double distant territory.

2. Write down advantages of double distant signal.

Objective Questions

State true OR false

1. When distant signal display green aspect then it indicates run though condition (False/ True)

2. Normal aspect of distant signal in double distant territory is caution. (False/ True)

Fill up the blanks

1. If distant signal in single distant territory display proceed aspect then it indicates _____

a) Run through on main line
b) Run through on loop line
c) Train is going to be received on Main line
d) all a,b &c

2. If distant signal in double distant territory display proceed aspect then it indicates _____

a) Run through on main line
b) Run through on loop line
c) Train is going to be received on Main line
d) all a,b &c

* * *

CHAPTER 6: LOCATION OF SIGNALS

6.1 Signal must be so located and aligned as to display the best possible view of their aspects to the driver of approaching train and shall avoid as far as possible the possibility of mistaking the aspect of one signal for the aspect of another, or confusion between the lights of running signals and the lights of subsidiary signals or any other lights. Signals should be normally on the left hand side or above the line to which they apply, unless there are special reasons to the contrary. All signal arms must be fixed on the left-hand side of the post. The other important considerations in locating the signals are that they should afford the required sighting distances and it should be possible to work or operate them efficiently, and should not infringe the schedule of dimensions. None of these considerations can be compromised. Signals should be so designed, failure of which shall assume the most restrictive aspect. It shall be noted that the adequate distances prescribed in these rules are minimum they may suitably be increased but not decreased, unless authorised by special instructions.

6.2 LOCATION OF SIGNALS IN TWO ASPECT L.Q.SIGNALLING

(a) WARNER SIGNAL: A Warner signal may be placed either

(i) On a post by itself with a fixed green light by night 1.5 to 2 Mts above it and shall be located not less than. 1200 Mts in rear of the first stop signal or Gate Stop Signal, unless otherwise it is permitted by approved special instructions.

Or

(ii) On the post, 1.5 to 2 Mts below the arm of the Outer signal. Or

(iii) On the post, 1.5 to 2 Mts below the last stop signal of a station.

When placed below a stop signal the change in colour of light of the stop signal shall take the place of fixed green light of the Warner Signal, and the arrangement shall be such that the Warner cannot be taken 'OFF' while the stop signal above it is 'ON'. The Warner signal must not be capable of being taken 'OFF' for any line other than that over which highest speed is permitted, and it must not be capable of being taken 'OFF, until the levers of all the relevant signals have been pulled. Where it is necessary to provide un-worked Warner Signal, it must be fixed at 'ON' position as shown in Fig 6.2.

(b) OUTER SIGNAL: In Two aspect signalling where Outer signal is provided, it will be the first stop signal of the station and shall be placed not less than 400 Mts in rear of the point up to which the line may be obstructed after the line clear has been given to the station in rear. On single line there should be at least 580 Mts between Outer and Home, so as to cater for Block overlap and Signal overlap i.e. (400 + 180 Mts) where Advanced starter or Shunt Limit Board is provided for shunting facility in the face of an approaching train at class „B“ station.

(c) HOME SIGNAL: The Home Signal shall be located in rear of all connections, and close to the first set of facing points clear of lock bar, or the fouling mark (if the first point is trailing) so as to protect the adjacent line. If it is found necessary to increase the distance between the signal and the first facing point beyond 180 Mts, other arrangements for route holding must be made like lock retaining bar, with necessary interlocking or track circuits or SM's route control.

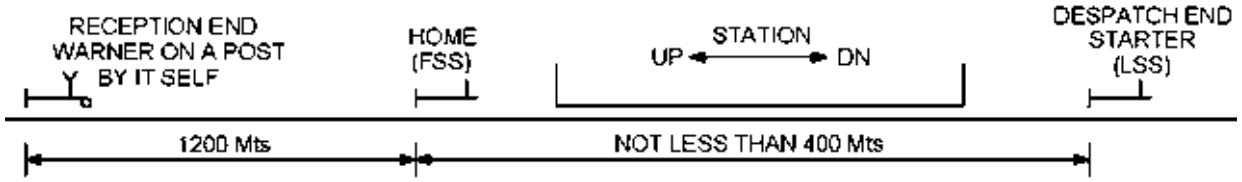
(d) ROUTING SIGNAL: A Routing Signal must be placed in rear of the point, which it protects.

(e) STARTER SIGNAL: The starter signal shall be placed at not less than 400 Mts in advance of the Home Signal. Where a starter signal is provided for each converging line, it shall be so placed as to protect the adjacent running line or lines. Where only one starter is used for two or more converging lines, it shall be placed outside the (point) connections on the line to which it applies.

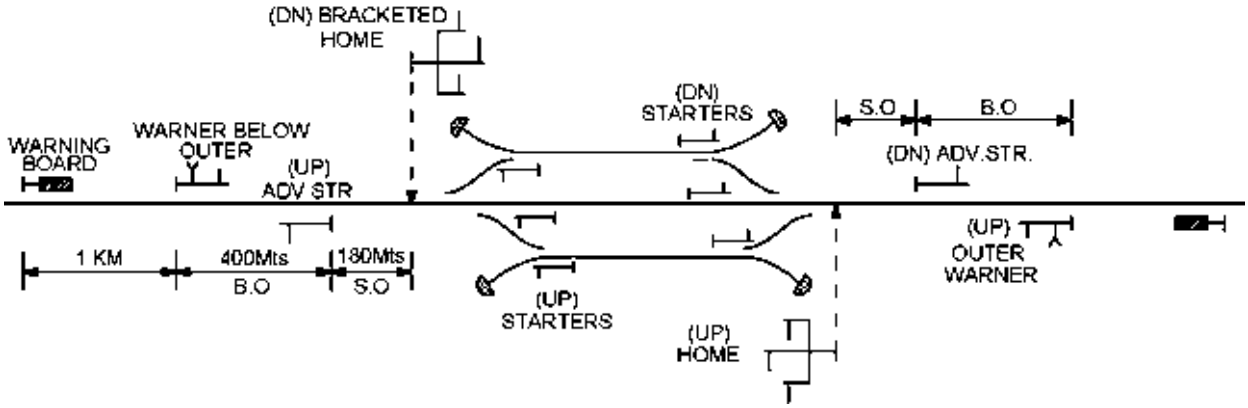
(f) INTERMEDIATE STARTER: An Intermediate starter shall be placed in rear of the point or fouling mark to which it protects.

(g) ADVANCED STARTER: Unless approved under special instructions, an Advanced starter shall be placed at outside all (point) connections on the line to which it applies. It shall be placed at not less than 180 Mts from the outermost point on single line. On double line this distance should be reckoned from the starter if this is not adequate enough, may be from the outermost point or fouling point under special instructions.

However in special cases where frequent shunting involving main line takes place, the Advanced starter may be placed at a distance of full train length beyond the trailing points and the track between starter and Advanced starter should be track circuited.



(a)



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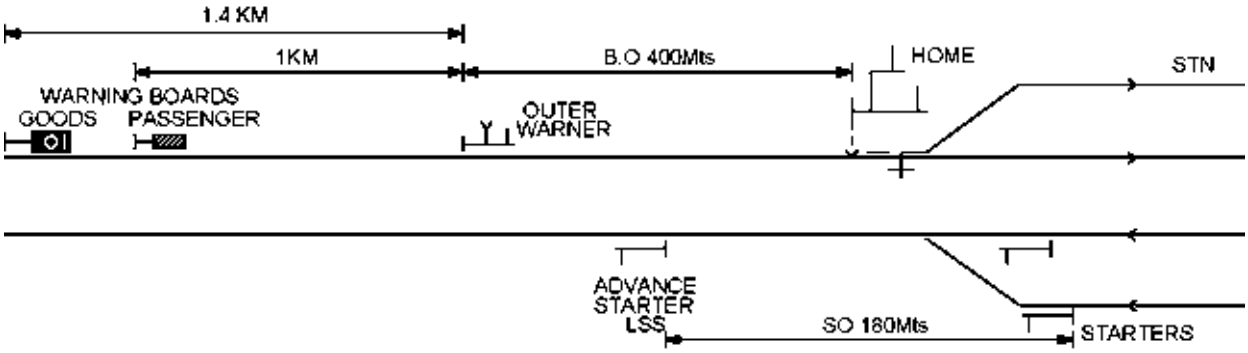
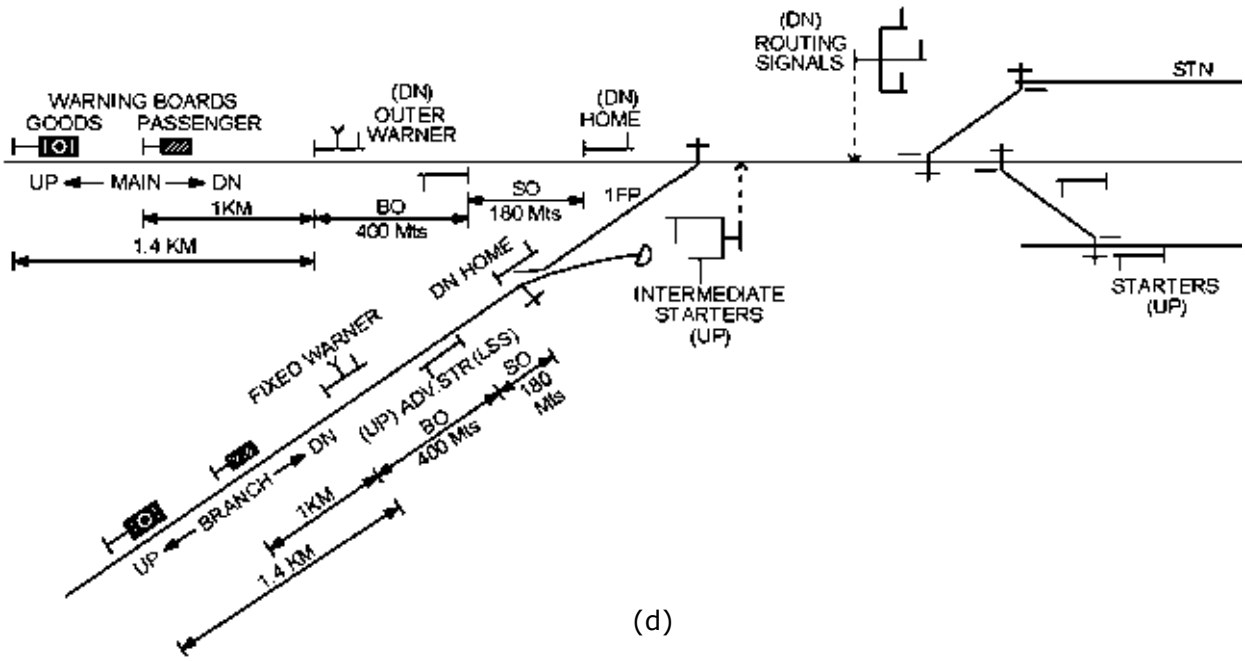


(c)



(d)

Fig. 6.2 Designation and location of Fixed Signals in Two aspect L.Q Signalling

6.3 LOCATION OF SIGNALS IN MAUQ SIGNALLING

(a) DISTANT SIGNAL: On single line or double line, the distant signal shall be placed at an adequate distance i.e. Normal braking distance in rear of the first stop signal of the station or gate stop signal, which shall not be less than 1 KM.

(b) HOME SIGNAL: The Home signal is the first stop signal of the station normally placed at Normal braking distance in rear of next stop signal and 180Mts in rear of the point up to which the line may be obstructed, after the line clear has been given to the station in rear. To obtain maximum operational facility on single line, the Home signal shall be placed at not less than 300 Mts i.e. BO + SO (180 Mts + 120 Mts) in rear of the first facing point if the facility of shunting in the face of an approaching train is desired, so that BO is available between the Home and the opposite Advanced starter/SLB. Route holding is achieved by providing Lock Retaining bar (LRB) or track circuit or SM's control (See Fig 6.3 a) On double line the Home Signal may be located at a distance of BO (180 Mts) in rear of the facing point or Block section Limit Board (if first point in the approach is trailing or no point). Where two or more lines diverge the signals shall be fixed on bracketed post, or gantry. The signal which refers to main line shall be at higher level than of the loop lines (see 6.3 b)

(c) ROUTING SIGNAL: A routing signal must be placed just in rear of the points which it protects. Generally they are used in junction stations

(d) STARTER SIGNAL: Starter signals are usually placed in rear of the facing point or fouling mark of the converging lines such that they should protect the adjacent running line or lines.

(e) INTERMEDIATE STARTER: It shall be placed in rear of the point to which it protects. They are generally used at Junction stations to inform the driver of the train that to which direction he is being dispatched

(f) ADVANCED STARTER: The advanced starter shall be placed outside all connections on the line to which it applies, and shall not be less than 120 Mts from the outermost point on single line. On double line this distance shall be reckoned from the starter. However, if this distance is not adequate for working of trains may be reckoned from the outermost point or fouling mark and in special cases up to a distance of full train length beyond the outermost point where frequent shunting is involving the main line. In such cases the track between the starter and advanced starter shall be track circuited.

LOCATION OF SIGNALS

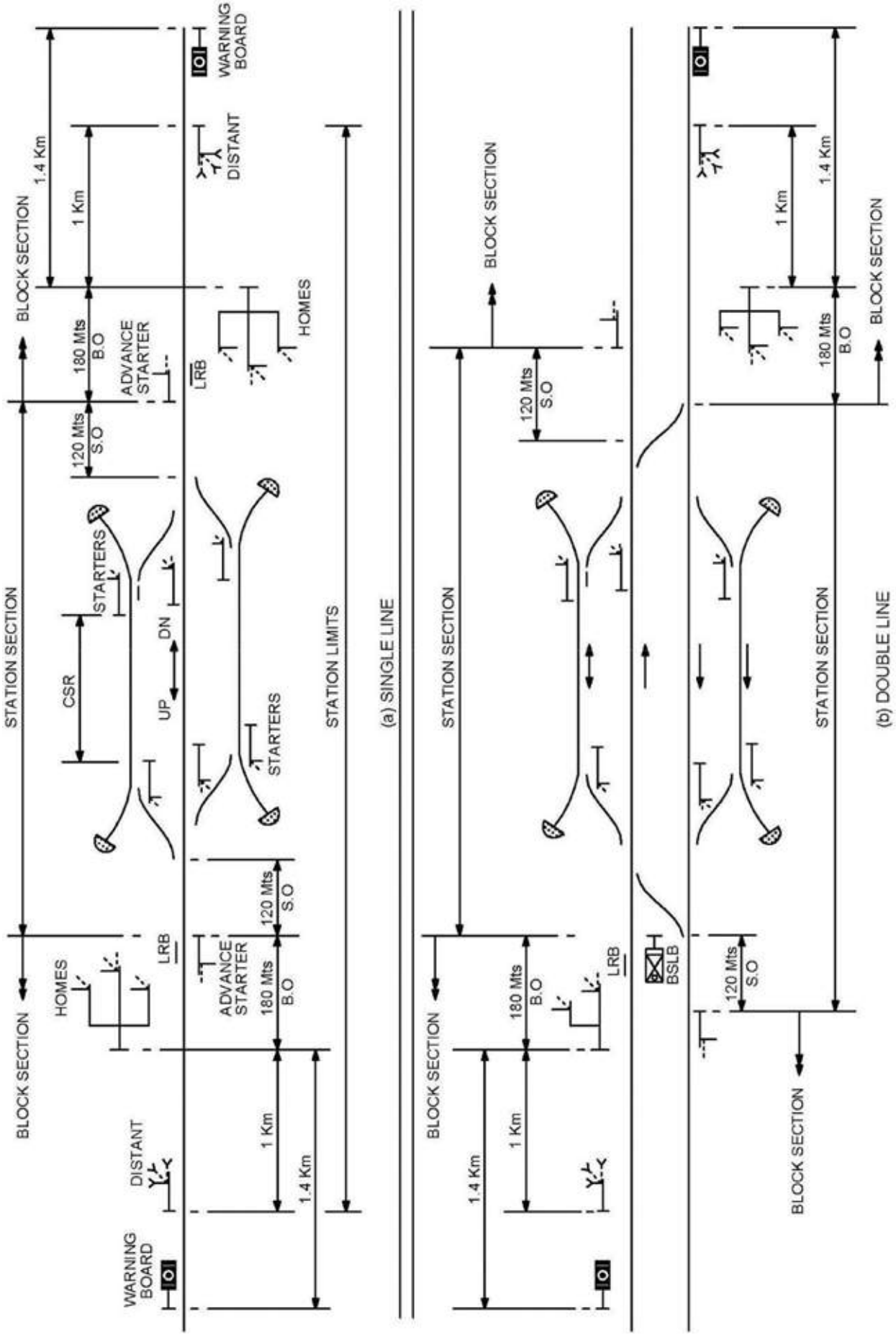


Fig: 6.3 DESIGNATION AND LOCATION OF FIXED SIGNALS IN MAUQ SIGNALLING

6.4 LOCATION OF SIGNALS IN (MLQ) MODIFIED LOWER QUADRANT SIGNALLING

Modified lower quadrant signalling shall be provided only under special instruction issued by the Railway Board. **It is now outdated**. Where such signalling is permitted the requirement of signals and their locations shall be as follows:

(a) DISTANT SIGNAL: On single line or double line, the distant signal shall be placed at an adequate distance in rear of the first stop signal which shall not be less than 1KM.

(b) WARNER SIGNAL: It shall be placed on the same post at 1.5 to 2 Mts below the main Home Signal.

(c) HOME SIGNAL: The Home Signal shall be placed at not less than 180 Mts in rear of the point up to which the line may be obstructed after the line clear has been given to the station in rear.

(d) STARTER SIGNAL: It shall be placed on each converging line as to protect the adjacent line or lines

(e) ADVANCED STARTER: It shall be placed outside all connections and not less than 120 Mts from the outermost point. If this distance is increased, the track between starter and Advanced starter should be track circuited.

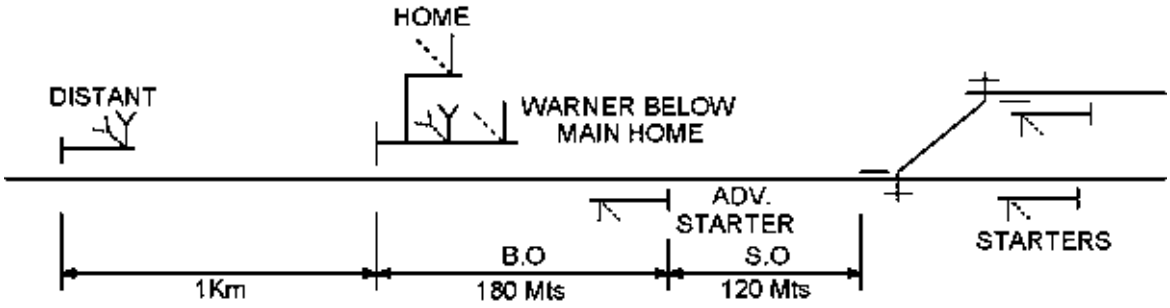


FIG. 6.4 DESIGNATION AND LOCATIONS OF MLQ SIGNALS

6.5 LOCATION OF SIGNALS IN COLOUR LIGHT SIGNALLING

The requirement of signals and their locations in stations equipped with colour light signalling is same as it is for semaphore signalling, whether Two aspect or Multiple Aspect. However when colour light signalling is to be provided it is preferable to go for multiple aspect, because it is convenient and advantageous. In the case of semaphore signalling the physical appearance of arm for permissive signal and stop signal is different. Whereas in colour light, the signals look alike, to distinguish a permissive signal from a stop signal a 'P' marker is provided on the post of a colour light Distant Signal. So that the driver need not stop and can pass this signal when it is found blank after seeing the 'P' marker. Similarly providing separate Home signals on a bracketed post for each diverging line, a common colour light stop signal with route indicator is used to indicate the driver as to which route the line is set for him. Route indicator is provided only when the colour light signal is kept common for more than one route for diverging lines and not provided for straight line and when it is for one line. For example starter signals whether on loop line or main line are not provided with route indicator since they are for only one line ahead (see Fig. 6.5).

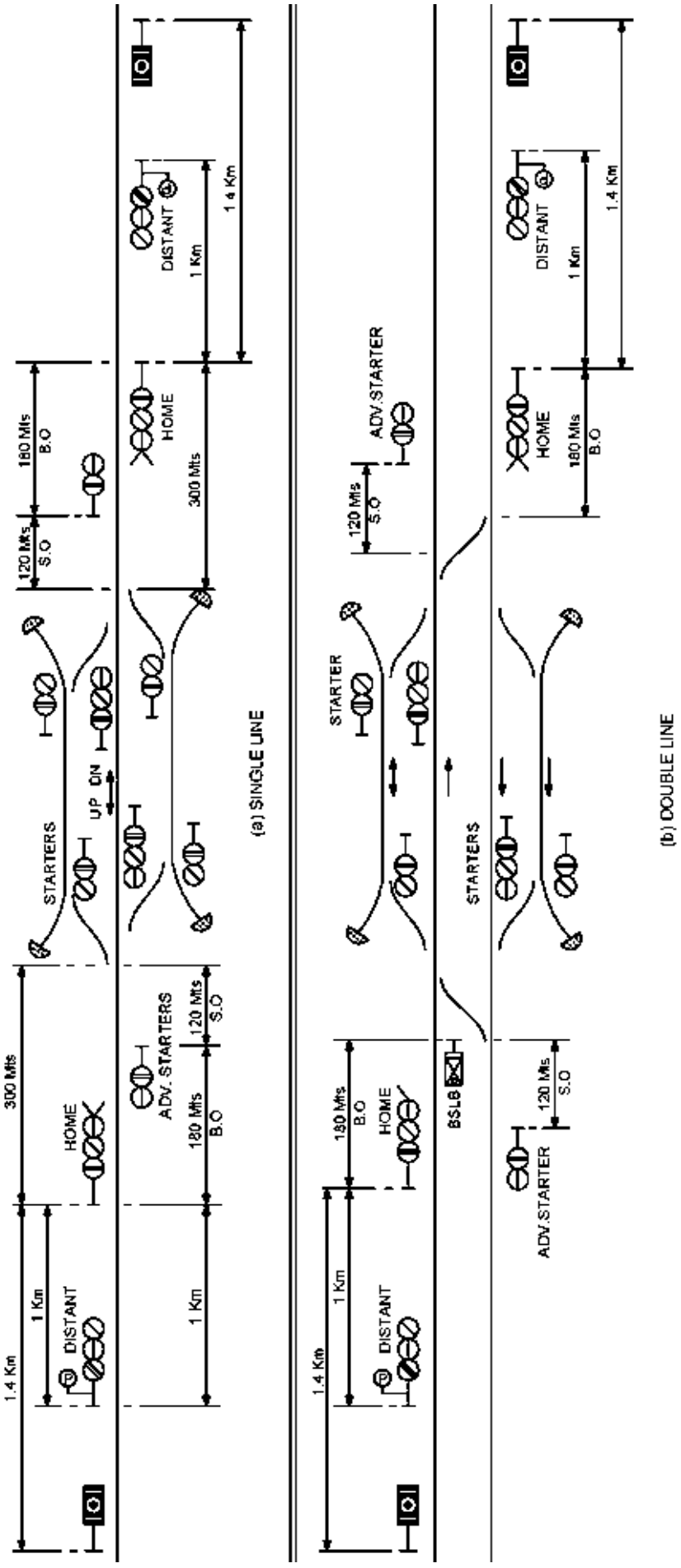


Fig: 6.5 DESIGNATION AND LOCATION SIGNALS IN MACL

Review questions

Subjective Questions

1. Draw a four line **class B** station with multi aspects colour light signal on **Double line section** with a siding taken out from common loop line. Provide all necessary signals & warning boards, inter distances of signals, station limits, station section, block section & also **demarcate** all possible overlaps of UP home signal.

2. Draw a three-line class B station with UQ multi aspects signal **on single line section** with a siding taken out from one loop line. Provide all necessary signals & boards, distances of signals, station limit, station section, block section& also demarcate all possible overlaps of UP home signal.

Objective Questions

State true OR false

1. First stop signal on single line station normally shall be placed at distance of 400 Mts plus 180 Mt from outer most point. (False/ True)
2. First stop signal on double line section normally shall be placed at distance of 400 Mts plus 180 Mts from outer most point. (False/ True)

3. The starter signal shall be placed at not less than 400 Mts in advance of the Home Signal and is usually placed in rear of the facing point or fouling mark of the converging lines such that they should protect the adjacent running line or lines. (False/ True)
4. Location of distant signal and Warner signal on independent post is same. (False/ True)

5. Location of Advanced starter in LQ and UQ signal on single line and double line may be reckoned starter signal. (False/ True)

* * *

CHAPTER 7: SUBSIDIARY SIGNALS, REPEATERS, INDICATORS, MARKERS & BACK LIGHTS

7.1 In the previous chapters we have seen the signals authorising the drivers to enter the station from a block section by the use of Reception Signals; and enter the block section from the station by the use of Departure Signals. These signals were, therefore, being used for "reception" and "despatch" of running trains. As per the definition a "Running train" is a train which has started under an authority to proceed and has not completed its journey whereas "a train" is an engine with or without vehicles attached or self propelled vehicle with or without a trailer which cannot be readily lifted off the track. The signals, which control the movement of trains within the station section, are to be differentiated and convey different indication to the driver. These signals are (a) Shunt signals and (b) Calling on Signals and are called "SUBSIDIARY SIGNALS".

7.2 SUBSIDIARY SIGNALS

In addition to the reception and despatch of train from and to a station some other movements of trains are required such as transfer of vehicles from one line to another, attaching and despatching of vehicles to and from a train to Marshall a train, so that vehicles meant for the same destination are always in one line etc. Such movements differ from regular train moves with the low speeds and movements are confined to a small area and the line on which the movement is to be done may invariably be occupied by vehicles and as such the driver has to exercise more caution called shunting movement of train / vehicle. A running signal taken 'OFF' signifies that the line on which the movement is to take place is clear of obstruction, whereas a shunt signal if taken 'OFF' may authorise the driver to go past the signal at slow speed irrespective of whether the line is vacant or not. These movements are also required to be controlled and 'not left' to the discretion of the driver. These movements can be carried out by the use of "Hand Signals" exhibited by authorised persons to carry out the shunting. Where these movements are frequent and regular then the use of separate signals called "Shunt Signals" have to be fixed. Naturally the shunt signals are to be different from running signals as the information conveyed by them when 'OFF' is different. Moreover, as the movement is done in a smaller area, the visibility of the signal is not critical and low visibility is adequate. Also no pre-warning is necessary. Since visibility required is less, smaller types of signals can be used compared to running signals.

7.3 SHUNT SIGNALS (GR 3.14)

(a) Shunt signals authorise movement only at such slow speeds as to be able to stop short of any obstruction and control shunting movements.

(b) Shunt signals can be placed on a separate post by itself close to the ground or can be placed below a stop signal other than the first and last stop signal of a station.

(c) More than one shunt signal may be placed on the same post in which case the top-most signal shall apply to the extreme left hand line and the second shunt signal from the top shall apply to the next line from the left and so on.

(d) Shunt signal when taken 'OFF' authorises the driver to draw ahead with caution even though the stop signal, if any, above it is at 'ON' position, and

(e) The shunt signal shall be either

  (i) Disc type shunt signal;

  (ii) Position Light Shunt Signals.

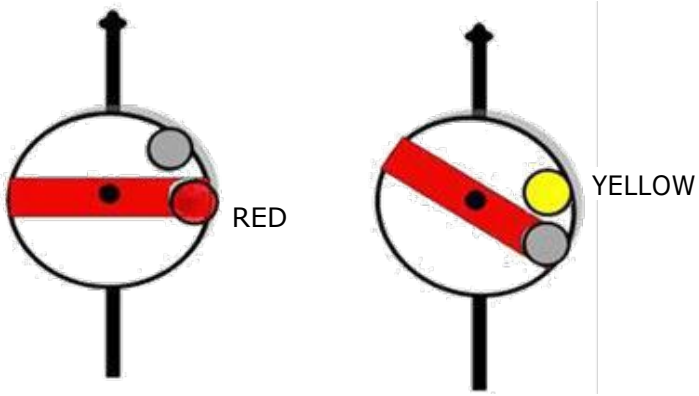
(f) Under special instructions, a shunt signal may be a miniature arm.

(g) When a Shunt Signal is placed below a Stop Signal, it shall show no light in the "ON" position.

7.4 DISC TYPE SHUNT SIGNAL

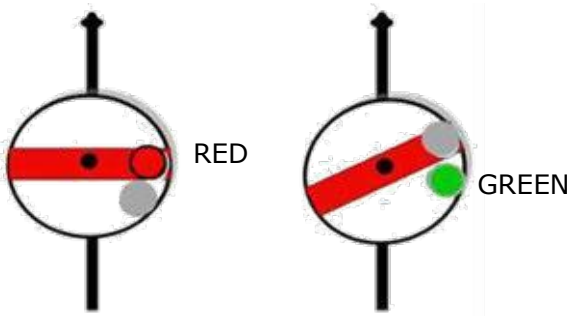
Shunt signal of the 'Disc' type is a circular disc painted white with red horizontal bar in the front and white with black bar in the rear. Disc type shunt signal used in Two aspect Lower Quadrant Signalling territory moves to the lower mid-position in the Lower Quadrant when 'OFF' and moves to upper mid-position in the Upper Quadrant for the Multiple aspect territory for the 'OFF' aspect. The night aspect in the LQ is 'RED' when 'ON' and Green when 'OFF' and MA territory, it is 'RED' when 'ON' and yellow when 'OFF'. The disc type shunt signal can also be placed below a Semaphore stop signal other than the first stop signal in which case, the 'Red' indication in the 'ON' aspect (Red light) of the main signal will prohibit the driver from passing the signal. However, the night aspect will continue to be Green/Yellow if the Shunt signal is taken 'OFF'. But, if shunt signal has to be located independently then the problems arise. The shunt signal is relevant only for a shunting train and not for a running train. If so, a Red of an independent shunt signal does not mean anything to a running train, and he can ignore it. But ignoring a Red aspect is bad in principle. So this is overcome to some extent by doing away with red lights for shunt signals. In position type shunt signal, the day and night indications of the Disc type shunt signals is shown in Fig. 7.4.

ASPECT AND INDICATION FOR UPPER QUARDRANT SHUNT SIGNAL



Aspect	Stop	Proceed slow
Indication	Stop dead	Proceed with caution for shunting

ASPECT AND INDICATION FOR LOWER QUARDRANT SHUNT SIGNAL



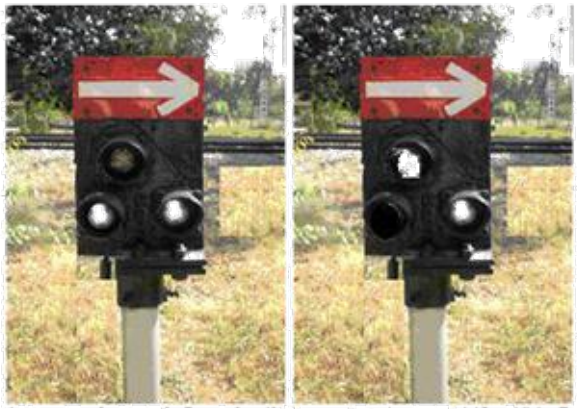
Aspect	Stop	Proceed slow
Indication	Stop dead	Proceed with caution for shunting

Fig. 7.4 DISC TYPE SHUNT SIGNALS IN MULTIPLE ASPECT & LQ SIGNALLING

7.5 POSITION LIGHT SHUNT SIGNAL

A position light shunt signal provided generally in the colour light signalling territory consists of a row of two white lights; one for the ON aspect and one for the 'OFF' aspect. The position light shunt signal used in the Two aspect lower quadrant or multiple aspect Upper Quadrant is the same. Since this is also considered as a Colour Light Signal the day and night aspect is the same. The two lights of the position light shunt signals will be white. By day and by night, the lights of the position light shunt signal will be horizontal in the „ON" position and 45º above horizontal in the 'OFF' Position. The aspects are shown in Fig. 7.5.

ASPECT AND INDICATION FOR POSITION LIGHT TYPE SHUNT SIGNAL



Aspect	Stop	Proceed slow
Indication	Stop dead	Proceed with caution for shunting

'ON' POSITION **'OFF' POSITION**

SHUNT SIGNALS

Shunt signal below stop signal

Shunt signal on independent post

Fig.7.5

7.6 MINIATURE SEMAPHORE ARM TYPE SHUNT SIGNAL

The semaphore arm of miniature shunt signal is square ended. The front of the arm is painted Red with white bar and the back of the arm is painted white with black bar. The day aspect is horizontal for 'ON' position and lowered to mid position for 'OFF' position in the case of lower quadrant and raised to 45º above horizontal in the 'OFF' position in the case of upper quadrant. The showing of 'Red' indication when the arm is horizontal constitutes the night 'ON' aspect, showing of 'Green' indication constitutes the night 'OFF' aspect for Two aspect lower quadrant and showing of 'Yellow' indication constitutes the night 'OFF' aspect for multiple aspect signalling. The day and night aspects of miniature semaphore shunt signals

instructions. **MINIATURE SEMAPHORE ARM TYPE SHUNT SIGNAL**

MINIATURE SEMAPHORE ARM TYPE SHUNT

MINIATURE SEMAPHORE ARM TYPE SHUNT SIGNAL

Multiple aspect		**Two aspect L.Q.**
ASPECT	**STOP**	**PROCEED SLOW**
Indication	Stop dead	Proceed with caution for shunting
Aspect	**Stop**	**Proceed slow**

Fig.7.6. MINIATURE SEMAPHORE ARM TYPE SHUNT SIGNALS

Indication Stop dead Proceed with caution for shunting

7.7 SHUNTING MOVEMENTS AND SHUNT SIGNALS IN GENERAL

Shunt signals are additional signalling equipment provided at stations where shunting movements are very frequent and manual shunting is difficult to perform. Driver while doing busy in shunting movements should not refer to running signals. The conditions for taking 'OFF' a shunt signal in an interlocked station are the same as required for taking 'OFF' a running signal except, that it does not require signal overlap and isolation, berthing track clear, released by another shunt signal due to slow speeds. A shunt signal is generally not confined to one route/siding; it may read to any number of diverging lines ahead to which it is accessible, with or without route indicators. It conflicts with all running signals of the line to which the route of the shunt signal is set. Shunt signal is fixed on a post closer to ground, as it does not require long range of visibility. On running lines where starters and advanced starter are provided, the starters of the station can be used for shunting. Where shunt signals are not provided, hand signals are used for shunting movements in such stations.

(a) SHUNTING PERMITTED INDICATOR: At certain stations where uninterrupted shunting operation is required in both the directions (to-and-fro towards the shunting neck or other connected lines), a Shunting Permitted Indicator (SPI) may be provided. It is not a stop signal, but an indicator, which is operated by a ground frame lever and works in conjunction with the stop signal such that either the SPI or the associated Shunt signal can be taken off at a time. This is of two types:

(i) Disc type: a black disc with yellow cross - painted on it.

(ii) Light type: Yellow cross light

Fig: 7.6 (a) SHUNTING PERMITTED INDICATOR

Type	When shunting is permitted		When shunting is not permitted	
	Day	Night	Day	Night
Disc type	Black disc with yellow cross painted on it	Yellow cross light	Edge of the disc	No light
Light type	Yellow cross light	Yellow cross light	No light	No light

7.8 CALLING ON SIGNALS

A calling on signal is a subsidiary signal and has no independent existence. It is provided below a stop signal governing the approach of a train. "CALLING „ON' signal can be a miniature semaphore arm type or colour light type in Two aspect or Multiple aspect territory.

Typically these are located on Home & Starters signals (Not on LSS) and taken off after time delay (1 minute for Calling ON below Home signal) on occupation of approach track of 5 Rail Length.

7.9 In the case of semaphore "Calling on" signal, it shall be miniature square ended arm painted white with red bar in the front and painted white with black bar in the back. The bars are parallel to the end of the arm. The Painting of a calling on signal with white is to distinguish it from a shunt signal miniature arm.

By day the arm must be

(a) Horizontal in the 'ON' position;
(b) Inclined downwards to the horizontal in the 'OFF' position in the Two aspect signalling territory and
(c) Inclined upwards to the horizontal in the OFF position in the multiple aspect signalling territory.

By night the signal will display

(a) No light in the ON position;

(b) A miniature yellow light in the OFF position for Two aspect lower quadrant; and

(c) A miniature yellow light in the OFF position for multiple aspect territory [(Refer Fig.
7.9 (a) and (b)]. In the case of colour light signalling a miniature yellow light with „C' marker is used. Fig. 7.9 (c) and (d)

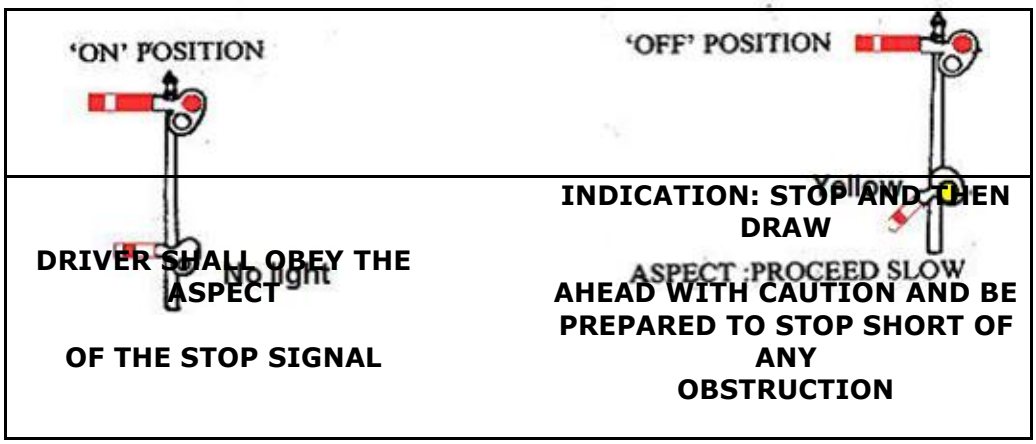


Fig. 7.9 (a) Miniature Semaphore type Calling ON Signal in Two aspect Signalling territory

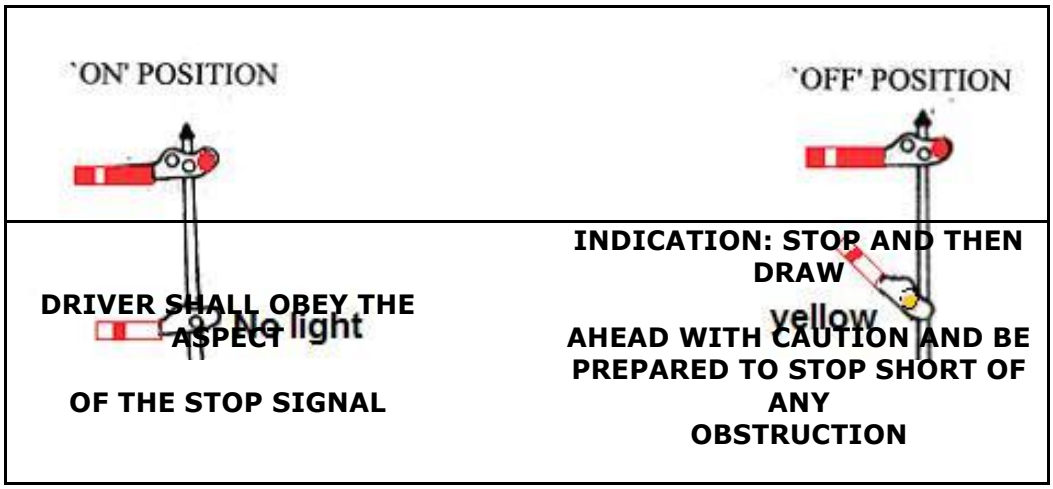


Fig.7.9 (b) Miniature Semaphore type Calling ON Signal in Multiple Aspect Signalling territory

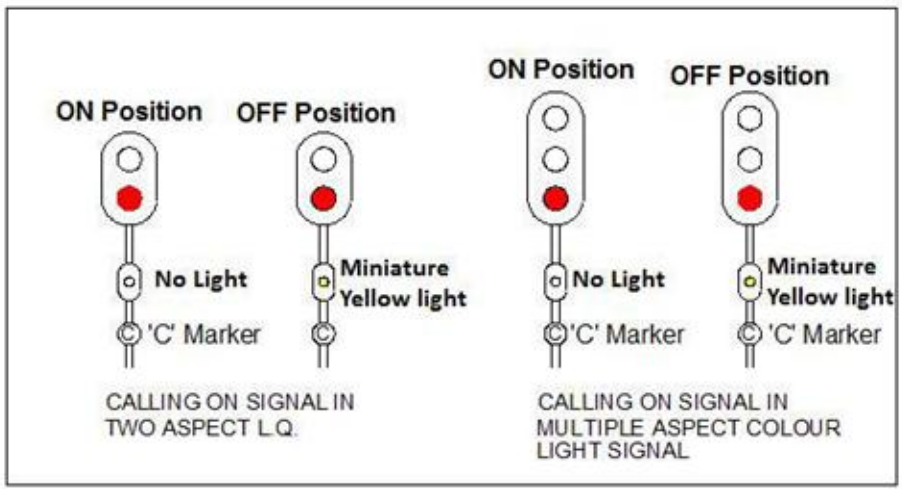


Fig.7.9 (c), (d) Colour light Calling ON Signal in Two Aspect and Multiple Aspect Signalling

7.10 Calling on signals are used only for the specific purpose of indicating to the driver that he is required to draw ahead when OFF and be prepared to stop short of any obstruction even though the stop signal above it, is at ON. Calling on signals are taken OFF only after the train has come to a stop. Calling on signals of the colour light type are provided with a "C" marker board. Under approved special instructions, a "calling on" signal may be provided below any other stop signal except the last stop signal.

7.11 OTHER MISCELLANEOUS SIGNALS

(a) CO-ACTING SIGNALS

All fixed Signals must have a minimum visibility to the driver of an approaching train and it is also essential that the signal is continuously visible to the driver of an approaching train. When it is not possible to get the minimum continuous visibility due to a foot-over bridge or road-over bridge, or tunnel or any other partial obstructions, then co-acting signals are required to be provided.

Co-acting signals are duplicate signals fixed below running signals on the same post; and are provided where, in consequence of the obstruction as stated above, the main signal arm or light is not in view of the approaching driver during the whole time the driver is approaching it. Co-acting signals shall be fixed at such a height that either the main arm / light or the co-acting arm/ light is always visible. The main signal and the co-acting signal are rigidly connected and they work together. Co-acting signals are provided in TALQ territory.

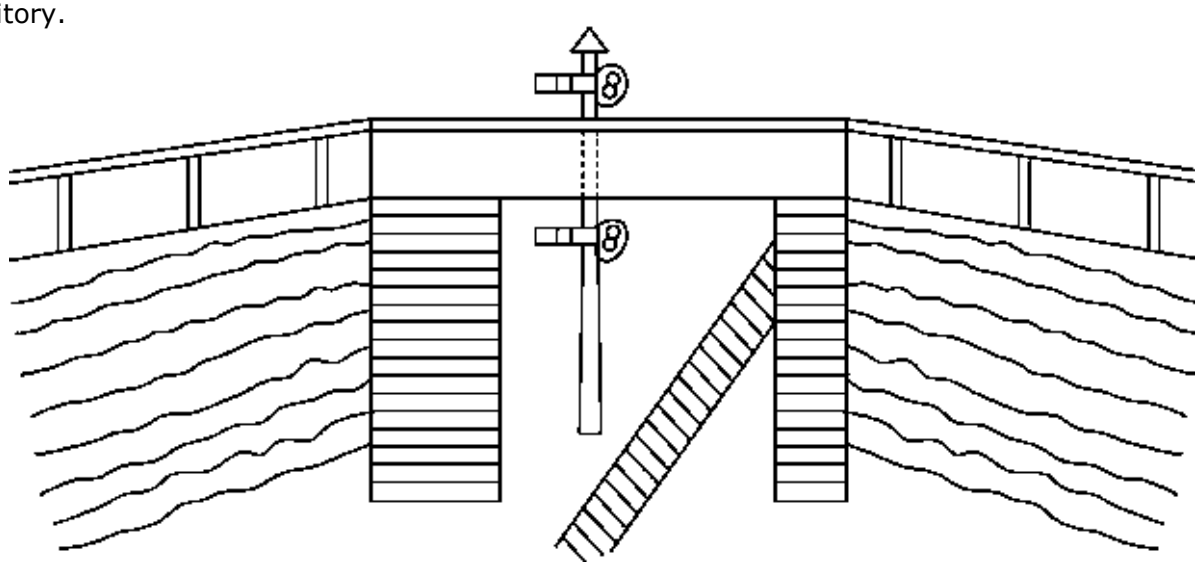
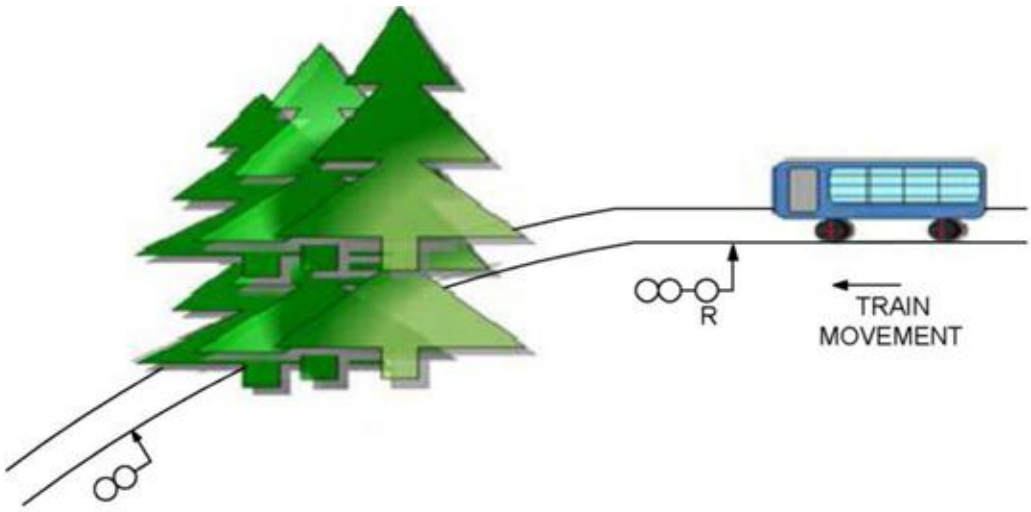


Fig. 7.11(a) CO-ACTING SIGNALS

(b) REPEATING SIGNALS



Normally any fixed signal shall be visible to the approaching driver. However, due to the terrain of the land, a tunnel or bridge coming in between or any other obstruction, then it may not be always possible to get a clear view of the signal from the specified distance. To overcome this, repeating signals are provided, to repeat the condition of the main fixed signal, at a place where the main signal is required to be sighted. The purpose of repeating signal is to inform the driver of the approaching train about the aspects displayed by the fixed signal in advance, which it repeats. A repeating signal shall be provided with a marker 'R' and shall be (i) a square ended semaphore arm or (ii) a banner type or (iii) a colour light signal. Repeating signals are required only for Two aspect signalling. In the case of multiple aspect signalling, as every stop signal is pre-warned, no repeater signal is necessary.

In the case of Two aspect lower quadrant semaphore arm type, it is provided with a semaphore arm square ended painted yellow with black bar in the front and painted white with black bar in the rear. The horizontal position of the arm in the daytime and showing of a yellow light by night constitutes the ON aspect of the signal. The arm inclined to the lowered position in the daytime and showing of the green light by night constitutes the OFF aspect. The banner type repeating signal is a disc, painted white with a rectangular bar painted yellow in the middle with black bars on the top and bottom. The horizontal position is "ON" and an upward inclined position is "OFF" position. The banner type signal is not lit in the night. The aspect of the colour light signal is yellow at ON and green at OFF position. The details are shown in the Fig. 7.12 (b), (c) and (d).

The semaphore arm type and Banner type repeaters are provided with marker plates with letters 'R" painted black on white disc and colour light repeaters are provided with 'R' marker lights, which indicates to the approaching drivers that the main signal in advance is repeated by the repeater signal. As can be seen the ON aspect of all type repeater signals is either yellow arm or yellow light which is not a stop signal indication and the driver is required to draw ahead up to the stop signal which it repeats.

ASPECT AND INDICATION FOR SEMAPHORE ARM TYPE REPEATING SIGNAL
ASPECT AND INDICATION FOR SEMAPHORE ARM TYPE REPEATING SIGNA

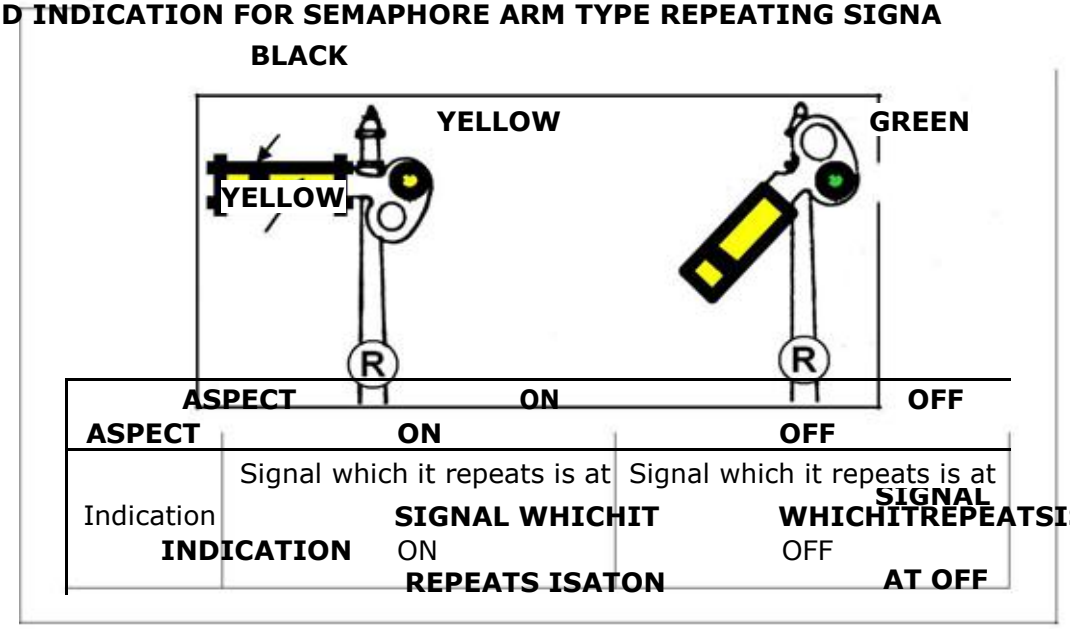
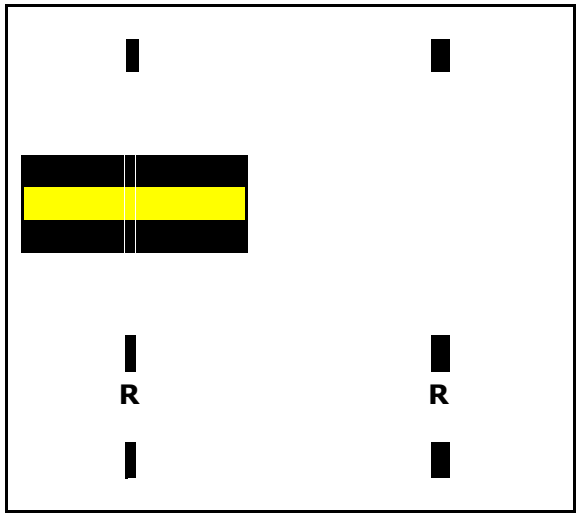


Fig.7.11 (b) SEMAPHORE ARM TYPE

ASPECT AND INDICATION FOR BANNER TYPE REPEATING SIGNAL

ASPECT AND INDICATION FOR BANNER TYPE REPEATING SIGNAL



ASPECT	ASPECT ON ON	OFFOFF
Indication	Signal **INDICATION** which it repeats is at ON Signal which it repeats is at OFF	

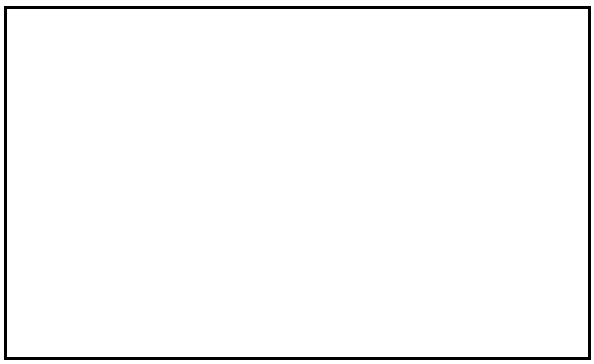
SIGNAL WHICH IT REPEATS IS AT ON

SIGNAL WHICH IT REPEATS IS AT OFF

Fig.7.11 (c) BANNER TYPE

ASPECT AND INDICATION OF COLOUR LIGHT TYPE REPEATING SIGNAL

ASPECT AND INDICATION OF COLOUR LIGHT TYPE REPEATING SIGNAL



ASPECT	ON	OFF
Indication	**ASPECT ON** Signal which it repeating at ON	**OFF** Signal which it repeating at OFF

SIGNAL WHICH IT

SIGNAL WHICH IT

INDICATION

REPEATING IS AT OFF

REPEATING IS AT ON

Fig.7.11 (d) COLOUR LIGHT TYPE

Summary of Co-acting or Repeating signals (for providing them under inadequate visibility conditions)

Type of territory		**Solution 1: -** Provide	**Solution 2 : If solution 1 is unable to give the combined visibility then**
Semaphore	Lower	Co acting signal or Repeating signal	Impose suitable speed restriction as per SEM Part 1 para 7.7.5
	Upper	N/ A	Impose suitable speed restriction as per SEM Part 1 para 7.7.7
Colour Light	Two aspect	Repeating signal	Impose suitable speed restriction as per SEM Part 1 para 7.7.5
	MACLS	N/ A	Impose suitable speed restriction as per SEM Part 1 para 7.7.7

7.12 DISTINGUISHING SIGNS

Sometimes the signals are provided with prescribed markers to distinguish the signals. They will normally be fixed on the semaphore arm itself or in some cases on the signal post below the signals as under

(a) SIGNS FIXED ON THE SEMAPHORE SIGNAL ARM

(i) Approach stop signals for goods running lines are provided with one black ring
„O“ on semaphore arm.

(ii) Approach stop signals leading to Dock platforms are provided with letter 'D' in black on semaphore arm.

(iii) Any signal, permissive or stop or shunt signal or colour Signal not in use are provided with crossed bars on the semaphore arm. The details are shown in Fig. 7.12 (a).

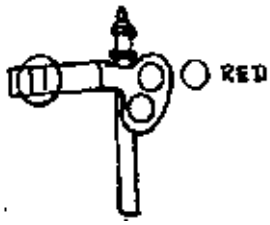
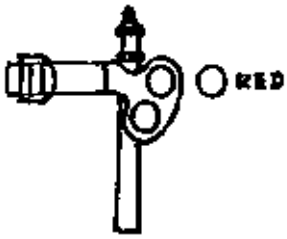
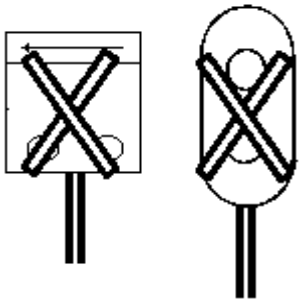
APPEARANCE	PROVIDED ON	DESCRIPTION
	Approach Stop signal for Goods running lines only	One black ring on semaphore arm
	Approach Stop signal for Dock Platform.	Letter 'D' in black on semaphore arm
	Semaphore Signal not in use	Crossbars on signal unit and such signals shall not be lit.
	Colour light Signal not in use	Crossbars on signal unit and such signals shall not be lit.

Fig. 7.12 (a) DISTINGUISH SIGNS PROVIDED ON SEMAPHORE SIGNAL ARMS

(b) MARKERS PROVIDED ON THE SIGNAL POST

(i) Automatic stop signals are provided with „A“ Marker (letter „A“ in black on white circular disc) to distinguish the signal as a full automatic signal.

(ii) Semi-automatic stop signals are provided with „A“ (white illuminated letter „A“ against black background) lit marker to distinguish the signal. when working as an automatic signal.
Letter 'A' extinguishes when the signal is working as a manual signal.

(iii) Colour light permissive signals on a post by itself are provided with „P“ Marker
(letter 'P' in black on white circular disc)

(iv) Gate stop signals are provided with „G“ Marker (letter 'G' in black on yellow circular disc.)

(v) Intermediate block stop signals are provided with „IB“ Marker (letter 'IB' in black on white circular disc.)

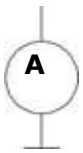
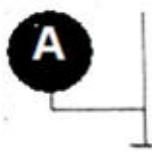
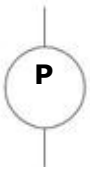
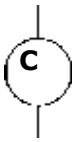
(vi) Colour light calling on signals are provided with „C“ Marker (letter 'C' in black on white circular disc.)

(vii) Repeating signals of semaphore type are provided „R“ Marker with letter 'R' in black on white circular disc

(viii) Repeating signals in colour light Two aspect signalling territory are provided with „R“ lit Marker white illuminated letter 'R' against the black background.

(ix) Gate signals in Automatic Block territory are provided with a 'G' marker and a white illuminated letter 'A' against black background. Letter 'A' shall be lit when the gate is closed and locked against the road traffic.

(x) When a semi-automatic signal is to protect a Level crossing gate and also points, the signal may be provided with illuminated 'AG' marker in addition to the illuminated 'A' marker (SEM 7.168.2 - 1988). Only one marker (either „A“ marker or „AG“ marker) can be lit at a time. When the points protected by the signal are correctly set and the gate is also closed, „A“ marker shall be lit. If the points are correctly set but the gate is defective, then „AG“ marker shall be lit.
When both the markers are not lit, the signal shall be treated as manual stop signal.

APPEARANCE	PROVIDED ON	DISCRIPTION
	Automatic Stop Signal.	Letter „A“ in black on White circular Disc.
	Semi - Automatic Stop Signal.	White illuminated letter „A“ against black background when working as an automatic stop signal and letter „A“ extinguished when working as a manual stop signal.
	Colour light Distant or Warner Signal on a post by itself.	Letter „P“ in black on White circular Disc.
	Intermediate Block stop signal	Letter „IB“ in black on White circular Disc.
	Calling ON Signal	Letter „C“ in black on White circular Disc.

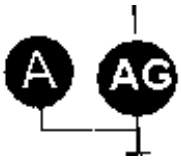
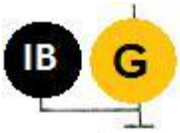
APPEARANCE	PROVIDED ON	DISCRIPTION
	Repeating signal in Semaphore signalling territory	Letter „R“ in black on White circular Disc.
	Repeating signal in Colour light signalling territory (2A)	White illuminated letter „R“ against black back ground.
	Gate stop signal	Letter „G“ in black on Yellow circular Disc.
	Gate stop signal in automatic block territory.	Letter „G“ in black on Yellow circular Disc and White illuminated letter „A“ against black back ground.
	Gate stop signal in semi - automatic block territory, when interlocked with points also.	White illuminated letters „A“ and „AG“ against black back ground.
	On „IB“ stop signal, when interlocked with LC gate also.	Letter „G“ in black on Yellow circular Disc and White illuminated letter „IB“ against black back ground.

FIG. 7.12 (b) MARKERS PROVIDED ON SIGNAL POSTS

7.13. INDICATORS

Certain appliances are provided on the un-interlocked points to indicate to the driver and Pointsman, whether the points are set for the straight line or for the diverging line. These are called Point Indicators. Similarly, indicators are provided on the trap points to indicate whether they are open or closed. These are called trap indicators. Point indicators/trap indicators shall be provided at all points/traps on running lines, which are not interlocked with signals unless the position of points/trap points is otherwise provided. The indicators must display the same indication in both directions, whether the movement is in facing direction or in trailing direction over the points. Point indicators and trap indicators shall be of the target type. They are provided with Day and Night indications are shown in Fig. 7.14 (a) and (b).

All the Point indicators shall show a white target by day or a white light by night in both directions when the points are set for the straight and no target by day and a green light by night in both directions when the points are set for the turnout.

TARGET TYPE POINT INDICATOR

SET FOR TURNOUT	SET FOR STRAIGHT

FIG. 7.14 (a) TARGET TYPE POINT INDICATORS

TARGET TYPE TRAP INDICATOR
TARGET TYPE TRAP INDICATOR

TRAP OPEN OR DERAIL ON	TRAP CLOSED OR DERAIL OFF

FIG. 7.14 (b) TARGET TYPE TRAP INDICATORS

7.15 ROUTE INDICATORS AND JUNCTION INDICATORS

We have already seen in the previous chapter that home signals of semaphore type can be provided one for each line either on a bracketed post or on a gantry. Similarly, for colour light signals, one signal can be provided for each line on a bracketed post or on a gantry. The number of colour light signals, one for each line can be replaced by one common signal with Route Indicators or Junction Indicators. Junction Indicators will be lighted only for all diverted routes along with common CLS, for straight line only the main signal will be lighted to the "OFF" position.

The Route Indicator can be a Stencil type or Multi-lamp type wherein the number of the lines made out for the driver is exhibited either as a letter **'M'** for Main Line, **'B'** for Branch, etc. or as a numerical figure as shown in Fig.7.15. Junction Indicators are also provided which shows a row of lights one for each line or route as shown in Fig. 7.15.

Types of Route Indicators to be provided shall be as under:

(a) Two aspect colour light signalling section - any route Indicator of approved design.

(b) Multiple aspect colour light signalling section :–

- ☐ For speed in excess of 15 KMPH - Direction (Junction) / LED matrix type route Indicator for up to three diversions on either side of main line
- ☐ For speeds not exceeding 15 KMPH - Any route Indicator of approved design

ROUTE INDICATORS		
		
JUNCTION (DIRECTIONAL TYPE)	**MULTI-LAMP TYPE**	**STENCIL TYPE**

FIG 7.15 ROUTE INDICATORS

(a) STARTER INDICATOR: At certain stations where colour light signalling is provided a Starter Indicator may be provided to repeat the aspect of the starter as an aid to the Guard to enable him to know the aspect of the starter. This indicator is fixed at a convenient place. It should show no light when starter signal is at 'ON' and show a yellow light when it is at 'OFF'

7.16 BOARDS

(a) SHUNTING LIMIT BOARD: It is a board rectangular in shape with "Shunting Limit" painted black at the bottom with a cross in black on a yellow background on the side facing the station. The board is fixed on a post, which is painted with black and white bands alternately as shown in fig. 7.16 (a). The shunting limit board is fitted with a lamp showing a white light on both directions to mark its position by night. This is provided on a single line class „B" station where shunting in the face of an approaching train is permitted. The shunting limit board shall be placed at such a shunting distance from the outer most facing point as the local conditions may require, and shall not be less than 400 Mts or 180 Mts from the opposing first stop signal in Two aspect or multiple aspect signalling respectively. Shunting Limit Board demarcates the Station section and Block section.

(b) BLOCK SECTION LIMIT BOARD: These boards are provided on Double line in multiple aspect signalling territory or modified lower quadrant territory to distinguish the limit of the Block section. It shall be provided at a station where there are no facing points or the outer most points at the approaching end are trailing. It shall be placed at distance not less than 180 Mts from the Home Signal and protects the fouling mark of the trailing point, if any in the approach of a train. It is a board rectangular in shape with the words 'Block Limit' painted in a black at the bottom of the Board with a cross painted in black on yellow background on the side which faces the station. The board is fixed on a post, which is painted with black and White bands alternately. The block section limit board is fitted with a lamp showing a white light in both directions to mark its position by night. This is as shown in Fig. 7.16 (a).

BLOCKBLOCKSECTIONLIMIT
BOARDANDANDSHUNTISHUNTINGLIMITLIMITBOARDBOARD

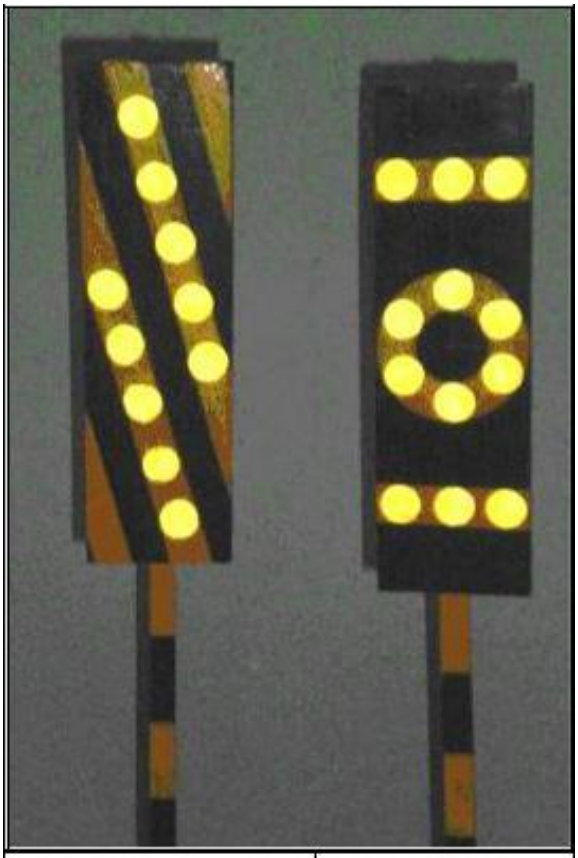
Fig.7.16 (a) (b)

(c) 'S' MARKER: An intermediate siding taking off in the facing direction of running line outside station limits is provided with a 'S' marker to indicate to the driver that a siding is being taken off from the main line. It is a circular board with letter 'S' painted in black on yellow background. The board is fixed on a post, which is painted with black and white bands alternately as shown in Fig. 7.16 (c).

(d) WARNING BOARDS: Warning boards are provided in rear of the first stop signal of the station for the purpose of giving the driver adequate warning that he is approaching a stop signal. Two types of warning boards are provided, one for the passenger trains and one for the goods trains.

(i) The warning board for the passenger train is a rectangular board painted black with yellow stripes diagonally painted. The board is fixed on the post, which is painted with black and yellow bands alternately, as shown in Fig. 7.16 (c) To draw the attention of the driver in the night, self-reflecting sheets or plastic reflectors of approved design are fixed. Passenger warning boards shall be located at not less than 1 KM in rear of first stop signal. In MACLS as distant signals are provided passenger warning board is dispensed with.

(ii) The warning board for the goods train is also a rectangular board painted black with two yellow bands horizontally painted one at the top and one at the bottom, with a circular target in the centre painted yellow. The board is fixed on a post, which is painted with black and yellow bands alternately as shown in fig. 7.16. To draw the attention of the driver during the night self reflecting sheets/ plastic reflectors of approved design are fixed. This Warning Board shall be located at not less than 1.4 KM in rear of the first stop signal. The distance may be increased suitably on falling gradients on approach to stations with the provision of second distant signal, this board is dispensed with.



PASSENGER WARNING BOARD | GOODS WARNING BOARD

Fig. 7.16 (c) WARNING BOARDS

(d) INDICATION BOARDS: Indication boards are provided to give warning to the driver about change in type of signalling or of block working etc. The board will have suitable legend like,

"Approaching unwarned stop signal" "Entering Absolute Block territory"

"Entering token territory" "Entering Automatic Block territory"

CAUTION INDICATORS | TERMINATION INDICATOR | SPEED INDICATOR BOARD | S MARKER BOARD

Fig. 7.16 (d) INDICATION BOARDS

7.17 BACKLIGHTS & REPEATERS

Obviously, the aspects displayed by signals which are operated or controlled manually should be visible from the place of operation or control and in the case of Block stations worked under the Absolute Block System also from the place where Block instruments are located (SM's Office).

Signal arms, which are not so visible, by day, are electrically repeated in cabins and SMs offices as required. An exception to this principle is the double wire worked signal controlled by a clutch lever, because such signals may be depended upon to respond correctly to lever operation so long as the transmission is intact and in case it is not, the clutch would trip as soon as out of correspondence between signal and lever occurs and operate an indicator.

Mechanical signals, the front lights of which cannot be seen, by night, from the place of operation of the place where Block instruments are located are provided with white back lights. The back light, which is an integral part of the signal lamp, is blanked out by a screen bearing on the spindle when the arm is moved beyond 5º with respect to the 'ON' position. This 5º adjustment of the screen is of very great importance as the ON aspect is verified by presence of the backlights.

Back lights and screen of signals whose front lights are visible from the place of operation and the place where Block instruments are located or which are provided with light repeaters should be removed not only for reason of economy, but because the fall, the lights fall in the line of sight of drivers of approaching trains.

The electrical arm repeater wherever provided, is adjusted for „ON“ aspect between -5º and +5º with respect to „ON“ for Two/Multi aspect signals, for „OFF“ aspect between 40º and 60º for Two aspect, for „OFF“ aspect between 40º and 90º for Multi aspect and defective in any other position. It is assumed that there will be no ambiguity in the 45º and 90º aspects displayed by MAUQ signals and since such signals are worked by Double Wire the assumption is not unjustified. In cases where it is important to distinguish between 45º and 90º aspects of MAUQ signals such as the Home signal and the distant from the point of view of efficient operation the repeaters indicate the two aspects separately.

A combined circuit and indicator are used for both arm and light repeaters for economy.

An audible warning is provided for the light out condition.

It is neither practicable nor desirable to provide colour or position light signals with backlights. All such signals, which have a manual control on them and cannot be seen from the place of operation of the controls, are electrically repeated. The repeaters take the form of miniature light units or are included in the circuits for the indication of a correct route line up in the case of relay interlocking. Where indication locks are used on lever type controls to prevent a lever being restored to the position corresponding to the aspect unless and until the correct aspect has been assumed by the signal, repeaters would not be required.

Review Questions

Subjective Questions

1. Write down difference between shunt signal and calling on signal.
2. Write down difference between co-acting and repeating on signal
3. Write down all various markers used in signalling with signal below, which it is fixed, and reason for using it.
4. Write short notes on

    (a) Shunt signal
    (b) Calling on signal
    (c) Repeating signal
    (d) Shunting limit board
    (e) Block section limit board
    (f) Route indicators

Objective questions

State true OR false

1.	Shunt signal can be placed below first stop signal.	(False/True)
2.	Calling On signal can be placed below last stop signal.	(False/True)
3.	Purpose of Repeating and Co-acting signal is same.	(False/True)
4.	More than one Calling On signals can be placed below a stop signal.	(False/True)
5.	A "C" marker shall be provided below a Semaphore miniature calling ON signal.(False/True)	
6.	Starter repeater and Repeating signal are same signals.	(False/True)
7.	Location of shunting limit board & Last stop signal is same.	(False/True)
8.	Block section limit board shall be provided at class B station on double line where first point	
	is a trailing point OR no point with Lower Quadrant signaling.	(False/True)
9.	Shunting limit board shall be placed at a distance of signal overlap from outer most trailing	
	point on Double line.	(False/True)
10.	Passenger warning board shall be placed at distance of 1KM in rear of first stop signal in a	
	station with multi-aspect colour light signaling.	(False/True)

11. Goods warning board shall be placed at distance of 1.4KM in rear of first stop signal. (False/ True)

Fill up the blanks

1. Repeating signal is provided when _____

    a) Signal is not continuously visible
    b) signal is not visible at all
    c) Prescribed visibility of signal is not available
    d) duplicate signal is to be provided.

2. If speed is less than 15 KMPH then _____ type route indicator shall be provided.

a) Directional b) stencil c) multi lamp d) none

3. The passenger warning board shall be provided 1 KM in rear of _____ signal.

a) Home b) first stop c) routed home d) none of above

4. The Mid-section LC gate under absolute block system shall be provided with _____ marker.

a) „G“ b) „AG“ c) „PG“ d) „A“

5. When the shunt signal and calling on signal is provided below stop signal then sequenced from top is _____ signal.

a) First calling on then shunt b) first shunt and then calling on

c) Not possible d) any of a, &b

6. A shunt signal can be placed

a) On post by it self b) below any stop signal

c) Below any stop signal other than first stop signal d) a &c

Match the Following:

1. Illuminated „A“ marker	(c)	a) No „P“ marker
2. „G“ marker	(d)	b) P marker
3. „AG“ marker	(e)	c) Protects LC Gate and point in auto section
4. Distant signal	(b)	d) LC Gate in block section
5. Distant cum gate home signal	(a)	e) LC Gate in automatic section

* * *

CHAPTER 8: OVERLAPS

8.1 The length of track in advance of a stop signal, which should be kept clear before the signal next in rear can be taken 'OFF' is known as the signal overlap.

In other words, to take „OFF“ a stop signal, the portion of the track to be kept clear not only up to the next stop signal but also for an adequate distance beyond it . This adequate distance is known as signal overlap. Fig. 8.1 (a).

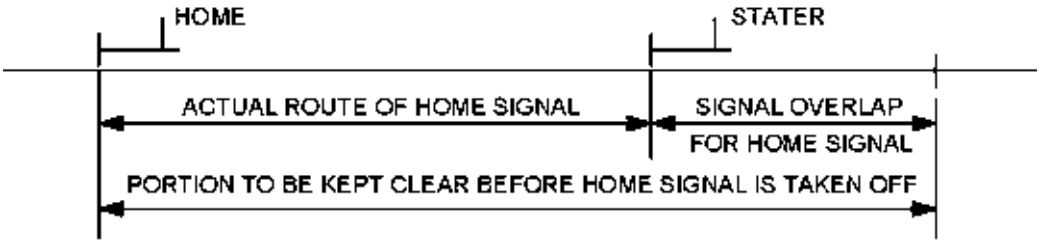


Fig. 8.1 (a)

The overlap provided for last stop signals in Absolute Block territories is greater than for other stop signals and this is referred to as the Block overlap. Block overlap, then, is the extra length of track in advance of the first stop signal of a next Block station, which should be kept clear before line clear can be given to the station in rear. (These overlaps are being referred to as adequate distances in the General Rules, the term adequate distance also being used to denote the braking distance in another context). Fig. 8.1 (b)

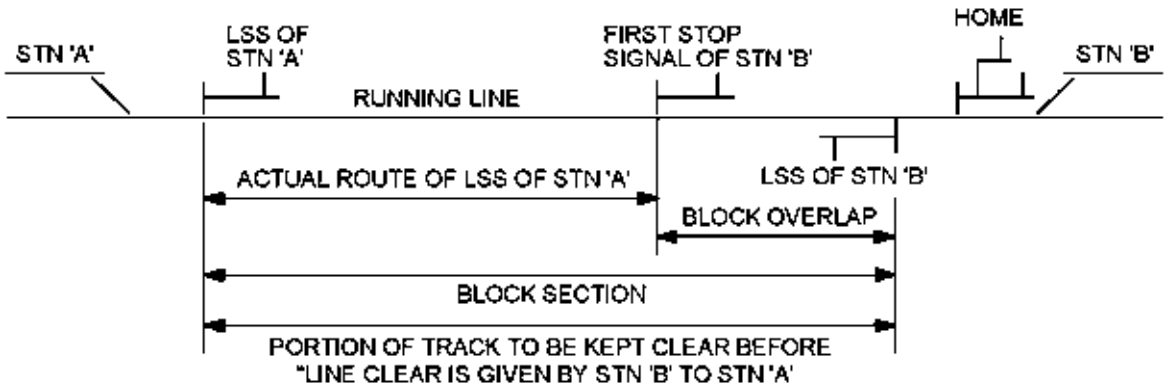


Fig. 8.1 (b)

Every stop signal must have an overlap, although the rules prescribe overlaps only for home and last stop signals in Absolute Block and every stop signal in automatic block. Overlap distances are a function of the number of aspects, Overlap decreases as the number of aspects increases.

In Two aspect signalling the Block and Signal overlaps are respectively 400 Mts and 180 Mts. These two Distances are arbitrarily fixed based on experience and do not depend on speeds, gauge or gradients. The overlaps are reduced to 180 Mts and 120 Mts respectively in MAUQ, MACL and MLQ signalling in automatic block there is no Block station overlap and the signal overlap is 120 Mts as in MAUQ.

NOTE:-(1) In connection with conditions to take OFF Home signal on single line , GR 3.40(2)b states that, line is clear for an adequate distance beyond the trailing point OR under approved special instructions for an adequate distance beyond the place at which train is required to come to stop.

In connection with condition to take OFF home signal GR 3.40(4) states that "Where a sand hump of approved design, or under approved special Instructions a derailing switch, has been provided for the line on which a train is to be received, they shall be deemed to be efficient substitutes for the adequate distance referred to in sub rules (3)".

8.2 A reduction in the overlaps in Multiple aspect signalling as compared with Two aspect is a rational development as it serves to increase section capacity and the efficiency of operation of signals without sacrificing safety. It can be proved that by increasing the number of aspects, the overlaps can be progressively reduced but this will only be of academic interest at the present time. The fact that safety margin is not reduced by the reduction of overlaps in MAS is shown in the figure 8.2.

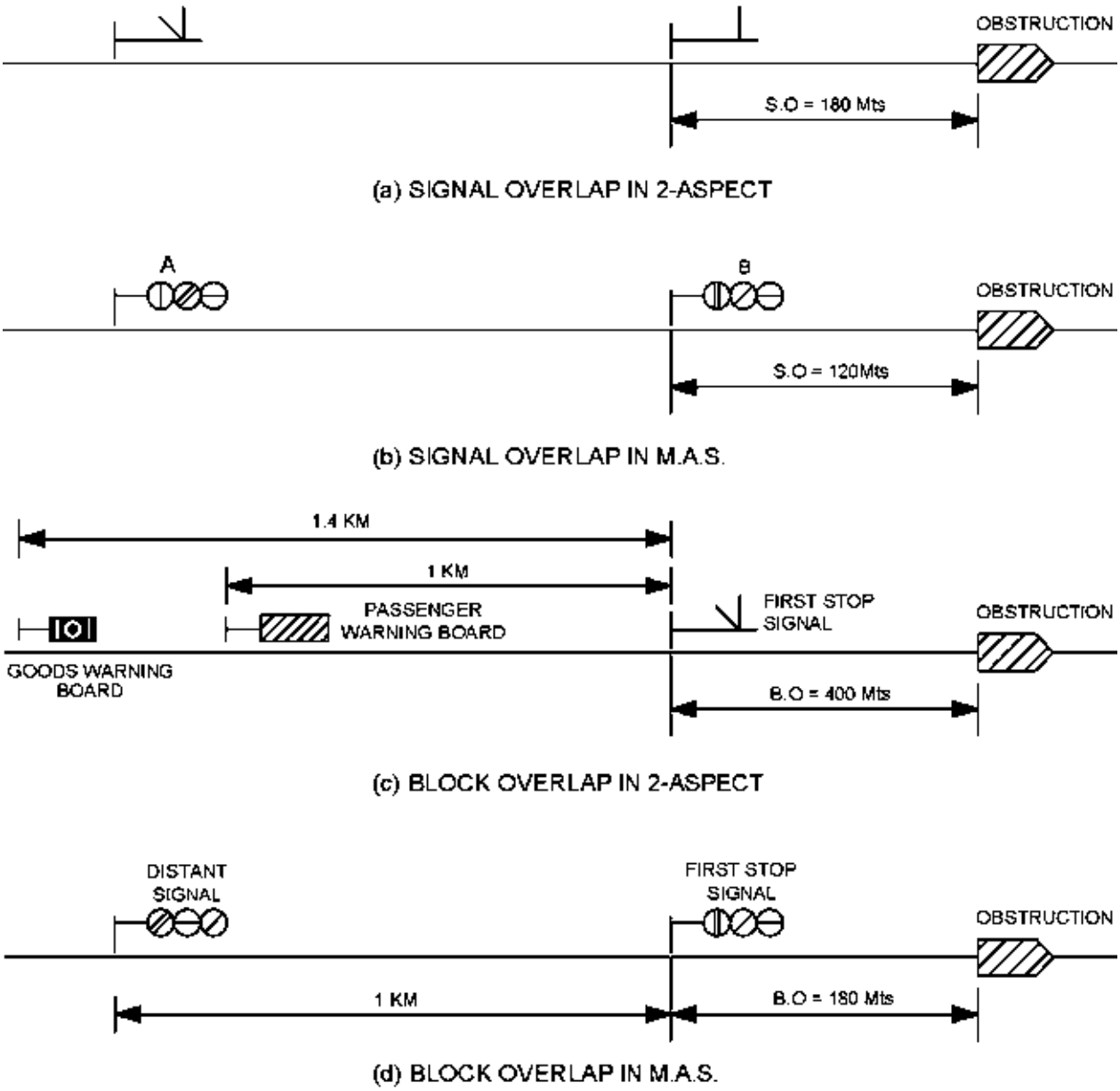


Fig. 8.2 OVERLAPS

Type of signal / Overlap	TALQ signal	MAUQ, MACLS & MLQ	Automatic signalling on Double line	Automatic signalling on Single line
Signal overlap	180 Mts.	120 Mts.	120 Mts.	120 Mts.
Block overlap	400 Mts.	180 Mts.	N.A	N.A

Please see figures 8.2 (c) and (d) showing the block overlap required in Two aspect and MAUQ systems. In case of (d) the aspect of the stop signal is pre-warned by the signal in rear. The distance between the obstruction and the indication of the obstruction in case of (c) is NBD +400 Mts and in case (d) NBD+180 Mts. The margin of safety is in fact greater in (d). As in MAUQ the first stop signal displaying the 'ON' aspect is approached at cautious speed, but in Two aspect it may be approached at full speed. It may be argued that the block overlap in Two aspect can be reduced where a separate Warner is used and this would be correct provided the Warner is completely reliable. But, so long as Warner is operated by single wire mechanical transmission without signal reverser (electrical control), the irregular operation of the Warner cannot be ruled out. When the Warner is 'OFF' in an irregular manner, conditions then obtaining would be worse than in Two aspect class „A" station. The Two aspect Warner is by no means a repeater of the first stop signal but an MA it is Distant. Figure (a) and (b) show the signal overlaps of a Two aspect and MAUQ systems respectively. In figure (a), the first stop signal displays the clear aspect whether the next signal is at 'ON' or at „OFF". The ability of a driver to stop at signal „B" depends entirely on the sighting distance of „B" being adequate and the driver obtaining a view of the aspect of this signal in time. In figure (b) aspect of B is repeated in signal „A", and since „A" is displaying 'Caution' speed is reduced at „A" and the driver approaches „B" at cautious speed, prepared to stop at „B".

By increasing the number of aspects, the overlap can be reduced without sacrificing safety. This is because (1) the speed can be continuously regulated by signals, (2) signal aspects are repeated by the signal or signals in rear in a rational manner, and (3) safety becomes lesser dependent on the uncertain factor of sighting distance.

Review Questions

Subjective Questions

1. Define overlap and explain purpose & function and that overlap is function of aspect.

Objective Questions

State true OR false

1. The block overlap in multi aspect signaling is more than L.Q. signal. (False/ True)
2. The signal overlap in two aspect signaling is 120 Mts. (False/ True)
3. First stop signal on single line normally shall be placed at distance of signal overlap plus block overlap from outer most point. (False/ True)
4. Block overlap class at C station is 400 Mts always. (False/ True)

Fill up the blanks

1. The Block overlap and signal overlap in Multi aspect signalling territory are _____ & _____ respectively.

   a) 180 Mts &120 Mts b) 400 Mts&120 Mts

   c) 400 Mts &120 Mt d) 300 Mts&180Mts
2. The Block overlaps and signal overlap in two aspect LQ signal are _____ & _____ respectively.

   a) 180 Mts &120 Mts b) 400 Mts&180 Mts

   c) 120 Mts &180 Mts d) 300 Mts&180 Mts

Match the Following:

1.	Signal overlap in LQ territory	(e)	a) 400 Mts
2.	Block overlap plus signal overlap in LQ territory	(d)	b) 300 Mts
3.	Signal overlap in automatic Signal territory (DL)	(c)	c) 120 Mts
4.	Block overlap plus signal overlap in UQ territory	(b)	d) 580 Mts
5.	Block overlap in class „C" station	(a)	e) 180 Mts

CHAPTER 9: BRAKING DISTANCE

9. 1 INTRODUCTION

The distance travelled by a train after its brakes are applied is known as the braking distance, and this is an important concept in signalling for determining the signal sighting distance. There are two methods of application of brakes:

(a) A normal or service application which involves only the shutting off the power (steam to the cylinders or electric power to the motors as the case may be and the gradual application of brakes; and

(b) An emergent application in which shutting off power and full application of brakes are done without any loss of time

Braking distance is a function of speed and other factors, such as the brake power available, gradient, roll ability of wheels, and the state of rails (wet or dry), curvature of track and velocity of wind, etc., which cannot be established very accurately.

As the only accurate method of ascertaining the Braking distance is to conduct trials at each location which is impracticable, all that can be done is to prepare curves from test data obtained from isolated test runs or devise a formula based on experience & in different situations and trains.

SERVICE BRAKING DISTANCE is the distance required to stop the train running at the maximum permissible speed of the line, at such a rate of deceleration that the passengers do not suffer discomfort or alarm.

EMERGENCY BRAKING DISTANCE is the distance travelled by train before coming to a stop by sudden application of brake at one stretch.

This braking distance depends on various factors such as speed, Type of Locomotive, Type of Rolling stock, Type of Braking (Air brake/ Vacuum brake, it"s integrity), Load, Gradient, Adhesion on track, Wind speed etc. An example is given below for information.

TRAIN BRAKING DISTANCE

For trains to safety travel on a railway, trains must be provided with sufficient distance to strop. Allowing too long a distance reduces the capacity of the line and has an impact on rail infrastructure investment. Too short a distance and collisions would occur, because the train would not be able to stop within the available distance and would therefore occupy a section of track that could be allocated to another train. Consequently it is important that distance be adequate. Train breaking distance is function of following factors.

1. Speed of the train when the brakes are applied.
2. The available friction between wheel and rail which influences the retardation rate available with complete brake application.
3. Brake delay time i.e time from when the brakes are applied by the train driver to when they are actually become effective.
4. The safe of wear of brake pads and the pressure available in brake cylinders.
5. Track gradient when brakes are applied and mass distribution of the track.

In order to stop the train it requires the work. The required work is the sum of change in the train"s kinetic energy and the change in is potential energy due to change in the height due to the gradient of the track.

BREAKING DISTANCE

Mathematically it may be expressed as:

$$maS + \frac{1}{2} m^{2} + mg(h_2 - h_1) \quad 0 \qquad 1$$

Where,

m = mass of the train

V = speed at which retardation begins

S = stopping distance

Height at which the retardation begins = h_1

Height at which the train stops ($h_2 > h_1$) = h_2

The above equation suggests that mass has no direct effect on the train stopping distance. However mass distribution has influence on train stopping distance as train"s centre of gravity varies with the mass distribution. In case of freight wagons where the mass varies from no load to full load there are two levels of brake force used „empty" and „loaded". This influences the design of the brake system. For calculating the braking distance calculations the lowest deceleration rate is used to calculate the deceleration rate for the complete train.

The Eq. 1 may also be written as

$$S \quad \frac{- 2}{2} \quad (a - g \tan) \text{ for } a \quad 0 \qquad 2$$

Where, Tan is the angle of the slope during the brake application. For small values of sin ≈ tan

Assuming constant gradient track and considering brake delay time the stopping distance can be calculated using following expression:

$$S \quad \frac{(- + b\, t_d)^2}{2(a+b) \left(- t - \frac{bt}{2} \right)} \qquad 3$$

Where,

t_d = brake delay time

a = retardation provided by braking system

b = retardation provided by gravity

Sl.	Parameters	Air Brakes	Vacuum Brakes
1	Emergency braking distance (level track, 65km/hr speed)	632m	1097m
2	Brake power fading	No fading	At least by 20%
3	Weight of equipment per wagon	275Kg(Approx)	700Kg (Approx)
4	Pressure Gradient	No appreciable difference in air pressure between locomotive and brake van up to 2000m	Steep reduction in vacuum in trains longer than 600m
5	Preparation time in yards	Less than 40 minutes	Up to 4 Hrs
6	Safety on down gradients	Very safe	Need additional precautions
7	Overall reliability	Very good	satisfactory

BREAKING DISTANCE

Various nomenclature used in above table indicate as follows

first single letter identifying the gauge of the track on:	The second one or two letters identifying the power source	The third single letter identifying the kind of load of the loco haul normally
1. W = Broad Gauge 2. Y = Meter Gauge 3. Z = Narrow Gauge (2' 6") 4. N = Narrow Gauge (2')	5. D = Diesel (C = DC traction) 6. A = AC traction 7. CA = Dual-power AC/DC traction 8. B = Battery electric(rare)	9. M = Mixed Traffic 10. P = Passenger 11. G = Goods 12. S = Shunting 13. L = Light Duty (Light Passenger) 14. U = Multiple Unit (EMU / DEMU) 15. R = Railcar

The fourth digit identifying the model of the loco and the fifth digit is an optional letter or number (or two of them) that indicates some smaller variation in the loco like different motor, etc.

* * *

CHAPTER 10: SIGHTING DISTANCE & VISIBILITY OF SIGNALS

10.1 Sighting Distance is the distance over which the most restrictive aspect of a signal is visible from the driving compartment of an approaching train under normal conditions of visibility. It is an inviolable rule of signalling practice that every signal should afford at least the minimum sighting distance required of it. The minimum sighting distance required should be the distance necessary for obeying the most restrictive aspect of a signal.

10.2 MINIMUM SIGHTING DISTANCE

Consideration will show that the minimum sighting distances required of signals will be as follows: -

(a) TWO ASPECT SIGNALLING

(i) OUTERS (not pre-warned): Normal Braking Distance + Reaction distance, Reaction Distance is the distance travelled at permissible speed during time taken by driver to react to the aspect of a signal.

(ii) OUTERS (Pre-warned): As the „ON" aspect of outer is pre-warned, sighting distance of outer is not important.

(iii) HOME SIGNALS: The Home Signals shall be continuously visible from Outer signal.

(iv) MAIN LINE STARTERS: The Main Line Starter shall be continuously visible from Home Signals.

(v) ADVANCED STARTER: Advanced Starter shall be continuously visible from the Starter Signals.

Signals, which indicate the route, should afford a sighting distance, which is sufficient for the driver to control his train in the event of the route is occupied. This principle especially will apply to lines, which are not provided with track circuits or Axle Counters.

When the operation of outer and at Home signal is not completely reliable, it may happen that an outer is irregularly at „OFF" An Outer, which is „OFF" when all corresponding Home signal are at „ON", then Outer is treated as a defective signal and cannot be passed. This would mean that the home signal should be visible from a point of Normal Braking Distance (NBD) in rear of the Outer unless the methods adopted for the operation of the signals are rendered completely reliable.

(vi) WARNERS: The Warner is not a Stop Signals and the most appropriate point at which action on the indication of a Warner should commence is the signal itself. Therefore, so long as NBD is available between a Warner and the next Stop Signal, the actual sighting distance of the Warner is unimportant. But when this distance is less than NBD, theoretical considerations would indicate that the actual distance between the Warner and the next Stop Signal plus Sighting Distance (S.D) of Warner should not be less than NBD + Reaction Distance. It would not be good practice, however, to rely too much on the S.D. of Warner and, therefore, the distance between a Warner and the next stop signal should not be less than at least the emergency braking distance + reaction distance.

(b) MULTIPLE ASPECT SIGNALS

(i) DISTANT SIGNALS: For distant signals, obviously, the same principle as for a Two aspect Warner should apply.

(ii) STOP SIGNALS: For Stop Signals, as the aspect of each is pre-warned by the signal in rear, no sighting distance would be required provided Braking Distance is available between signals displaying yellow and the signal next in advance displaying red. In the event NBD is not available, the signal in rear is provided with a double yellow aspect, so that the NBD is available between this signal i.e., the signal having double yellow aspect and the signal displaying red. The Revised Signal Engineering Manual stipulates that the distance between two stop signals shall not be less than 1 KM. Where the distance between 2 Stop signals is less than 1 KM, the signal in rear should display a double yellow aspect. In MAUQ signalling the distant signal shall display attention aspect to receive the train on main line, when Normal braking distance is not available between the Home signal and Main line starter.

(iii) ADVANCED STARTER: In the case of advanced starters, sighting distance is not important as the aspect is pre-warned at the home signal. Notwithstanding these considerations, it is the usual practice to ensure that stop signals are visible from the signals immediately in rear of them, so that in the event a signal changes its aspect when a train is approaching, speed of the train shall be suitably regulated.

10.3 AUTOMATIC BLOCK SIGNALS

So long as NBD + Reaction Distance is available between signals, the signals do not require any sighting distance. But should the distance between any two signals be less than NBD but greater than EBD, each signal should be visible from a distance greater than NBD minus the distance between the signal and the next signal in rear plus Reaction distance. Should the distance between two stop signals be less than 1 KM., the signal in rear should be prevented from displaying the green aspect when the second stop signal in advance is exhibiting Red aspect. It should instead display the double yellow aspect if four aspect signals are provided. If three aspect signals are provided, it should display only yellow aspect.

10.4 It should be evident that Sighting Distance is a far more important consideration in Two aspect territories than in Multiple Aspect. But sighting distance is an uncertain factor as it depends on weather conditions, types of background etc. The superiority of M.A. Signalling lies, inter alia in the fact that when properly located, signals do not require longer sighting distances. The aspect of every signal is pre-warned by the signal in rear and action on the indication of an aspect may commence at the signal itself and not at an undefined point. In the case of Two aspect signalling, safety is dependent entirely on the red aspect being observed at SD in rear, but as this point (SD in rear of the signal) is not defined on the ground, the problem is rendered more difficult.

10.5 Where a stop signal cannot be seen by the driver of an approaching train from the location at which he can control the speed of the train, in case the stop signal is at `ON', a repeating is usually provided.

This repeating signal is provided in rear of the stop signal, which it repeats. It is usually installed at such a location as to provide an adequate distance to the driver to enable him to stop his train in rear of the stop signal in case it is at `ON'.

The use of Warning boards placed at SD in rear of a Two aspect stop signal is of considerable help to drivers. Such warning boards are in use for first stop signal where speeds exceed 72 KMPH in BG and 48 KMPH in MG and for gate signals in Two aspect territories. A more liberal use of warning boards will be of advantage in Two aspect territories. The warning

board is not, of course, by any means a substitute for S.D. Where a signal does not afford the sighting distance required of it, it shall be shifted to a better location if possible, or a suitable speed restriction shall be imposed or the signal provided with a repeating signal or the need for SD eliminated by using another system of aspects. It should be remembered in this connection that shifting a signal in the rear direction might sometimes have an adverse effect on the track capacity. Further, the extra time taken for piloting of trains in case of failures, render shifting of signals away from station is undesirable.

10.6 As per Signal Engineering Manual (1988), the visibility of the signals is prescribed as under

(a) TWO ASPECT SIGNALS

Signal	Minimum Visibility	Remarks
Outer signal	1200 Mts	Where the sectional speed is 100 KMPH or above.
Outer signal	800 Mts	Where sectional speed is less than 100 KMPH
Outer signal (with Warner separated)	Not less than 400 Mts	Where minimum visibility cannot be achieved, Warner may be separated.
Warner on a post by itself	400 Mts	
Home Signal	400 Mts	
Main Starter Signal	400 Mts	
All Other Signals	200 Mts	

Wherever adequate/ continuous visibility of stop signals cannot be provided, Repeating or Co-acting signals shall be provided to ensure continuous visibility. Even after providing such signals , if the combined visibility is less than the distances prescribed above, suitable speed restrictions shall be imposed as per Para 7.7.5 of SEM Part 1 , 1988.

(b) MULTIPLE ASPECT SIGNALS

Signal	Minimum Visibility
Distant Signal	400 Mts
Inner Distant Signal	200 Mts where this signal is provided
All Stop Signals	200 Mts

If it is not possible to ensure 200 Mts continuous visibility of any stop signal while approaching it, a suitable speed restriction shall be imposed as per Para 7.7.7 of SEM Part 1 , 1988.

Review Questions

Objective Questions

1. Visibility of a pre-warned signal 200 Mts (False/ True)
2. Visibility of Warner signal shall be 1.2 KM for speed more than 100 KMPH. (False/ True)
3. Visibility of inner Distant signal shall be 400Mts. (False/ True)
4. Visibility of Outer signal shall be 1.2 KM for speed more than 100 KMPH. (False/ True)

* * *

CHAPTER 11: ISOLATION

11.1 The term „Isolation“ denotes the condition in which a line for a particular movement is separated from all adjoining lines connected to it in such a manner that the isolated line cannot be fouled or interfered with by any movement taking place on the adjoining lines. Rules for isolation are laid down in Chapter III, Part III of "Rules for the opening of a Railway or Section of a Railway for the Public carriage of passengers". Isolation is compulsory in the following cases.

(a) A line on which train movements at speeds higher than 50KMPH are permitted should be isolated from all connected lines.

(b) Passenger lines should be isolated from all connected goods lines and sidings, whatever the speed may be.

(c) The isolation of goods reception lines from sidings is considered desirable.

(d) It is not necessary to isolate one goods reception line from another goods or one passenger line from each other when dealing with speeds of 50KMPH and less.

In view of the huge expenditure involved in the provision of isolation, which is not regarded as essential in several other countries, isolation, which is not required by the rules or is in consistent with safety should be avoided.

To maintain safety in through running lines, points or trap & sidings should not be inserted in the main or through line. The exceptions to this rule, which may be adopted after obtaining special sanction of the CRS are:

(i) Where other means cannot be adopted, to permit simultaneous reception of trains on single line sections,

(ii) To avoid a train being brought to a stand at a stop signal on a rising gradient with the possibility of the train being unable to restart,

(iii) To trap vehicles running away from a station, and

(iv) To avoid a train entering from Block Section to the station due to heavy falling gradient.

11.2 THE PROVISION OF ISOLATION DOES NOT APPLY TO

(a) Running junctions, where two block section lines meet at the same end of a station equipped with full complement of signals.

(b) Stations where track circuits or other appliances have been provided to prove whether the connected non-isolated lines are cleared or occupied and the signalling arrangement shall be such that distinctive aspect is given to the driver of run through train, restricting the speed to 50 KMPH when the connected line is occupied.

(c) Catch sidings, Slip sidings, and sidings are provided for isolation purpose only.

11.3 MEANS OF ISOLATION

Any one of the following methods of isolation may be adopted.

(a) Connection to another line or siding {see figure 11.3 (a)}

(b) The provision of short dead and sidings (this siding should not be long enough to permit vehicles being stabled thereon) {see figure 11.3 (b)}.

ISOLATION

The provision of traps, viz., single or double derailing switches {see figure.11.3 c &d}. The use of scotch blocks and Haye's derails are obsolete but existing installations are permitted to remain. A scotch block is a triangular piece of metal placed on the running line and padlocked in that position. For movements over the block it is lowered in the off side of the rail. The action of the Scotch Block is not positive; cases of vehicles climbing the block and returning to the rail have indeed occurred. It is not possible to operate Scotch Block which can be connected to and worked from a lever frame and which if in good adjustment, can be depended upon to derail a vehicle. It is important that wherever Haye's derails are in use, they are lubricated periodically and maintained in good adjustment.

The single derailing switch commonly known as a trap is though inexpensive but dependable derailing device. It is usually located with its heal in rear of the fouling mark, on the straight portion of the track wherever possible and on the rail farther away from the line to be protected. To guide derailed vehicles away from the line to be protected. It is usual to provide double derailing switch with lead rails, but without crossing as shown in figure (d) or place a short length of rail to serve as a guide as shown in fig. (e).The need for guiding derailed vehicles becomes important when there is a possibility of their being pushed from some distance away.

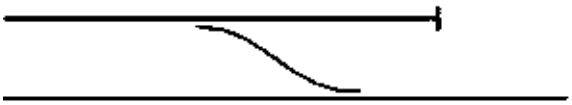
Double derailing switches are sometimes used as traps to facilitate the use of standard facing point layouts but following the design of a standard layout for single derailing switches; the case for using a double derailing switch does not exist.

Traps, when located at signal overlaps should be closed before the corresponding signal is taken „OFF“ and similarly the points leading to short dead end sidings should be set against the sidings and for the cross over. In cases where the short dead end siding has to be extended for the purpose of stabling vehicles, the trap may be located at a distance of signal overlap (180 Mts or 120 Mts as the case may be) away from the points leading to the main or through line and it is ensured that before the signal for the admission of a train on to the running line is taken „OFF“, the trap is set and locked against vehicles occupying the further part of the siding {see fig. 11.3 (f)}.

(c) **SAND HUMPS**: when all other methods of isolation cannot be used GR 3.40 permits the use of SAND HUMPS of approved design as a substitute for adequate distance. The length of siding should be at least one rail length and the formation is made-up for a short distance beyond the hump {See fig. 11.3 g)}.

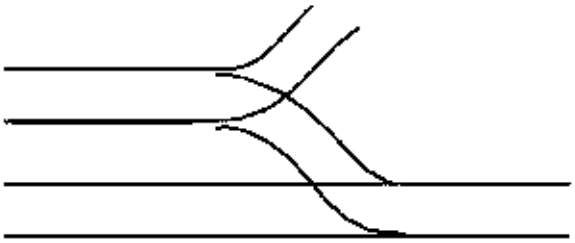
(d) **Slip Sidings and Catch Sidings:** The gradient within the station yard has to be low in order so that, the vehicles standing at the station do not start moving automatically due to the effect of gravity. On Indian Railways for all gauges the maximum gradient permitted is 1:400, whereas 1:1200 is usually recommended within the station yard. No station yard should be constructed on a gradient steeper than 1:260 except due to geographic condition where such a gradient cannot be avoided within the station yard, previous sanction of Railway Board through CRS has to be obtained and special arrangements like "Slip siding" has to be provided, where the gradient steeper than 1:100 falling away from the station in its close neighbourhood. This is to prevent vehicles escaping from the station and trying to enter into the next block section. Similar arrangements have also to be provided if the gradient steeper than 1:80 falling towards the station. This arrangement is known as `catch siding'. It is to trap vehicles coming uncontrolled from the block section and trying to enter into the station section."Slip siding" and `catch siding' points must be interlocked with the Block instruments, and such sidings should not be used for shunting or stabling purposes {see fig. 11.3 h)}.

(a) CONNECTION TO ANOTHER LINE OR SIDING

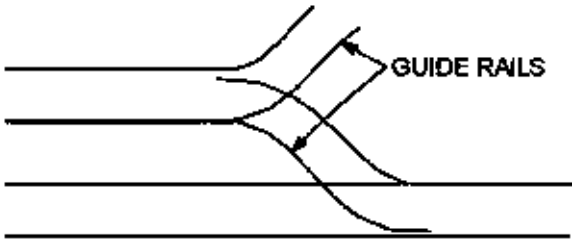


(b) SHORT DEAD END SIDING

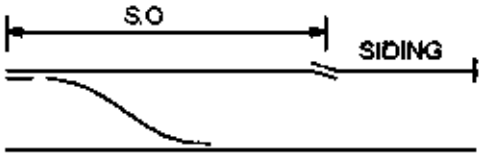
(c) SINGLE DERAILING SWITCHES
ALSO KNOWN AS TRAPS



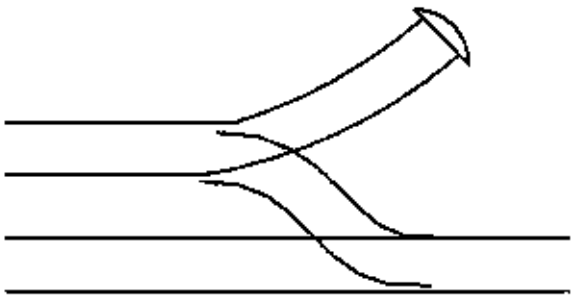
(d) DOUBLE DERAILING SWITCH WITH DEAD
RAILS BUT WITHOUT CROSSING.



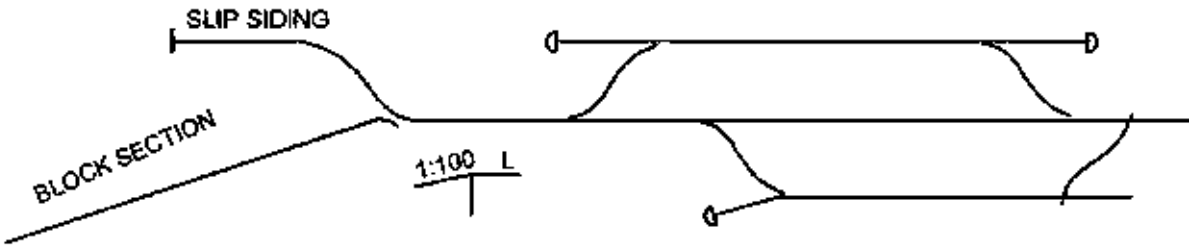
(e) SINGLE DERAILING SWITCH
WITH GUIDE RAILS



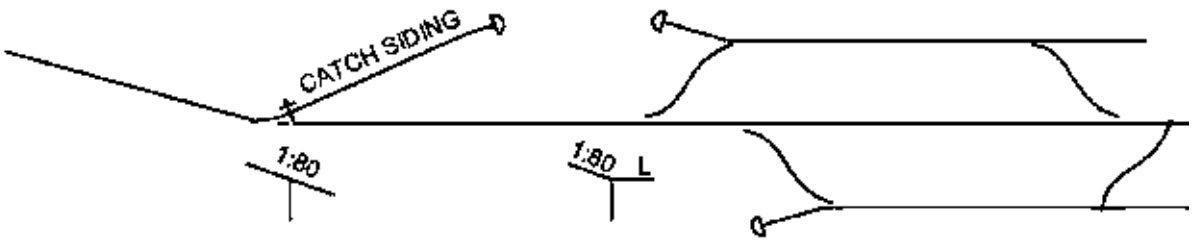
(f) SHORT DEAD END SIDINGS EXTENDED
TO ENABLE VEHICLES BEING STABLED



(g) SAND HUMP SIDING



SLIP SIDING DUE TO GRADIENT STEEPER
THAN 1:100, FALLING AWAY FROM THE STN.
IN THE CLOSE NEIGHBOUR HOOD.



(h) CATCH SIDING DUE TO FALLING GRADIENT WHILE
APPROACHING THE STATION IF STEEPER THAN 1:80

Fig. 11.3 METHODS OF ISOLATION

ISOLATION

Summary of Isolation :

<table>
<tr><th>Isolation between</th><th>Passenger line</th><th>Goods line</th><th>Siding</th></tr>
<tr><td>Passenger line</td><td>Not Required if speed ≤ 50 KMPH.
Required if speed > 50 KMPH</td><td colspan="2">Required irrespective of speed</td></tr>
<tr><td>Goods lines</td><td rowspan="2">Required irrespective of speed</td><td>Not Required if speed ≤ 50 KMPH
Required if speed > 50 KMPH</td><td>Desirable</td></tr>
<tr><td>Siding</td><td>Desirable</td><td>NA</td></tr>
<tr><td colspan="4">For further details please refer :- chapter III, Part III of "Rules for the opening of a Railway</td></tr>
</table>

Review Questions

Subjective Questions

1. Define isolation and write down when and where isolation is required? Also write down the means of isolation.

Objective Questions

State true OR False

1. Catch siding protects Block section and Slip siding protects station section. (False/ True)

2. If speed is more than 50 KMPH then one goods line shall not be isolated from other goods line. (False/ True)

3. A catch and slip siding shall be provided if the gradient steeper than 1:80 falling away from station and 1:100 falling towards the station in the vicinity of station respectively. (False/ True)

4. If speed is less than 50 KMPH, then isolation of a passenger line from other connecting passenger line is not required (False/ True)

Fill up the blanks

1. A catch siding shall be provided if the gradient steeper than 1:80 in near vicinity of station and falling _____

   a) Away from station b) towards station

   c) Towards block section d) all a,b &c

2. A slip siding shall be provided if the gradient steeper than 1:100 in near vicinity of station and falling _____

   a) Away from station b) towards station

   c) Towards block section d) all a,b &c

3. Maximum permissible gradient on Indian Railways for all gauges is ----------

   a) 1:1200 b) 1:260 c) 1:400 d) none of these

* * *

CHAPTER 12
SIMULTANEOUS RECEPTION AND DESPATCH OF TRAINS

12.1 In any interlocked yard, interlocking has to confirm to certain basic requirements. These basic requirements are also referred as "Essentials of Interlocking" and are laid down in para
7.82 of Signal Engineering Manual. The essentials of interlocking are:

(a) It shall not be possible to take „OFF" a running signal, unless all points including isolation are correctly set, all facing points are locked and all interlocked Level crossings are closed and locked against public road for the line on which the train will travel, including the overlap,

(b) After the signal has been taken „OFF", it shall not be possible to move any points or unlock the route, including overlap and isolation, nor to release any interlocked gates until the signal is replaced to "ON" position,

(c) It shall not be possible to take "OFF" at the same time, any two fixed signals which can lead to any conflicting movements and

(d) Where feasible points shall be so interlocked as to avoid any conflicting movement.

12.2 Taking „OFF" signals for more than one train at a time is detailed in GR 3.47. This para laid down that when two or more trains are approaching simultaneously from any direction, the signals for one train only shall be taken „OFF", other necessary signals being kept at „ON", until the train for which the signals have been taken „OFF" has come to a stand at the station, or has cleared the station, and the signals so taken „OFF" for the said train have been put back to „ON". There is, however, an exception permitted to this rule which laid down that where under special instructions, the interlocking or layout of the yard renders it safe, signals for more than one train may be taken „OFF" at the same time.

12.3 Taking OFF signals for different trains at the same time is called simultaneous reception of trains. This will only be possible if for each and every one of the approaching trains, the line on which the train is to be received is clear up to the point where the train is to come to a stand and overlap distance in advance of it. On single line sections, track capacity will increase, if at all crossing stations; the layout is such as to permit the simultaneous reception of two opposing trains.

The rules recognise the use of a short sand hump siding (also known as snag dead end) (see figure 11.3.g) in lieu the distance specified for the signal overlap. The points of the sand hump siding when set for the sand hump would also serve as a good method of isolating the adjacent connected line. Such sidings are more expensive, in terms of cost and required periodic maintenance as compared to trap point, therefore, sand hump sidings are used only when required for simultaneous reception purposes.

Figure 12.1 (a) shows a typical double line station. The two main lines are isolated by traps. Sand hump sidings (as shown dotted) may replace traps at busy stations to facilitate reception on the loop simultaneously, while a train is leaving from the main line in the same direction.

Figure (b) shows a typical layout of a single line station where simultaneous reception of trains is permitted. It may be noted that the loops on which trains may be received simultaneously shall be located on either side of the main line and the loops terminate at sand humps so that any train may be received on any loop.

To economise on sand humps, some railways adopt the layout shown in Fig. 12.1 c. But in this case, only an UP train can be received on line B simultaneously with a Down train on line A. Should the down train be a passenger train, platform will not be available for it. It would be much more expensive to provide two platforms, one for each loop and a foot over-bridge in comparison with two more sand hump sidings. Simultaneous reception at a 2 line stations would involve the use of sand humps on the main line as shown in Fig. d, but it is not desirable to place traps on fast lines.

SIMULTANEOUS RECEPTION AND DESPATCH OF TRAINS

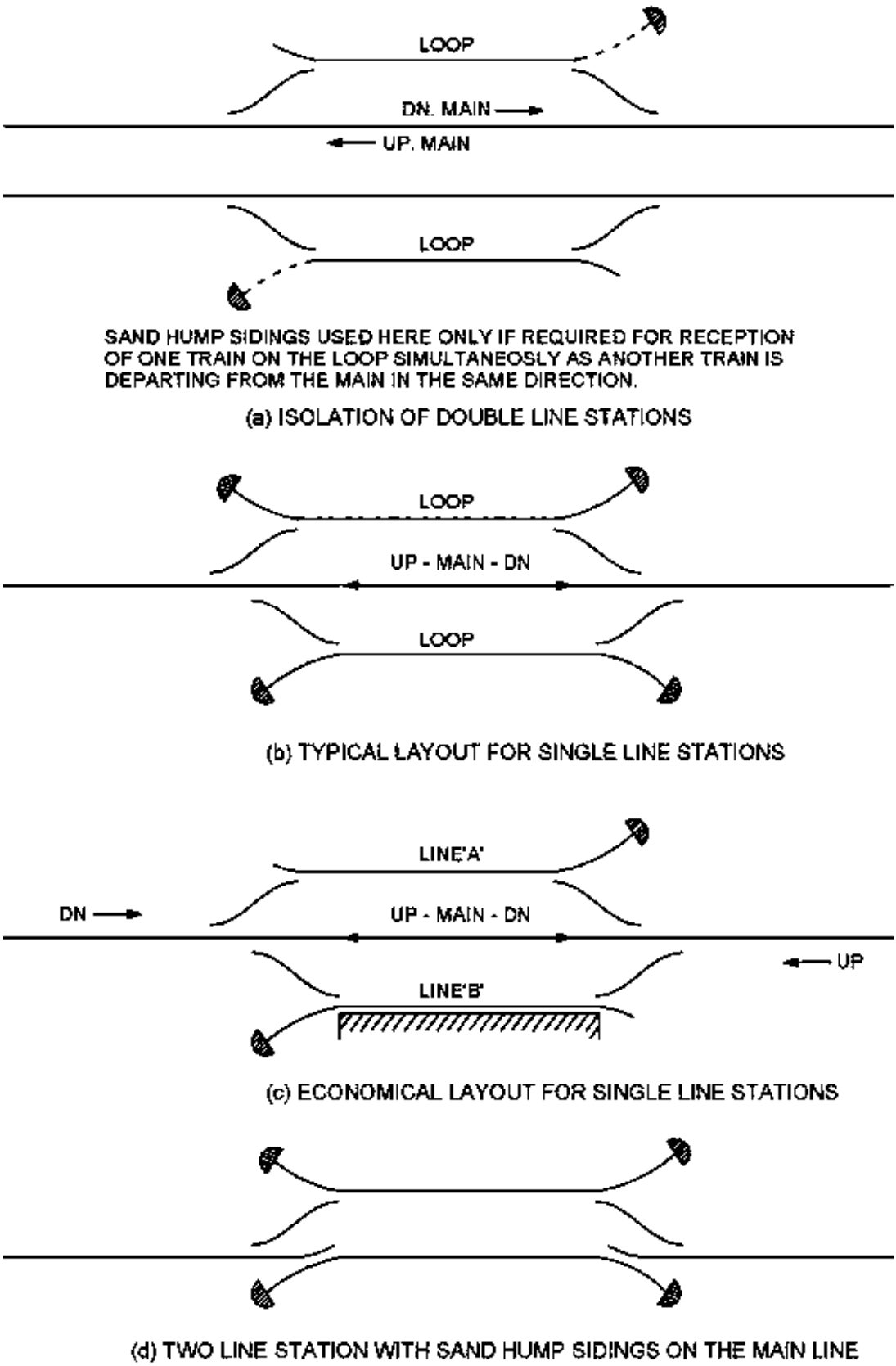


Fig.12.1 SIMULTANEOUS RECEPTION OF TRAINS

Note:- If physical isolation is not possible for simultaneous reception/despatch then adequate physical separation between the route shall be ensured. CCRS circular No 35 stipulates that there should be a physical separation of 300 Mts between simultaneous movements. The 300 Mts. may be further reduced to 120 Mts., if there is a speed restriction of 15 KMPH in the yard. This 300 Mts may be increased further for down gradient/curves/visibility problem.

Review Questions

Subjective Questions

1. Write down modification to done in yard layout to allow simultaneous reception of trains at station at same time and draw a single line yard with two loop lines facilitating simultaneous reception of trains from both UP &DOWN directions.

Objective Questions

State true OR false

1. Simultaneous reception and dispatch shall be done under special instructions. (False/ True)

2. Simultaneous reception of trains is allowed under approved special instruction. (False/ True)

* * *

CHAPTER 13: SYSTEMS OF WORKING

13.1 As explained earlier, the space interval system is used for the Block working wherein the entry of trains into the Block section is jointly controlled by the station masters at the entry and exit ends of the Block section. The driver is authorised to proceed with his train in to the Block section at the entry point, either by a signal or by any other means under the system of working, after ensuring that the section ahead is clear of all other trains.

13.2 For safe running of trains, different methods are adopted to control the train movement between two given points, say between two stations, mainly to ensure that not more than one train is permitted in to the block section at a time

13.3 SYSTEMS OF TRAIN WORKING

In Indian Railways, six systems of train working are adopted and they are

(a) Absolute Block System

(b) Automatic Block System

(c) Following Trains System

(d) Pilot Guard System

(e) Train Staff and Ticket System

(f) One Train Only System

Out of the above six systems of train working, the Absolute Block System and the Automatic System only shall be used, unless the adoption of other systems are especially permitted by the Railway Board.

(In latest European Rail Transport systems, Moving block is also adopted where sufficient clearance is maintained between trains using Radio communication& Tracking)

13.4 ABSOLUTE BLOCK SYSTEM

The Absolute Block system is the most important system of train working for our study, since it is the most widely used system on Indian Railways.

(a) Para 8.01 of General Rules stipulates the essential requirements of the system as under

"Where trains are worked on the Absolute Block System".

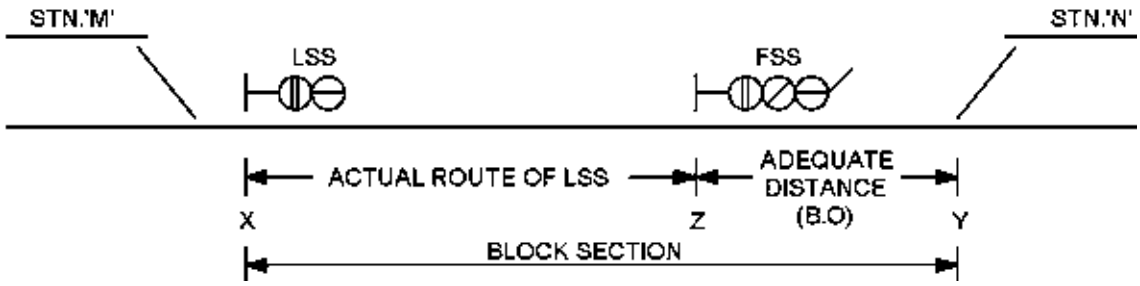
(i) no train shall be allowed to leave a Block station unless Line clear has been received from the Block station in advance, and

(ii) On double lines, such line clear shall not be given unless the line is clear not only up to the first stop signal at the Block station at which such line clear is given but also for an adequate distance beyond it.

(iii) On single lines, such Line Clear shall not be given unless the line is clear of trains running in the same direction, not only up to the first stop signal at the Block station at which such Line Clear is given but also for an adequate distance beyond it, and is clear of trains running in the direction towards the Block station to which such Line Clear is given.

(b) The General Rule further states that the adequate distance referred above shall not be less than 400 Mts in case of Two Aspect signalling and 180 Mts in Multiple Aspect Upper Quadrant Semaphore Signalling or Colour Light Signalling and modified lower quadrant signalling. This is generally called the "Block Overlap" in signalling system. This distance can be reduced in case of necessity but this can be done, only under "approved special instructions" which means that sanction of Commissioner of Railway Safety is required to be obtained for reduction of the adequate distance.

(c) The sketch below will help us to study the essentials of Absolute Block section as mentioned above. For station `N' to give Line Clear to station `M' line must be clear of trains between `X` and `Y'.



(d) `M' and `N' are two Block stations. Under the Absolute Block System controlling the movements of train between `M' and `N' is such that, Station `M' can allow a train to leave his station towards Station `N' only when the line clear is obtained from Station `N'. Station `N' is supposed to give the "line clear" for a train to approach towards `N' only, when the whole Block section is clear of trains.

(e) It can be seen from the above that a train when despatched from Station `M' by obtaining line clear from Station `N' can travel only up to first stop signal of „N“ unless the Signal is taken `OFF'. The Station Master at N““ shall ensure that once the line clear is granted portion „ZY“ i.e. adequate distance beyond the first stop signal (also generally referred to as Block Overlap) is no way obstructed. This in turn ensures that even if the approaching train overshoots the first stop signal at `ON' due to any reason, the driver can still have this extra distance available for him to control the train.

(f) After allowing a train into the block section,

(i) the next train can be permitted to enter the block section only when the previous train has cleared the Block section and the adequate distance ZY, therefore, if the rules governing the system are followed strictly the possibility of collision between trains is completely eliminated. To make sure that the Station Masters on both sides are able to follow the rules, provision of communication between stations under this system is compulsory. Additional aids to Station Master in addition to Block Instruments, Last Vehicle Check Device etc., also may be provided according to the requirements.

(ii) And for despatching a train from Station “N“ line clear has to be obtained from Station „M“

(g) The conditions for granting line clear are given in Chapter 8 of General Rules as detailed below:

(i) **Rule No.8.02:** Conditions for granting Line Clear at Class `A' Station

(ii) **Rule No.8.03:** Conditions for granting Line Clear at Class `B' Station

(iii) **Rule No.8.04:** Conditions for granting Line Clear at Class `C' Station

(h) In all the above cases, two important points must beside other things are stressed. They are

(i) The whole of the last preceding train has arrived complete; and

(ii) All necessary Reception signals have been put back to `ON' behind the said train

(i) The arrival of a complete train is checked either by physical verification (Last vehicle Board or Tail Lamp) or by provision of a last vehicle check device or by having continuous track circuits in the entire block section or by having Axle Counters in the Block section or by any other approved means.

(j) With regard to ensuring all necessary signals have been put back to `ON' after the arrival of a train, "ON" Position of signal are proved by certain relays which ensure that the signals have been restored to `ON' position before closing of the Block Instrument after the arrival of the train.

13.5 AUTOMATIC BLOCK SYSTEM

13.5.1 Automatic Block System on Double Line

(a) What is Automatic Block?

The main difference between absolute block and automatic block is that in the latter, space intervals are secured automatically by the use of Track Circuits or Axle Counters while in the former by human agencies in the form of two Station Masters located at the ends of a Block section.

(b)The essentials of automatic block system are: -

(i) The line shall be provided with Continuous Track Circuits or Axle Counters.

(ii) The line between two stations may where required be divided into a series of section and each section known as "Automatic Block Signalling Section".

(iii) Entry into each automatic block signalling section is protected by a colour light Multiple Aspect Stop Signal.

(iv) Track Circuits or Axle Counters should controls the aspects of the Signal such that:

☐ It cannot display the `OFF' aspect unless the line is clear not only up to the next stop signal but also for an adequate distance beyond it. Since the `OFF' aspect can be yellow, double yellow or green, the `OFF' aspect of stop signal mentioned above can be only yellow with the minimum clearance of one automatic Block section plus Overlap. The stop signal can exhibit green aspect when the line is clear for two automatic block sections plus overlap in the case of 3-aspect signalling or double yellow in the case of 4-aspect signalling. The signal will go to green only when three block sections plus overlap are clear in the case of 4-aspect signalling (refer Fig.No.13.5).

☐ The Signal is automatically replaced to `ON' soon after it is passed by a Train.

Note: *Unless otherwise directed by approved special instructions, the adequate distance referred above shall not be less than 120 Mts.*

(v) (1) Under special instructions, one of the automatic stop Signal between two stations in the automatic block signaling territory in each direction may be made as modified semi-automatic Stop signal.

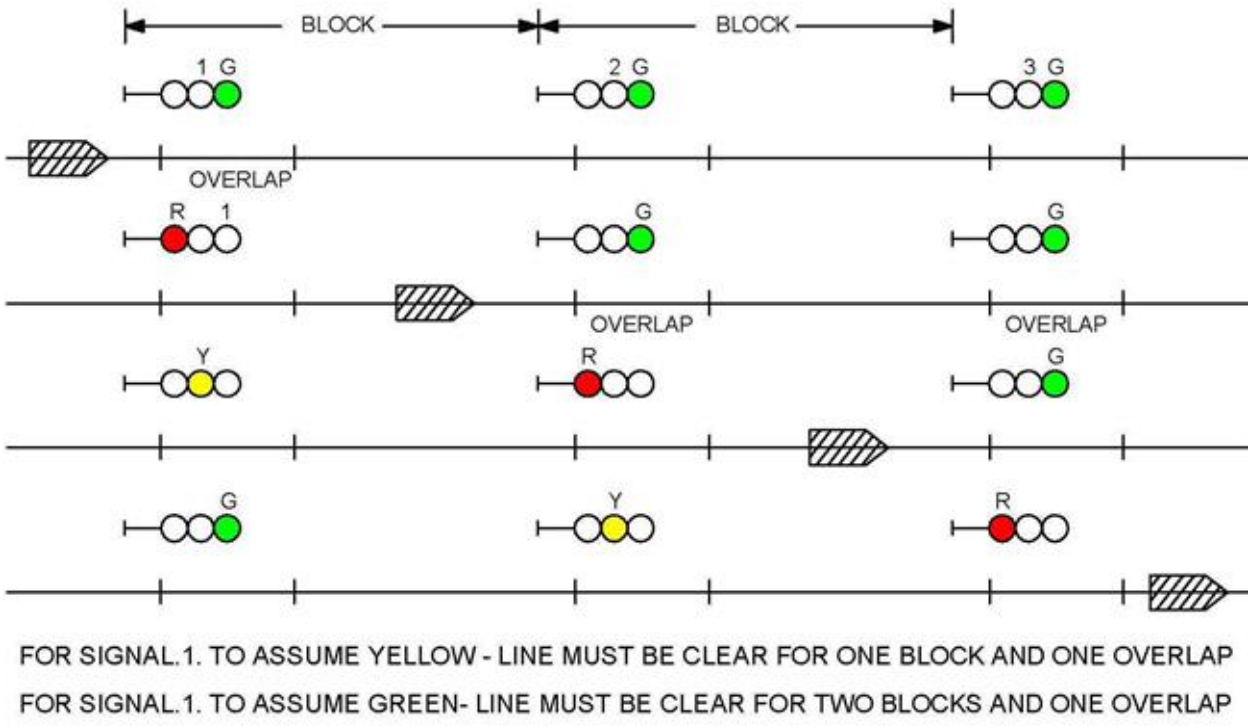
(2) The mid-section modified semi-automatic stop signal so provided shall be interlocked with the signals of the station ahead through track circuits or axle counters or both and shall be controlled by the station Master of the station ahead, the relevant indications whether the Signal is in automatic mode or modified semi-automatic mode shall be available to the Station Masters at both the ends.

(3) Advanced starter signal of the station in rear shall be interlocked with the mid-section modified semi-automatic Stop signal in such a way that when working with „A" marker light is extinguished, the Advanced starter shall assume
„off" aspect or be taken „off" only when the line is clear up to an adequate distance beyond the mid-section modified semi-automatic stop signal; similarly the mid-section modified semi-automatic stop signal shall assume "off" aspect automatically or be taken „OFF" only when the line is clear up to an adequate distance beyond the Home signal of the station ahead.

(4) During abnormal conditions like fog, bad weather impairing visibility, the mid-section modified semi-automatic stop signal may be worked by extinguishing „A" marker in the manner prescribed under special instructions and this action shall also ensure that the „A" marker of the Advanced starter signal of the station in rear and Home signal of the station in advance shall also be extinguished;

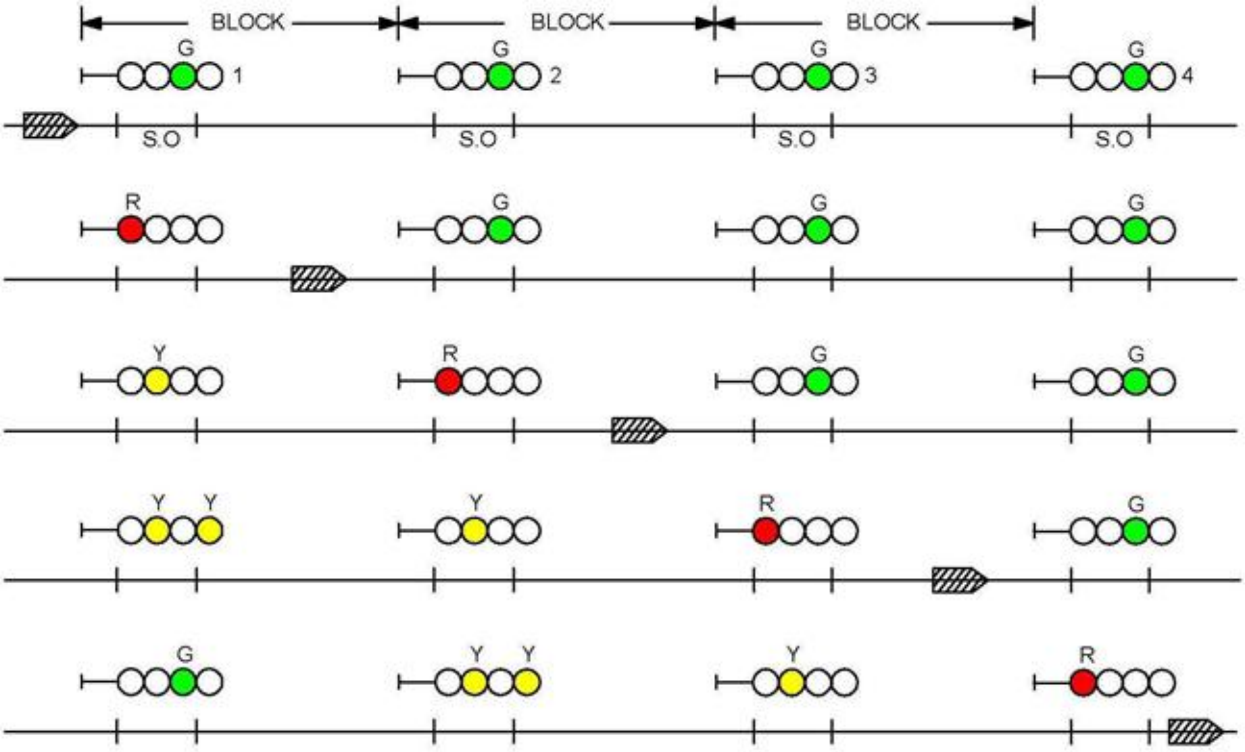
(5) The adequate distance mentioned under clause(c) shall not be less than as prescribed under sub-rule (2) (Note stated above).

(6) During normal conditions, mid-section modified semi-automatic stop signal shall work as normal automatic stop signal.
(The gazette of India No 5211 dt 21/10/2011)



(a) IN THREE ASPECT AUTOMATIC SIGNALLING

SYSTEM OF WORKING



In three aspect territory where emergency braking distance is more than 1 KM is to be catered for , four aspect automatic signal shall be provided , if not provided then suitable speed restriction shall be imposed.(Ref:- Addendum and corrigendum slip 09 SEM para 7.48)

(b) IN FOUR ASPECT SIGNALLING

Fig. 13.5 Sequence of automatic change of aspects as the Train passes

(c) It is obvious that any system, which complies with these requirements, is deemed to be an Automatic Block System and worked accordingly.

Where 3-aspect signals are provided, the second yellow (provided on top) is dispensed with.

(d) From the requirements, it should be clear that every running signal must be of the multiple aspect colour light type, the red and yellow aspects being compulsory and others are optional. The aspects used are `RED', `YELLOW', `DOUBLE YELLOW' and `GREEN' and the indications of these aspects are identical to the indication of corresponding night aspects of multiple aspect signals used in the absolute block. The `Double Yellow' is used in the same manner and for the same purpose as in multiple aspect signalling i.e. where a turnout is present ahead of the stop signal in advance or the distance between the two consecutive stop signals in advance is less than Braking Distance.

(e) Signal will, however, carry required aspects only. For instance, at a terminal station, it is usual to use only the yellow and red, but each of the aspects always conveys the same indication. If a signal unit consists only of green and red, the green will always means proceed, the next signal is `OFF' and if it consists yellow and red, the Yellow will mean, proceed with caution, preparing to stop at the next stop signal in advance.

(f) The red is placed at Driver's eye level, the yellow above it, the green next above it and the second yellow light above the green light. The two yellows are separated by the green to provide a distinctive "Attention" aspect and the single yellow is chosen

as the aspect less restrictive than the double yellow, so that should any one of the two yellow lamps be fused, a more restrictive aspect single yellow will be resulted.

(g) In accordance with the essentials, all running signals protecting the entry of trains into automatic block section should be replaced to `ON' automatically. Such signals must not display „yellow“ aspect unless the block section and overlap in advance are clear, and double yellow (or green), unless two block sections in advance and overlap are clear as proved by track circuits (see figure 13.17). Signals so controlled by track circuits or axle counters are known as Automatic Signals.

(h) Where there is a choice of route or if required for any other special purpose, a manual control is included in the circuits of the `OFF' aspects of signals, such signals may either behave fully automatic signal or a manual stop signal FSS, and LSS are called as semi-automatic signals.

(i) Signals in which the manual control of the proceed aspects is not always present i.e. the manual control can be introduced or removed at will are known as "Semi-automatic Signals", because they can be worked either as automatic signals or as Manually operated Signals.

(j) As the aspect and indication of these three types of signals, viz., MANUAL, AUTOMATIC and SEMI-AUTOMATIC are identical; it would be unnecessary to distinguish one from the other under normal circumstances.

(k) In the event of a failure, however, the procedure for passing the red aspect of a manual signal must differ from the procedure for passing „RED“ of an automatic signal. A written authority or a pilot man is required in the case of a defective signal, but in the case of an automatic signal, no competent person to issue this authority or pilot the train is available or even if he is available, he would, in no way be concerned with the operation of the signal and, therefore, it would not be safe to rely on him. A special procedure which enables the driver to pass the red aspect of an automatic signal under his own responsibility, has been prescribed and, therefore, it is necessary for a driver to know whether the signal at which he is held up is an automatic signal or not. For this purpose only, automatic signals are provided with an `A' marker sign, letter „A“ in Black on a white enamelled disc, Signals with „A“ marker light in Semi-automatic signals which remains automatically lit during the period the signal is working as an automatic signal. Signals with „A“ marker lights which are unlit are treated as Manually operated signals.

13.5.2 Procedure for passing an automatic stop signal displaying the red aspect (on Double line)

When an automatic stop signal with „A“ marker is at „ON“, the driver shall bring his train to stop in rear of the signal. After the train has been stopped he shall wait there for one minute by day and two minutes by night. If after waiting for this period the signal continues to remain at „ON“, he shall give a prescribed code of whistle and exchange signals with Guard and proceed slowly exercising great caution so as to stop short of any obstruction. The „ON“ position of an automatic stop signal may be due to presence of a train in the automatic section ahead or due to some obstruction on the track or broken/fracture of rail or any other cause. The train may resume normal speed only after passing the „OFF“ aspect of the signal in advance.

As each signal is pre-warned, repeating signals are not required on automatic block signalling territories. Where the distance between two consecutive signals is so great that in the event the signal in advance is in red, the train will be running on the yellow over a long distance, it would be better to split this long block section so that one or more stop signals are introduced in between rather than repeat the signal in advance. The most appropriate location for the yellow aspect is braking distance in rear of the red aspect in advance so that it not only warns the driver that he is approaching a stop aspect but also indicates the place at which he must apply the brakes.

13.5.3 Gate Signals

Automatic Signals interlocked with Level crossing gates are distinguished by the provision of „G“ marker yellow enamelled disc with a letter „G“ in black, in addition to an illuminated „A“ marker. When a driver finds such a signal at „ON“ he is permitted to pass it in the same manner as he would and under the same procedure for an automatic signal displaying the red aspect, provided the „A“ marker light is lit. In such cases, it is essential that the 'A' marker light be lit only if the gates are closed and locked against road traffic. In the event, the „A“ Marker light is extinguished, the driver is permitted to pass the signal after waiting for one minute by day and two minutes by night, draw his train cautiously ahead and stop in rear of the crossing. After ascertaining that the gates are locked against road traffic and on getting hand signal from the gateman, the driver may then proceed cautiously up to the signal in advance.

13.5.4 Illuminated AG marker with illuminated `A' marker

Automatic signals interlocked with Level crossing gates are distinguished by the provision of illuminated AG and illuminated `A' marker. When a driver finds the signal at `ON', he is permitted to pass it with same manner as he would and under such procedure for an automatic signal displaying the red aspect provided the `A' marker light is lit whereas when he finds the signal at `ON', with `AG' marker is lit, he is permitted to pass it in such manner as he would and under such procedure for an automatic signal displaying red aspect with `G' marker below. If both the markers are not lit, the driver should treat this signal, as an absolute stop signal, showing red aspect.

13.5.5 Modified Semiautomatic Stop Signal with illuminated `A' marker

(a) When the Loco Pilot finds mid-section modified semi-automatic stop signal with „A“ marker extinguished in „ON“ position, he shall stop his train in the rear of the signal
and inform this fact to the Station Master of the station ahead on approved means of communication as prescribed under special instructions.

(b) The Station Master of the station ahead may authorize the Loco Pilot to pass the mid-section modified semi-automatic stop signal working with „A“ marker extinguished in „ON“ position through approved means of communication after ensuring conditions and procedure prescribed under special instructions.

(c) In case the Loco Pilot is unable to contact the Station Master of station ahead, he shall pass the signal at „ON“ after waiting for five minutes at the signal and proceed cautiously and be prepared to stop short of any obstruction, at a speed not exceeding 10 KMPH up to the next Signal and act as per aspect of this signal, and

(d) The Loco Pilot shall report the failure of mid-section modified semi-automatic stop signal to the Station Master of the station ahead.”
(The gazette of India No 5211 dt 21/10/2011)

13.5.6 Automatic Block System on Single Line

(a) **Introduction:** The main object of introducing Automatic Block System on single line is to increase the section capacity by reducing the `head way' between two consecutive trains moving in the same direction.

This system is particularly suitable on single line section where the pattern of traffic is such that trains follow one another in quick succession during certain parts of the day. Further advantage can be had if Centralised Traffic Control is introduced in this section.

(b) **System:** In this system of working, the entire block section may, where required, be divided into two or more automatic Block signalling sections each of which being controlled by a colour light stop signal on both the directions. The movement of trains in the section is controlled by the stop signals in the direction for which, direction of

traffic is established, while the stop signals in the opposite direction display `ON' aspect. This is to prevent movement of trains in opposite direction at the same time. The entire block section is track circuited or provided with axle counters.

(c) Before despatching the first train of a series in any particular direction, the direction of traffic for that particular direction is to be established by obtaining line clear from the station in advance and for the following subsequent trains line clear need not be taken from other end.

(d) To facilitate direction of traffic to be established and for the purpose of granting line clear, one panel at each Block station is provided generally.

13.5.7 Essentials of Automatic Block System on Single Line

Where trains on a Single line are worked on the Automatic Block system

(a) The line shall be provided with continuous track circuiting or axle counters.

(b) The direction of traffic shall be established only after line clear has been obtained from Block station in advance.

(c) A train shall be started from one Block station to another only after the direction of traffic has been established.

(d) It shall not be possible to obtain line clear, unless the line is clear, at the Block station from which line clear is obtained, not only up to the first stop signal but also for an adequate distance beyond it.

(e) The line between two adjacent Block stations may, where required, be divided into two or more automatic block signalling sections by provision of stop signals.

(f) After the direction of traffic has been established, movement of trains into, through and out of each automatic stop signalling section shall be controlled by the concerned Automatic Stop Signal and the said Automatic Stop Signal shall not assume „OFF" position unless the line is clear up to next Automatic Stop Signal, provided further that where the next stop signal is a, First stop signal the line is clear for an adequate distance beyond it, and

(g) All stop signals against the direction of traffic shall be at `ON'.

(h) Unless otherwise directed by approved special instructions, the adequate distance referred to in clause (d) and (f) of para 13.5.6 above shall not be less than 180 Mts.

(i) Under special instructions, one of the automatic stop Signal between two stations in the automatic block signalling territory in each direction may be made as modified semi-automatic Stop signal.

(j) The mid-section modified semi-automatic stop signal so provided shall be interlocked with the signals of the station ahead through track circuits or axle counters or both and shall be controlled by the station Master of the station ahead, the relevant indications whether the Signal is in normal automatic mode or modified semi-automatic mode shall be available to the Station Masters at both the ends.

(k) Advanced starter signal of the station in rear shall be interlocked with the mid-section modified semi-automatic Stop signal in such a way that when working with „A" sign extinguished, the Advanced starter shall assume „off" aspect or be taken „OFF" only when the line is clear up to an adequate distance beyond the mid-section modified semi-automatic stop signal; similarly the mid-section modified semi-automatic stop signal shall assume "OFF" aspect automatically or be taken „OFF" only when the line is clear up to an adequate distance beyond the Home signal of the station ahead.

(l) During abnormal condition like fog, bad weather impairing visibility, the mid-section modified semi-automatic stop signal may be worked by extinguishing „A“ marker in the manner prescribed under special instructions and this action shall also ensure that the „A“ marker of the Advanced starter signal of the station in rear and Home signal of the station in advance shall also be extinguished;

(m) The adequate distance mentioned under clause(c) shall not be less than as prescribed under sub-rule (2) (Serial No „h“ stated above)

(n) During normal conditions, mid-section modified semi-automatic stop signal shall work as normal automatic stop signal.

(The gazette of India No 5211 dt 21/10/2011)

13.5.8 Minimum equipment of fixed signals in Automatic Block Territory on single line

(a) Manual stop signals at a station

(i) A Home

(ii) A starter

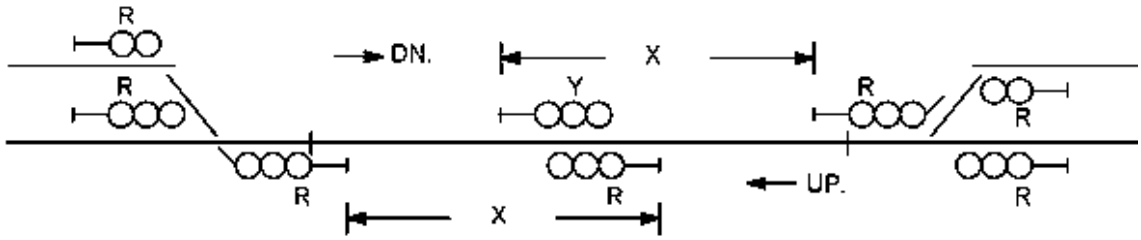
(b) An automatic stop signal in rear of the Home signal of the station.

13.5.9 Additional fixed signals in Automatic Block territory on single line

(a) Besides the minimum equipment prescribed above, one or more additional Automatic Stop Signals, as are considered necessary, in between Block stations may be provided.

(b) In addition, such other fixed signals as may be necessary for the safe movement of trains may be provided.

A typical layout is shown below:



NOTE: 'X' - AUTOMATIC BLOCK SIGNALLING SECTION
DIRECTION OF TRAFFIC LAST ESTABLISHED IN DOWN DIRECTION

13.5.10 Description of Panel

A control Panel is provided at every station of the Automatic Signalling Section. Each station controls all the movements of one adjacent section as given below:

Station A controls all movements between A & B
Station B controls all movements between B & C
Station C controls all movements between C & D and so on.

The Figure No.13.5.9 shows a typical control panel. The control panel consists of two parts; one part is termed as `Controlling side' and the other as `Controlled side'.

In the panel, the following switches and indications are provided:

(a) Illuminated arrows: Two arrows for each direction are provided on both sides of the panel. Only the arrow corresponding to the direction of traffic established would be illuminated and the other arrow will not be lit. White light appears when relevant block section is clear and changes to Red when the block section is occupied or due to failure of track circuits/Axle Counters.

(b) Signal normal: (White indication): This is provided on either side of the panel. When Illuminated indicates that the signals of that side of the station are at `ON'.

"Permission from . . . . . (Green indication): This is provided at the controlling side of the panel only. When illuminated, indicates that the push button of controlled station in advance has been pressed, permitting controlling station to establish direction of traffic towards "controlled side" station.

(c) Direction switch: A two position switch is provided on the controlling side of the panel to enable the controlling station to establish direction of traffic from station A to Station B or vice-versa.

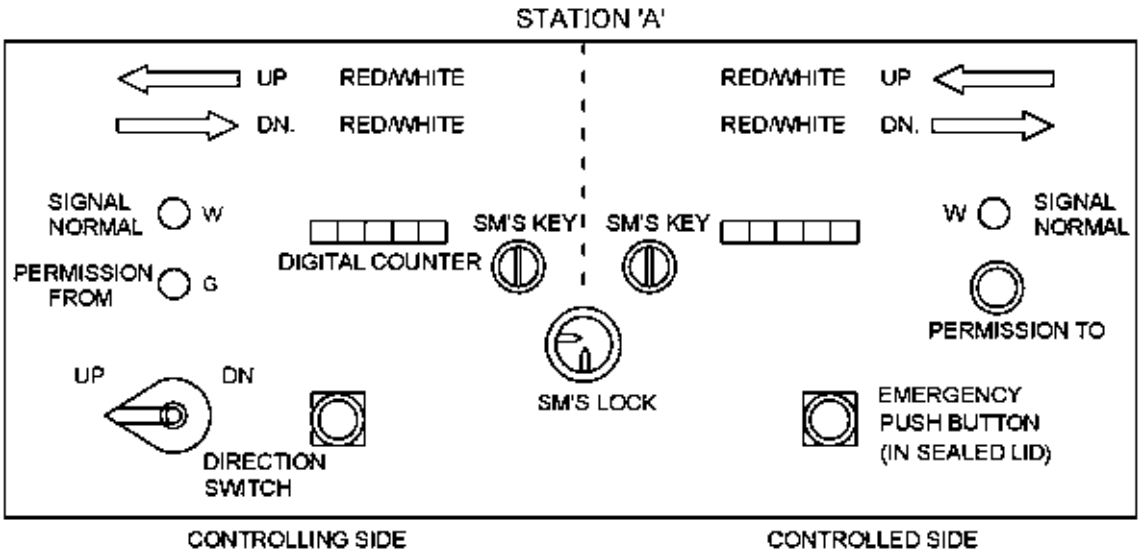


Fig. 13.5.9

(e) SM's lock up key: This key when removed will keep the panel locked in the last operated condition to prevent inadvertent or unauthorised operation of panel.

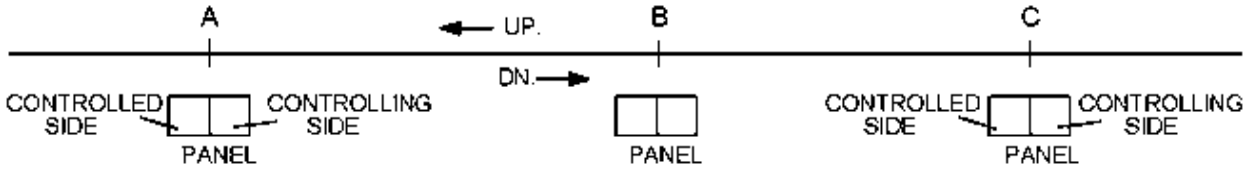
(f) Permission button: This is provided on the controlled side of the panel which when pressed grants permission to controlling station to establish direction of traffic from controlling station A to the controlled station B.

(g) Emergency Push Button: Two push buttons are provided: one on the "controlled half" and the other on the "controlling half" of the panel. When it becomes necessary to change the direction of traffic under track circuit/axle counter failure, the button pertaining to that section shall be pressed at controlling station is turned to the required position, for permitting a movement in emergencies.

(h) **Counters:** Each operation of emergency push button registers next higher digit on the digital counter of the respective half of the panel.

13.5.11 Establishing direction of traffic movement

Let us take a case of stations A and B on a single line section provided with Automatic Signalling and let us assume that station A is the controlling station for any movement of train between A&B.



Station `A': Controls all movements between `A' & `B'

Station `B': Controls all movements between `B' & `C' and so on.

Fig.13.5.10

13.5.11 Let us assume that the direction switch at Station „A“ is in "UP" direction by a previous operation, the "UP" arrow is illuminated white (which means that the Block Section AB is clear) and Station „A“ has a train to despatch.

Station „B“ will press the push button provided on the „controlled side“. This will cause lighting up of a „green“ indication in the panel at „A“ signifying the receipt of "Permission" to despatch a train from Station „A“ to Station „B“. After getting this green indication, the SM at Station „A“ will turn the direction switch to "DOWN" and establish the direction of traffic. This will cause the "DOWN" arrows at both the stations to be lit to white and extinguish the light of the `UP' direction arrows at both the stations. The white indication of „DOWN“ arrows will turn to red when the trains enter the section.

For despatching an UP train from Station „B“ to Station „A“ all that the SM at the controlling station „A“ has to do is to turn the “Direction Switch“ to the „UP“ position provided the whole section is clear of train. This will cause the „UP“ arrows at both the stations of the controlled section to be lit white, extinguishing the white lights of "DOWN" arrows. The white lights of the „UP“ arrows will turn to `Red' when the train enters the section.

13.5.12 Rules for passing the Automatic Stop Signal at `ON': (On single line)

(a) When a Driver finds an Automatic Stop Signal with an `A' marker at `ON', he shall bring his train to a stop in rear of that signal and wait there for one minute by day and two minutes by night.

(b) If after waiting for this period the signal continues to remain at `ON', and if telephone communication is provided near the signal, the Driver shall contact the Station Master of the next Block station or the Centralised Traffic Control Operator of the section where Centralised Traffic Control is provided, and obtain his instructions. The Station Master or the Centralised Traffic Control Operator, as the case may be, shall, after ascertaining that there is no train ahead up to the next signal and that it is otherwise safe for the Driver to proceed so far as is known, give permission to the Driver to pass the signal in the `ON' position and proceed up to the next signal, as may be provided under special instructions.

(c) If no telephone communication is provided near the signal or if the telephone communication provided near the signal is out of order and cannot be made use of, the Driver shall give the prescribed code of whistle and exchange signals with the Guard and then proceed past the signal as far as the line is clear, up to the next Stop Signal in advance, exercising great caution so as to stop short of any obstruction.

13.5.13 Modified Semiautomatic Stop Signal with illuminated `A' marker (On single line)

(a) When the Loco Pilot finds mid-section modified semi-automatic stop signal with „A“ marker extinguished in „ON“ position, he shall stop his train in the rear of the signal and inform this fact to the Station Master of the station ahead on approved means of communication as prescribed under special instructions;

(b) The Station Master of the station ahead may authorize the Loco Pilot to pass the mid-section modified semi-automatic stop signal working with „A“ marker extinguished in „ON“ position through approved means of communication after ensuring conditions and procedure prescribed under special instructions;

(c) In case the Loco Pilot is unable to contact the Station Master of station ahead, he shall pass the signal at „ON“ after waiting for five minutes at the signal and proceed cautiously and be prepared to stop short of any obstruction, at a speed not exceeding ten KMPH up to the next Signal and act as per aspect of this signal; and

(d) The Loco Pilot shall report the failure of mid-section modified semi-automatic stop signal to the Station Master of the station ahead.”
(The gazette of India No 5211 dt 21/10/2011)

Review questions

Subjective Questions

1. Write down essential requirements of Absolute Block System
2. Write down essential requirements of Automatic Block system on Double line
3. Write down procedure to pass an Automatic Gate signal on Double line at „ON“.

Objective Questions

Fill up the blanks with correct answers

1. Semiautomatic signal is provided with

   a) „A“ marker b) Illuminated „A“ marker c) „AG“ marker d) „P“ marker

2. Adequate distance in Automatic Block System on Double line is _____

   a) 180 Mts b) 400 Mts c) 120 Mts d) 300 Mts

3. If a semiautomatic stop signal is protecting LC gate as well as point then _____ shall be provided on the post.

   a) „A“ marker b) Illuminated „A“ marker c) Illuminated „AG“ marker d) b&c

4. If two Automatic block sections and overlap ahead of an automatic signal is clear of train in, four aspect Automatic signalling territory, then it will display _____ aspect

   a) Attention b) a OR d c) stop d) caution

5. Adequate distance in automatic block system on single line is _____

   a) 180 Mts b) 400 Mts c) 120 Mts d) 300 Mts

6. The normal aspect of automatic stop signal is

   a) Proceed b) caution c) stop d) attention

* * *

CHAPTER 14: CLASSIFICATION OF STATIONS - A, B & C

14.1 For the purpose of rules, stations in absolute block system are classified as shown below.

(a) CLASS `A' STATIONS: Where line clear may not be given for a train, unless the line on which it is intended to receive the train is clear for at least 400 Mts beyond the Home Signal, or up to the starter.

(b) CLASS `B' STATIONS: Where line clear may be given for a train before the line has been cleared for the reception of the train within the station section.

(c) CLASS `C' STATIONS OR BLOCK HUTS: Where permission to approach may not be given for a train unless the whole of the last proceeding train has passed complete at least 400 Mts beyond the Home Signal (IBS / IBH) and is continuing its journey. This will also include an Intermediate Block Post.

(d) Class 'D' Stations (Non Block stations) : Called that Halt stations will become part of Block sections between two Block stations**.**

14.2 As the classification is laid upon the minimum signalling equipment provided, in each direction for class of stations are shown below. Stations in Automatic Block territories are not classified, as from the point of view of the operation of trains, the stations as such have no significance.

Class of Station	Minimum Equipment	Additional Equipment
A. Two Aspect Signalling:		
1. A	Warner, Home, Starters	Or under approved special instructions an Outer, Warner in rear of outer ; and Starter Warner if trains run through at speeds exceeding 50 KMPH without stopping.
2. B Single Line	Outer, Home	Advanced starter or SLB where shunting in the face of an approaching train is required.
4. B Double Line	Outer, Home & Starters	Warner if trains run through at speeds exceeding 50 KMPH without stopping.
4. C	Warner, Home	-----
5. D	(These are passenger Halts & Non- Block stations)	
B. Multiple Aspect Signalling:		
6. B Single/Double line	Distant, Home, Starters	Advanced Starter or SLB on single line where shunting in the face of an approaching train is required. Starters on double line. Block section limit board where there are no points or outermost point at the approach end is in trailing direction on double line.
7. C Single/Double line	Distant, Home	-----
C. Modified Lower Quadrant:		
8. B	Distant, Home, Warner below main Home & Starters	MLQ Signalling may be used only where it is especially sanctioned by a special order of the Railway Board
9. C	Distant & Home	-----

14.3 On the Double line station, starter signals are included in the minimum equipment for A
& B class as entry into the next Block section is controlled by signal indications alone without the use of a tangible authority in the form of a tablet, token, etc. Warner signals are provided for high-speed operation to indicate the run-through condition and to provide the means for adequate interlocking. Starter signals are not used in `C' class working because trains are not booked to stop at such stations.

In all those types of stations, before permission to approach is given, the line must be clear up to the first stop signal and the block overlap beyond it and before a signal is taken off, it should be ensured that the line is clear up to the next stop signal and the signal overlap is reckoned from the trailing points (GR.38) and often from the opposing home which provides a more convenient point of reference to staff.

For the purpose of comparison of the stations definition of Block section and Station section is given below

BLOCK SECTION means that portion of the running line between two Block stations on to which no running train may enter until Line Clear has been received from the Block station at the other end of the Block section.

STATION SECTION is that portion of Station limits which can be used for shunting even after granting Line clear to station in rear. It exists only for Class B Station explained below in the table.

At a class `B' station provided with	**STATION SECTION**	
	On Double Line	**On Single Line**
Two-aspect signals	Between Home Signal and the Last Stop Signal of the Station in either direction	Between the Shunting Limit Boards or Advanced Starters (if any), Or Between the Home Signals if there are no Shunting Limit Boards or Advanced Starters, Or Between the outermost facing points, if there are no Home Signals or Shunting Limit Boards or Advanced Starters.
Multiple-aspect or Modified Lower quadrant signals	Between the outermost facing points and the last Stop Signal of the station in either direction, Or Between the Block Section Limit Board, where provided, and the last Stop Signal of the station in either direction	Between the Shunting Limit Boards or Advanced Starters (if any), Or Between the outermost facing points if there are no Shunting Limit Boards or Advanced Starters.

14.4 COMPARISION OF CLASS A, B AND C STATIONS WITH MAUQ & MLQ OPERATION

14.4.1 Class A & B Stations

In class `A' operation, the Block section extends from the last stop signal of one station to the home signal of the next station and the block overlap. On Single line layouts, since shunting in the face of an approaching train cannot be performed and when two trains are approaching the station simultaneously from opposite directions the first train as well as the second in most cases will have to be stopped at the Home signals, unless separate signal overlaps are available. Hence, class `A' working is adopted on the single line only for special reasons such as for instance (1) trains cannot be stopped at the first signal because of rising gradients or (2) the sighting distance of the first signal would be inadequate if it was a stop signal. In such cases, loop lines terminating with snag dead ends are provided on either side of the main line so that independent signal overlaps for the Home signals are available for the simultaneous reception of two opposing trains, one on each of the two loops.

On the double line, the only advantage of class `B' over `A' operation is that more trains can be dealt with, on a given section. In Class `B' at a given time there can be one train on each reception line of the station and one train in each Block section, but in class `A' if all reception lines are occupied there cannot be any train in Block section. This disadvantage can be overcome by providing one more loop at each station or by berthing a train at the advanced starter or by locating the home at Block overlap in rear of nearest fouling mark. From the safety point of view, class `A' is to be definitely preferred especially on high-speed heavy density sections.

Safety in class `B' operation is too much dependent upon the sighting distance of the Outer which is an uncertain factor and the correct operation of Outer and Home signal which are difficult to ensure with single wire operation. The point beyond which the line may be obstructed, after permission to approach is given, is protected by two stop signals in the case of class `A' but by only one stop signal in the case of class `B' station where shunting in the face of an approaching trains is permitted. It may be argued that by separating the Warner from the outer and placing it at NBD in rear of the outer, the margin of safety can be increased, this argument cannot be denied. But by doing so section capacity is reduced as the Warner at ON may mean to stop on main line, or "run through over loop", and the driver on seeing the Warner at ON at once reduces speed and be prepared to stop at the outer. As the aspect of separate Warner can be picked up when approaching trains are between 2 to 3 KM away from the stations, the loss of capacity will be considerable.

From the point of view of speed class `A' is better as there is no Outer at which a train may be detained and drivers can approach such stations with more confidence than they do stations with an un-warned outer.

14.5 COMPARISON OF CLASS `A' AND CLASS `B'

From the para 14.4 the comparison of class `A' and class `B' of Two aspect signalling is as follows

Class 'A'	Class 'B'
1. Class `A' stations are only provided with Two aspect signalling.	1. Class `B' stations can be provided with Two aspect or Multiple Aspect signalling.
2. Provided under special circumstances like, (a) Sighting distance is not adequate (b) Due to steep rising gradient in approach (c) Presence of long Bridge in approach.	2. Normally most of the stations are Class „B“

Class 'A'	Class 'B'
3. There is no station section	3. There is station section.
4. Shunting in the face of approaching train is not possible.	4. Shunting in the face of approaching train is possible within station section.
5. Line Clear cannot be granted simultaneously for trains from either side, unless special arrangements like separate overlap for each reception line is provided.	5. No such problem for granting line clear.
6. If all reception lines are occupied, there can be no train in the block section. Unless train is drawn ahead between starter & advanced starter on double line.	6. No such problem more trains can be dealt with.
7. Obstruction is protected by two stop signals, so more safe.	7. Obstruction is protected by one stop signal, Safety depends on sighting distance.
8. Driver is approaching with more confidence as FSS is pre-warned.	9. Driver is approaching with less confidence, if adequate sighting distance is not available, so takes more time to clear the block section.

14.6 CLASS `C' STATIONS

Class `C' working is mainly intended to serve the purpose of splitting double line block sections in an economical manner, such stations are employed on the single line either for a special purpose or where there is a pre-consideration of traffic in one direction over long periods of the day such as, for instance, near terminals. It should be remembered that the only stop signal available is the Home and when a train is held up at the home, a stop signal is not available to protect the train. It is for this reason that trains cannot be booked to stop at such stations and the stations should not normally be provided with a loop or siding class `C' stations are usually so located that the time taken to clear the section on either side of it is nearly the same. When permission to approach is given soon after train has been dealt with, it is not enough if the line is clear up to the Home and also block overlap beyond it; it should also be ensured that the last preceding train is continuing its journey. This additional precaution is taken because the limit of block overlap is not defined by a signal as in the case of A&B and class `C' stations, not having loops cannot deal with more than one train at a time.

14.7 MULTIPLE ASPECT SIGNALLING (M A S)

MAS combines the advantages of Class A & B working. As there is station section between the two advanced starters or SLBs shunting may be permitted in the face of approaching trains. There is a separate Distant signal which not only merely repeats the home but also distinguishes between reception on the main line, loop line and stop at Home. When a train is being received on the main, it may run at normal speed up to the Home, as BD is available between the Home and the Starter. When a train is to be received on the loop line, the speed is reduced, just before passing the Distant, to the extent necessary for taking on to the loop line at 15 KMPH. When a train is to be stopped at the home, its brakes are applied at the most appropriate point viz. BD in rear of the train. It is thus possible to control the speed of trains within the station limits in such a manner that unnecessary speed reductions are avoided. This results increase in capacity as compared with class A & B will be considerable on sections which are near the saturation point.

The reduction in overlaps enables quicker crossing of trains. In Class `B' the opposing starter is at a distance of 580 Mts + length of no. crossovers from the Outer while in MAS, this distance can be reduced to 300 Mts +length of no. crossovers. The loss of time at class `B'

stations on this account would again be considerable when a whole section is considered. The use of a Distant and the location of the FSS closer to the facing points than the location of an outer allows more time for obtaining permission to approach for a second train which is to run through the station after the arrival of the first train in the opposite direction.

From the safety and speed points of view, MAS, is superior to TAS. In MAS, signals repeat the signals in advance and when correctly located, eliminate the problem of sighting distances, repeating signals, etc. Thus when a fast train is approaching a distant, the driver is relaxed from the strain of picking up the aspect of the signal from a distance. When he is close to it, he would pick up the aspect of the signal comfortably; if it is at 90º he proceeds at normal speed, if it is at 45º he knows, he will be entering a loop and begins to reduce speed, if it is at 0º, he has to stop at the Home and therefore makes a normal brake application. When he is close to the Home, if the Main Home is at 45º, he makes a normal brake application to stop at the starter signal.

It is the policy, adopted to provide MAS signalling on all main line sections.

14.8 MLQ

MLQ provides the same operational advantages as MAS except that it does not distinguish between receptions on the loop and stop at the home. From the safety point of view, however, it is inferior to MAS, as the indication of the green aspect on the distant signals and the Warner are widely different*. (Note:-MLQ signalling was adopted in some railways like SERly but is now out of use.)*

Review Questions

Subjective Questions

1. Write down the difference between class "A" and class "B" station.

2. Write down the basis and purpose classification of stations

Objective Questions

State true OR false

1. The class "A" station can be provided with multiple aspect signaling (False/ True)

2. Shunting is not allowed in class "A" station (False/ True)

3. Class "A" station does not have station section (False/ True)

4. Class "C" station is not possible on single line (False/ True)

Fill up the blanks with correct answers

1. Shunting in the face of approaching train can be performed at ---------- station/stations

a) Class „A" b) Class „B" c) Class „C" d) all a,b &c

2. The block overlap in class „C" station provided with colour light signal is---------

a) 180 Mts b) 400 Mts c) 120 Mts d) 580 Mts

* * *

CHAPTER 15: STANDARDS OF INTERLOCKING

15.1 Pl refer to Chapter 1,2 for Definition of Interlocking. In the interest of safety it is obvious that train speeds should depend upon the Signal& Telecommunication equipment provided. Four standards of interlocking are actually prescribed. These standards were amended / revised to suit the new requirements. On the basis of speed the existing and revised standards of interlocking areas follows,

Comparison of Speeds in previous & revised standards of interlocking

Standard of Interlocking	**Existing standard (speeds up to KMPH)**	**Revised standard (speeds up to KMPH)**
Un-interlocked	15	-----
Rudimentary / Modified Non Interlocked / Standard -0	15 (Has Point /Trap Indicator)	---
I	50	50
II	75	110
III	Unrestricted speed	140
IV	-----	160

The term unrestricted speed may not be taken literally. It is being increasingly realised that an un warned FSS should not be employed in high-speed sections. Generally speaking, Two aspect system in which safety is dependent on sighting distances of signals, is not conducive either to efficiency or safety of operation because the sighting distances required would become too long.

15.2 MINIMUM EQUIPMENT FOR PREVIOUS STANDARDS OF INTERLOCKING

The minimum equipment prescribed is based on considerations of safety alone. Thus a large station at which all trains stop may be left un-interlocked. But since considerable delays to train movements would occur and number of operating staff required would be large, it is obvious to interlock such stations. In fact from the view of efficiency and staff economy, it would be the best to work all points from a central location. The complement of signals and the number of aspects provided should again conform to the requirements of operation and safety,
subject to the minimum equipments prescribed for each standard: -

STANDARDS OF INTERLOCKING

Previous Standards of Interlocking				
Minimum Equipment	**Un Interlocked (15 KMPH)**	**Standard I (50 KMPH)**	**Standard II (75 KMPH)**	**Standard III (unrestricted speed)**
I. Points				
1. How Gauge is maintained	A Gauge tie plate where steel sleepers are not provided			
2.How Operated	May be worked locally			From a Frame where Point & Signal levers are grouped.
3. How Locked	Bolt & Cotter fitted to each switch rail and padlocked or clamp to hold switches and padlock to lock them in position	A key lock of approved type locking each switch independently * (in most installations the type of lock prescribed for Standard II is used)	A Plunger type of FPL locking each switch independently which may be hand operated.	A plunger type of FPL worked from the frame.
4. How switches are prevented from being unlocked Under a train.	No special arrangements	An arrangement in which a key is used to release signals which cannot be brought back to the points until signals have been replaced to „ON".		Lock bar/ or TC or such other means.
5. Switch detection	Not required	A means for detecting each switch independently should be provided **		A means for detecting each switch independently should be provided
6.Lock detection	Not required	Not required	Yes, if plunger is hand operated or is of the economical type	Yes, if plunger is hand operated or is of the economical type
II. ISOLATION				
& sidings				

Note: ** Although the two switches of a turnout are invariably coupled by at least two stretchers & operated together, wherever a lock is provided, each switch is to be locked independently to safeguard against the possibility of both stretchers being broken at the same time.*

*** For the same reason and in order to ensure that the switches are not bent or broken, detectors, where provided, also detect each switch separately and independently.*

Min equipment of Signals:-

Minimum Equipment	Class of working	Un interlocked (15 KMPH)	Standard I (50 KMPH)	Standard II (75 KMPH)	Standard III (unrestricted speed)
III. Signals:					
Two Aspect	A	(Not usually adopted) {see Discussions}	Warner, Home, Starters.		
Two Aspect	B	Outer & common Home (the Home may be omitted if traffic is very light)	Outer & Bracketed Home, Warner in MG only if considered necessary Starters are optional	Outer bracketed Home, Warner should interlocked with Block instruments if Starters not provided	Outer Bracketed Home, Warner and Starters
Two Aspect	C	(Not usually adopted)			Warner & Home
MAUQ & MACLS	B	Distant, Home	Distant, Home	Distant, Home & Starter	
MAUQ & MACLS MLQ	C	(Not usually adopted) (Not prescribed)	Distant, Home Distant Bracketed Home , Starter, Warner below main Home		
IV. Grouping of Levers		Not required	Signal levers should be grouped & key provided to enable SM to lock up frame	Point & Signal levers should be grouped	Point & Signal levers should be grouped.
V. Interlocking		NIL	Indirect by means of key locks. Warner should interlock trailing points. Direct locking between signal levers.	Indirect interlocking should be extended to all trailing points direct locking between signal levers or as prescribed for Std.III	Direct interlocking between points & signals & where there are different locations SMs supervisory control should be provided.

NOTE:-

(a) Common Home signal may be used for contiguous loop lines if TCs are provided to prove that route set is clear for a group of goods loop lines.

(b) Minimum equipment of signal for MAUQ un-interlocked is not prescribed, hence, the same equipment as used for Standard I. In this case, the Distant should not carry the green aspect.

(c) In case of Standard I interlocking, on sections with light traffic, Outer signal may be operated from a separate location, near from the facing points. But arrangements should be provided to ensure that Outer signal cannot be taken „OFF" unless the Home Signal is taken „OFF".

(d) For speeds above 72 KMPH on Broad gauge and 48 KMPH on Meter gauge, a warning board should be provided at full braking distance, not less than 1 KM in rear of the 1st stop signal. The Passenger Warning Board at 1 KM need not be provided where the first stop signal is preceded by a Permissive Warner/Distant Signal, if the distance between the Permissive Warner/Distant Signal and stop signal is 1 KM or more.

(e) Where sectional speed is 120 KMPH or above, two distant signals shall be provided.
In such cases, these signals are called „DISTANT" and „INNER DISTANT" signal respectively.

(f) Unrestricted speed may be allowed over indirectly interlocked siding points taking off from the main line within the station limits where

(i) The equipment provided at the points are in accordance with the requirement of the speed over 75 KMPH (Para 144 of IRSE Manual).

(ii) A control for operation of points is transmitted through `E' type of key transmitters manufactured as per IRS design or lever lock and circuit controllers.

(iii) A control for operation of points is transmitted in conjunction with electrically speaking instruments and special instructions have been laid down for the operation of points.

(iv) Route holding is provided to ensure the integrity of the points till the signalled movement over the same is completed.

15.2 EXPLANATION

It will be noted that the main difference between standards I and II is that isolation is not required in Standard. I. Starter signals are compulsory in Standard III, as they are required for high-speed operation. Standard I and II are not usually employed on the Double line, where train densities are usually high. But should they be used on the Double line, Starter signals should be used, as the General rules stipulate that starter signals cannot be dispensed with on the Double line except in the case of „C" class stations. The main difference between Standard II and III is that the latter does not permit indirect locking between points and signals with keys and compels the use of starter signals. The view that indirect locking with keys is less safe than direct locking, which is not correct, except direct locking, higher speed is not permitted.

There cannot be an un-interlocked class `A' station as the use of Warner is prohibited in un-interlocked working (and also Standard I on the B.G.). The reason for permitting a Warner in MG Standard I and not in BG Standard I, perhaps is that the maximum permissible speed in MG is 75 KMPH which is close to the Standard I speed of 50 KMPH, while in BG. it is 110 KMPH which is more than the double speed, permitted in case of Standard I. The Warner is regarded as a high-speed signal and is not used for comparatively low speeds or where speeds are restricted. However, since there is no other method of indicating the run through condition, the use of Warners in Standard I BG is being authorised in some individual cases. A better solution of course is, to provide isolation and adopt standard II (instead of Standard I) in BG.

It will be noted that in Standard I, the Home Signal need not be interlocked with trailing points, but this interlocking is essential in Standard II. In Standard I, therefore, when two opposite trains are approaching a single line station at which the two trains cannot be received simultaneously, it is usually to set the Up facing points for the Up train and Dn facing points for the Dn train, take „OFF" signals for the first train first and then take „OFF" signals for second train. Under such circumstances, trailing points incorrectly set are not deemed to be an obstruction in so far as the overlap for the Home is concerned. Under similar conditions, in case of Standard II, the second train would be considerably delayed, as prior to signals being taken „OFF" for its reception; (1) the signals for the first train must be replaced to ON, (2) the point keys carried from the platform frame to the points at both ends of the yard. (3) Both near and far endpoints set and locked as required to receive second train and (4) point keys again brought to the frame.

In Large Yards even though the signalling is complying with std III and fulfil requirement in all other respects, it should be classified as Standard. I, as all trains stop, Main Line may not be isolated

15.4 REVISED STANDARD OF INTERLOCKING

The standards of interlocking amended by Railway Board and holds good for all new & existing installations.
INDIAN RAILWAY SIGNAL ENGINEERING MANUAL, PART - I (1988 EDITION) Addendum and Corrigendum Slip No. 6 (RB's Letter No. 2003/SIG/SEM/3 Dt. 19.05.2004) Chapter VII, Para 7.131, Section M Important Minimum Signalling features

Sl. No	**ITEM**	**As per New Revised Para 7.131**			
1	Allowable Speed (KMPH)	**Std I** Up to 50	**Std II** Up to 110	**Std III** Up to 140	**Std IV** Up to 160
2	Isolation	Y*	Y	Y	Y
3	2A Semaphore/ MAS	2A/MA	2A/MA	MA	MA
4	Double Distant	N	Y**	Y	Y
5	Point Operation	Mech	Mech/Elec	Mech/Elec	Elec
6	Point Locking	Key/FPL/ HPL	FPL/Pt M/c	FPL/Pt M/c	Clamp type direct – (Desirable)
7	Point Detection	Mech/Elec	Mech/Elec	Mech/Elec	Elec
8	Lock Detection	N	Y	Y	Y
9	Interlocking	Key/Mech	Mech/Elec/Electronic	Mech/Elec/Electronic	Elec/Electronic
10	Track Circuiting	N	Run through lines / Running lines	All Running Lines	All Running Lines
11	Block Working	Token	Token / SGE	# SGE / TC	# SGE / TC
12	Preventing SPAD	N	N	N	Y (Desirable)

Note:-

** Speed not exceeding 50 KMPH, if permitted all shunting to be stopped, no vehicle unattached to an engine or not properly secured may be kept standing on a connected line which is not isolated.*

15.5 EXPLANATION

The main difference between standards II and I is that isolation and lock detection is not required in Standard. I. The Multi aspect signals are made compulsory in standard III and standard IV. Double distant signals are mandatory in standard III and standard IV and conditionally required in standard II if on sections where goods trains should have a braking distance of more than 1 KM. For standard IV the clamp type point machine are made desirable and relay OR Electronic Interlocking is compulsory. Standard III and standard IV are applicable on double line sections only. Starter signals are compulsory in Standard III, as they are required for high-speed operation. Standard I and II are not usually employed on the double line sections, except where train densities are usually high. But should they be used on the double line sections , Starter signals should be employed as the General rules require that starter signals cannot be dispensed with on the Double line except in the case of class „C" stations. The main difference between Standard I and remaining standards is that the latter does not permit indirect locking with keys between points and signals. The view that indirect locking with keys is less safe than direct locking, which is not correct, except with direct locking, higher speed is not permitted.

It may be noted that in Standard I, the Home Signal need not be directly interlocked with trailing points, but this interlocking is essential in Standard II. In Standard I, therefore, when two opposite trains are approaching a single line station at which the two trains cannot be received simultaneously, it is usually to set the Up facing points for the Up train and Dn facing points for the Dn train, take off signals for the first train first and then immediately after second train. Under such circumstances, trailing points incorrectly set are not deemed to be an obstruction in As far as the overlap for the Home signal is concerned. Under similar conditions, in case of Standard II, the second train would be considerably delayed, as prior to signals being taken „OFF" for its reception; (1) the signals for the first train must be replaced to ON, (2) the point keys carried from the platform lever frame to the points at both ends of the yard. (3) Both near and far endpoints set and locked as required to receive second train and (4) point keys again carried to the frame.

In Large Yards even though the signalling is complying with std III and fulfil requirement in all other respects, it should be classified as Standard. I, as all trains stop and also Main Line may not be isolated

Review Questions

Subjective Questions

1. Write down main differences between existing and revised standards of interlocking

Objective Questions

State true OR false

1. Isolation is not required in standard III interlocking (False/ True)
2. Lock detection is not required in revised standard II interlocking. (False/ True)
3. Standard IV Interlocked station is possible with centralized lever frame (False/ True)
4. Double distant is not required in standard I station of revised standards of interlocking (False/ True)

Fill up the blanks with correct answers

1. Isolation is required for station with ----------of interlocking

   a) Standard I b) standard II c) standard III d) b & c

* * *

CHAPTER 16: OPERATION OF POINTS

16.1 POINT IN GENERAL

Points, which are used to divert trains from one line to the other, will become a source of danger unless adequate precautions are taken, points are said to be facing when they are approached from the toe end.

Points should be correctly set for trailing movements, but even if they are not, the probability of an accident to a train is remote, but the points will certainly be damaged. Points are said to be trailed through or burst when a movement in the trailing direction takes place with the points incorrectly set (that is set in normal when required in reverse and vice versa). The points are then unsafe for facing movements until repaired (this may not apply to trailable points).

Even a casual study of points will indicate that for movements in the facing direction more precautions should be taken. The points should be correctly set, i.e., the closed switch should be housed correctly against the stock rail and the open switch should be well clear of the corresponding stock rail. A large gap between the closed switch and its stock rail or an insufficient clearance between the open switch and its stock rail will cause a serious accident to the train. The switches should be held in position by an external force, and/or a lock, if not, the vibrations set up by the movement of trains over them may cause the closed switch to open or the open switch to close. The points should be prevented from becoming unlocked during the passage of a train.

16.2 LOCATION OF POINT AND RANGE OF OPERATION

Points must be so located that movements over them shall be within the view of the cabin or other location from which they are worked, unless an approved alternative for direct vision by cabin man, e.g., electric indication, is provided.

The distance at which points may be worked by rodding is stipulated in section 2 of chapter III of "Rules for opening a railway" and must not exceed 320 Mts where the stroke at the lever tail is 150 mm, where the stroke at the lever tail is 200 mm in the above distance may be increased to 460 Mts These distances are also indicated in SEM-1988 para 7.61. Unless otherwise permitted under approved special instructions, rodding must be used throughout for the mechanical working of points and also for bolting them when required.

The correct setting of switches should be proved or detected before a signal can be taken „OFF" for a movement in the facing direction. This is performed either by the signal transmission wire (or wires) itself or by a separate transmission wire (or wires) operated by an independent lever in the case of mechanical signalling and by electrical detection in the case of power signalling. In India normally the two switches are coupled together by at least two flexible stretcher bars (The thick web switches with clamp type locking may not have stretcher bars) to flex equally in the normal and reverse positions.

It is important that gauge at all points and crossings are correct. A metal gauge tie plate is used for this purpose where the points are laid on wooden / PSC sleepers.

16.3 PARAMETER FOR SETTING OF SWITCHES

The maximum gap permitted between the closed switch and the stock rail is 5mm, but it is usual to ensure that the points cannot be locked or detected with a 3.25mm obstruction, placed 150 mm (six inches) from the toe of switch rail, between the switch rail and stock rail. The switches are coupled together and, therefore, the detector checks only the independent movement of each of the two switches for the correct stroke of 115 mm in Broad Gauge and 100 mm in Metre Gauge. But so long as the gauge is correct, it will mean that the switches are correctly set with reference to the respective stock rails and it is for this reason among others, that the gauge should be frequently checked. The frequent checking of the gauge will serve as precaution against worn stock rails, which is not checked by interlocking. The speeds permitted over facing points set for the straight road is dependent on the extent to which these precautions are taken.

16.4 Speed of train over point Standard wise

Points consists of equipment is, a gauge tie plate and a padlock for locking them in operated position, and which may or may not be locally operated are said to be un-interlocked. A speed restriction of 15 KMPH is imposed over them in the facing direction and of 50 KMPH in the trailing direction. Unrestricted speed in the trailing direction is, however, permitted on the straight road if the points are interlocked with signals, even though locking and detection are not provided.

On points, interlocked to standard I requirements, a speed of 50 KMPH is permitted in the facing and unrestricted speed in the trailing direction when the points are set for the straight. When set for the turnout, speed will be further restricted by the curvature of the turnouts (15 KMPH in the case of 1 in 12) in both facing and trailing directions.

On points interlocked to standards II, III speeds of 75 and 100 KMPH are permitted in the facing direction respectively and unrestricted speeds in the trailing direction on the straight road. When set for the turnouts speeds will be further restricted by the curvature of turnouts (15 KMPH in the case of 1/12 and 10 KMPH for 1 in 8 ½ turnouts).

The restriction of 15 KMPH should not be confused with a corresponding restriction over turnouts. The restriction of 15 KMPH over 1 in 8 ½ and 1 in 12 turnouts is on account of curvature (since super elevation cannot be provided on turnouts) is applicable both in the trailing and facing directions for movements over turnouts. Actually, a higher speed may be permitted over 1 in 12 than over 1 in 8 ½ as the former has a greater radius but this is not being done. There should be no change in gradient within 30 Mts for BG, 15 Mts for MG. from points and crossings on the either side, i.e, beyond SRJ and heel of crossing.

The maximum speed permitted over facing points set for the straight road as per previous and revised version of Standards of Interlocking is as follows.

Standards of Interlocking	Existing Standard (speed is up to KMPH)	Revised Standard (speed is up to KMPH)
I	50	50
II	75	110
III	Unrestricted speed	140
IV	Not Applicable	160

The maximum speed permitted a point is set in reverse (negotiating turnout)			
Details of Turnouts	**Permissible Speeds in KMPH**		
	With Straight Switch		**With Curved Thick Web/ Curved Switch**
1 in 8 ½	BG	10	25/15
	MG	10	15
1 in 8 ½ Symmetrical Split	BG	15	40/30
1 in 12	BG	15 *	40/30
	MG	15	25
1 in 16	BG	–	50 or 60 **+**
	MG	–	30
1 in 16 Symmetrical Split	BG	–	75
1 in 20 Turnout	BG	–	50
1 in 24 Turnout	BG	–	100

*In special cases this may be relaxed up to 25 KMPH on interlocked sections where trains may pass on 1 in 12 turnouts throughout the section and locomotives are fitted with Speedo Meters.

+ 60 KMPH permitted only on high speed turnout.

An unrestricted speed is allowed over point in the trailing direction on the straight road.

CHAPTER 17: INTER CABIN CONTROL

17.1 PRINCIPLES OF SLOTTING

Inter cabin control is also known as slotting. The term `Slotting' has come to mean in signalling terminology the control of a signal by source or sources other than the operating source. The control of signals by more than one source is much more frequent than in the use of points.

Signals, for convenience, are worked from the nearest source, but when the control lies which extend into adjoining territories, they are slotted (permitted) from cabins or stations located in all such contiguous territories. A slotted signal cannot be taken `OFF' unless the controls from all remote locations have been operated, but it should be possible for any one of the controlling agencies to replace the signal to its most restrictive aspect.

17.1.1 The purpose of slotting is two fold

(a) To ensure that the points located on the line controlled by the signal including the overlap are set correctly and facing points locked and the line is clear, before the signal is taken „OFF“ and

(b) These conditions are maintained until the train movement is completed. In other words, no other conflicting or fouling movement is allowed to take place and the points are not altered until the train movement is completed.

Because a slotted signal can be replaced to its most restrictive aspect by any one of the slotting agencies, it follows that other signals which are dependent upon or released by the slotted signal, should also be similarly slotted so that the aspects displayed by all these signals are in correspondence.

These principles are best understood by a reference to the Fig. 17.2. Home signals 3, 4 & 5 are worked from Cabin „A“ for convenience but they encroach into territory controlled by „B“ cabin. The Block instruments are located in the SM's office and the SM has overall control over movements and is responsible for line nomination. Before the Home signal can be taken „OFF“ the line must be clear up to the far end trailing points and the Signal Overlap. of 180 Mts beyond it. The signals are therefore, controlled from „B“ cabin as well as by the S.M. Because the loop lines terminate into sand humps and the far end points can be set either way, it may be argued that the Loop Home signal need not be controlled by „B“ cabin. This argument is only partially true, i.e. only in so far as the setting of the far end points for the overlap is concerned, but unless, slotting arrangement is provided, „B“ cabin cannot be held responsible for the monitoring of the line `clear', till the train movement is completed, nor will be in a position to replace the signals, in case an emergency occurring in his territory.

The Outer signal No.2 is released by any one of the Home signals and, therefore, it should also be slotted so that it returns to the `ON' position as soon as the Home is returned to the `ON' position by „B“ cabin or by the SM, so that any one of them can replace it and it can be ensured that

(i) the Main line is clear,

(ii) All points are set and locked for the Main line

(iii) Permission to approach from the next station in advance has been received and,

(iv) All signals for Main line have been taken „OFF“, before the Warner can be taken „OFF“ and

(v) These conditions are maintained until the train movement is completed.

17.2 Types of Controls Slots

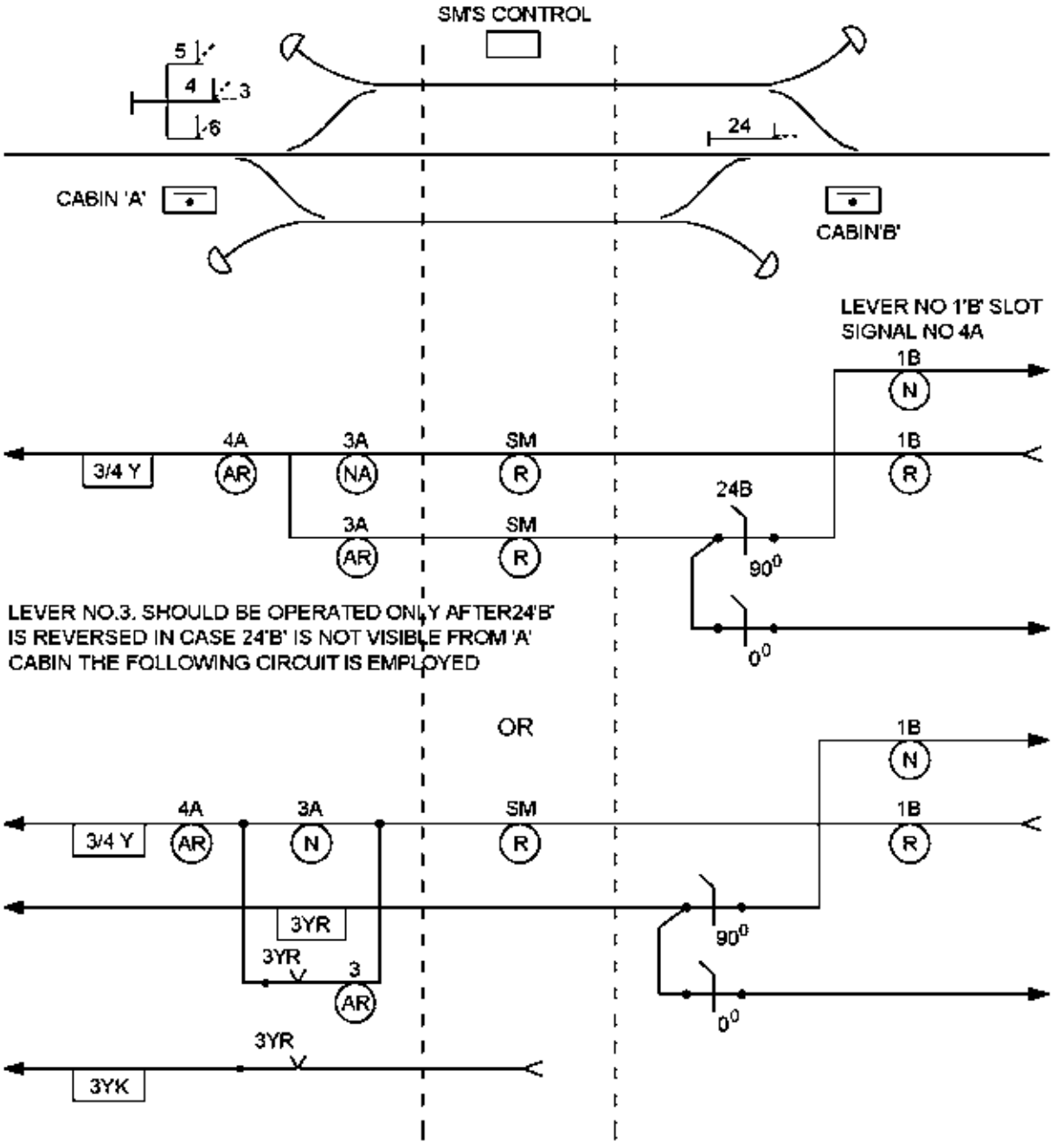
The following types of Controls/Slots are in general use in mechanical installations:

(a) The mechanical lever lock worked by key transmitted electrically

(b) The electric lever lock

(c) The electric signal reverser post type

The design, construction and maintenance of the various types of slots are dealt with elsewhere.



b) REVERSER CONTROL OF A 3 - ASPECT SEMAPHORE SIGNAL.

Review questions

1. Write down in short the purpose of slotting.

* * *

CHAPTER 18: LEVEL CROSSING GATES

18.1 INTRODUCTION

When road traffic crosses rail traffic over a bridge or under a bridge at a different level no signalling arrangements are required. When road traffic crosses the rail traffic at the same level they are known as Level crossings and signalling arrangements at such crossings may be required if they are busy. A road rail crossing at different levels is, of course, the best arrangement as it is completely safe and the movement of road traffic is then unrestricted but in view of the high initial cost of bridges, such crossings are employed only where road or rail traffic are heavy.

In Level crossings, the roadway is brought up to the level of rail tables and guard rails provided to ensure the roadway clear of wheel flanges.

Level crossing gates are either of the swing type with one or two leaves on each side depending on the width of roadway, or of the barrier type. There are two types of barriers, of the track the movable and the lifting. The movable barrier is superior to the swing type gate because they can be quickly operated and move parallel to the track they are not obstructed by road traffic as may happen with swing gates opening away from the track. However, in view of the difficulty involved in keeping the bearing rails free from dirt etc. They are not popular and are obsolete now.

The use of lifting barriers constitutes the best arrangement from the points of view of quick clearance and the control can be local or remote or automatic as required. In lifting barrier operation, it should be ensured that the road vehicles are not trapped over the tracks. When the barriers are controlled manually either from gate lodge or from a remote location such as from a nearby cabin, the operator must be able to see that the crossing is clear of road vehicles before signals for a train are taken „OFF“. In the event of a good view of the Level crossing being not available to the operator in the cabin, in the continent closed circuit TV is employed, for the surveillance of roadways. In U.K. all automatic barriers are of the half barrier type (see figure 18.1.) to eliminate the possibility of road vehicles being trapped over tracks. But in the case of manually operated barriers, it is the practice that they shall be of the full barrier type; because manual barriers may remain closed for longer durations than necessary. When this happens frequently, the road users may be tempted to take the risk of zigzagging their way through the half closed barriers.

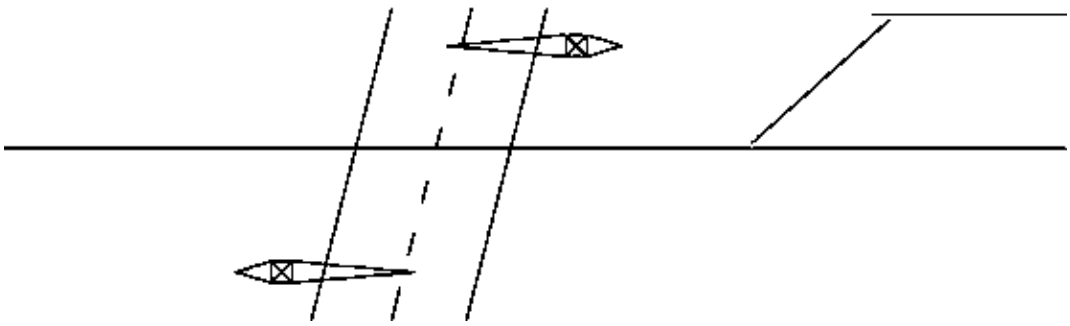


Fig.18.1. LIFTING BARRIERS – HALF BARRIER TYPE

In U.S. there are several Level crossings in which gates or barriers are not provided, the road traffic being entirely controlled by road signals. Although this practice eliminates expenditure on staff, accidents take place occasionally and, therefore, the present trend is to provide lifting barriers worked automatically or controlled remotely.

All Level crossings in this country (except cattle crossings) are provided with gates of one or the other type, or at least chains and the vast majority of them are manned. In Europe and USA, it is very common to provide only signals (and no physical barriers) at Level crossings

to warn road users of approaching trains. However, this arrangement is not practicable in India. Therefore, manning of Level crossings becomes necessary even though it is expensive. Remote operation (using closed circuit television for surveillance of the roadway over and near the crossing) is a possibility but has not so far been tried either with full barriers or with half barriers.

Where lifting barriers are operated from the nearest cabin, the distance from the cabin to the L.C. is limited to 150 Mts. It is necessary that the operator have a clear view of the L.C. and approach road on either side to ensure that speedy vehicles do not damage the lifting barriers or get trapped between the barriers. To prevent speeding vehicles damaging the barriers at the time of closing, the present directives are to provide humps or speed breakers on both sides of approach of Level crossings.

18.2 CLASSIFICATION OF GATES

The classification of Level crossings is made after conducting the Level crossing census once in 3 years by a team consisting of supervisors of Engg. and traffic department shall do the census of TVU for seven days generally and average per day is taken.

(TVU train vehicle unit = No of trains x No of road vehicles . Train /motor vehicle, Bullock Cart and Tanga – 01 unit; Cycle, Rickshaw and Auto-rickshaw - ½ unit)

Classification of Level crossing gate is given below

For road vehicles : - „Special" class, „A" Class , „B" Class , „C" Class

For cattle crossings :- „D" Class.

Details are shown in the table below.

Sl.	Class	Criteria	Interlocking/Remarks
1	Special class	TVU greater than 50,000	R.O.B/R.U.B to be provided. Gate to be interlocked till R.O.B is commissioned
2	„A" class	TVU between 30,000 – 50,000 and number of road vehicles greater than 1000	Compulsory
	„B" class	TVU between 20,000 – 30,000 and number of road vehicles greater than 750	
3	„B1" class „B2" class	TVU between 25,000 – 30,000 TVU between 20,000 – 25,000	To be interlocked if existing within station limits.
4	„C" class	All other L.C. gate not covered in above classes	L.C. Gate to be manned under following circumstances: 1. >3000 Cat „CI" & >2500 Cat „CII"
5	„D" class	For Cattle Crossing	---

2. Normal Position of Gate			
	Shall be normally kept open to road traffic	interlocke If d, shall b e normally kept open to road traffic.	
3. Telephonic Communication from the Gate Lodge			
a) Within or outside station limits	Telephone communication to be provided with Assistant Station Master"s office with all manned Level crossing gates.		havin In Block sections g number of Level crossing gates, the connections should distribut be uniformly ed between the Block stations.
4. Warning Bells or Hooters Operated by Approaching Train			
a) Within or outside station limits	Warning Bells or Hooters operated by approaching train should be provided.	Warning Bells or Hooter s operated by approachin g train should be provided, where Level crossing is at outside the limit i station s n all suburban sections non- and suburban sections provided with Automati c Block signalling territories.	Provisio o warnin n f g bells operate approachin d by g trains should be confined to interlocke d Level crossing gates only. Hooters shall be provide wher powe d, e ever r supply is available.
5. Type of Lifting Barrier			
a) Within or outside station limits	Electrically operated lifting barrier to be provided.	Electrically operated lifting t barrier o be provided in suburban sectio n.	In non-suburban section, electricall y operated lifting barrier to be provided, where power supply is reliable.
6. Approach Locking			
	i) To be provided in suburban section and	i) To be provided in suburba n section	

	ii) Dead approach locking with time lag of 30 seconds in other sections.	and ii) Dead approach locking with time lag of 30 seconds in other sections, where electrically operated lifting barriers are provided.	

Note:

(a) The Level crossing inside station limits should be beyond the advanced starters or beyond the limits up to which shunting is normally carried out or at an adequate distance of at least 250 Mts ahead of the starters and trailing points of the station where advanced starters/shunting limit boards are not provided.

(b) In case of Level crossings falling on suburban section they may be considered for up gradation to „B" class in the event of their not qualifying for up gradation to „special" or „A" class and when so up graded to „B" class the facilities as indicated for „B" class should be provided.

(c) In the case of Level crossings located outside station limits, protected by signals where the sighting distance of the signal by the engine driver is inadequate a warning board should be placed at not less than Emergency Braking distance in rear of the gate stop signal.

(d) Where Level crossing is situated outside station limits in close proximity thereof, the clear distance between the LC and an Outer signal should not be less than a full train length

(e) In cases where communication with ASM is stipulated, the communication may be given to the switchman in the cabin as per the local condition.

(f) Provision of warning bells operated by approaching trains should be confined to interlocked Level crossings only.

(g) *Railway Boards letters No 20000/safety (A&R) /19/39 Pt Dt 01.10.2009 stipulates the essential condition to maintain normal position of manned Level crossing gate provided with telephone* ***"open to road traffic"*** *subject to clear view of an approaching train. In case the telephone at such manned Level crossing Gates, with normal position "open to road traffic" becoming defective (other than at interlocked gates), Railways are advised to treat these LC Gates (with restricted visibility) to have a working system similar to that applicable for gates with normal position" closed to road traffic".*

It will be noted that in accordance with the rules, the interlocking of gates with signals is compulsory only in the case of the most important category, viz., „Special class“ and in the case of „A“ class only, if located within station limits. However, in accordance with the instructions issued by Railway Board, all „Special“ and „A“ class gates are interlocked and also „B“ class, if the „B“ class gates are operated from the cabin.

At all busy Level crossings, the gates on of both sides should be coupled so that they may be closed simultaneously. Wicket gates are provided at all „Special“, „A“ and „B“ class crossings so that slow moving pedestrian traffic (which may be depended upon to exercise due caution, is not unnecessarily detained. For similar reasons, V shaped traps, which enable cycles being carried across the closed gates, are also provided where necessary.

All Level crossings, irrespective of their classification, must be interlocked if they fall in sections provided with automatic signals. `B' class gates falling in Suburban Sections shall also be interlocked. Further interlocking shall be provided for all `B' and `C' class gates if they are operated from the Cabin.

18.3 LOCATION OF LC GATE

Level crossings should not be located fouling reception or stabling lines or within the signals overlaps at stations. In the case where a Level crossing is located within signal overlap, it is to be ensured that the signals are taken „OFF“ only after the gates are closed against road traffic and the Level crossing is clear of road traffic. Level crossings do not, however, constitute an obstruction in so far as block overlaps are concerned and may, therefore, be located in them. (This is consistent with the practice of Level crossings being permitted in Block sections).

Level crossings located in Block section should as far as possible, provide an uninterrupted view to Loco pilot of approaching trains. Where adequate visibility is not available due to sharp curves or deep cuttings, a telephone communication with the adjacent station is required to be provided.

18.4 PROTECTION

Figure below shows two methods of interlocking the Level crossing gate located outside the station limits i.e. in the block section:

In case of Two aspect territories, a stop signal at 400 Mts from the gate with a `G' marker and a warning board at 1 KM in rear of the gate signal shall be provided.

In case of multiple aspect territory, both colour light signalling and upper quadrant, a stop signal at 180 Mts from the gate with a `G' marker and a distant signal at 1 KM in rear of the stop signal shall be provided.

In case of MLQ territories the same procedure as in Multiple aspect may be followed.

Where the speed of goods train exceeds 72 KMPH, a second Warning board also should be provided at a distance of 1.4 KM in rear of the stop signal in all types of signalling.

A lever frame or some other operating device is provided for the control of the gate lock and signals and to provide the interlocking.

18.5 WARNING ARRANGEMENTS

A warning arrangement is provided at all „Special“ class Level crossing Gate located outside station limits and `A' class Level crossings falling on suburban sections and Automatic Signalling Sections. It is also desirable at other `A' class Level crossing when justified on account of local conditions. This may consist of a bell worked by trains when they pass over track circuits located at adequate distances in rear of the Level crossings. A telephone must be provided at all special and `A' class Level crossings in addition to the warning bell arrangement. A telephone is also required at `B' and `C' class/Level crossings located within station limits or on suburban and Rajdhani routes.

An automatic warning arrangement in the form of a bell controlled by the trains is mandatory in Automatic signalling sections. This is ideal at suburban sections where the frequency of trains is high and the trains are of identical types. If this were employed at locations where train densities are low and different classes of trains (fast express and slow goods) are in operation, road traffic will be unnecessarily detained in the case of goods trains, as the treadle or track circuit controlling the bell has to be located at a fixed distance in rear of the signal protecting the level crossing is adequate for the fastest train. Although comparatively more expensive, the automatic bell is the most dependable warning system; even if there is a failure the bell will ring.

In some countries, a speed detection device is employed in conjunction with the automatic warning system so that the period at which the gates or barriers remain closed is neither early nor late excessive, when dealing with slow trains, as compared with the faster trains or, in the other words, the warning is on a fixed time basis rather than on a fixed distance basis.

18.6 PROTECTION OF LEVEL CROSSING INSIDE THE STATION LIMITS

In the case of Level crossings located inside the station limits of Block stations worked under the Absolute Block system, the stop signals on either side of the Level crossing are utilised to function also as gate signals by providing interlocking between them and the Level crossing gates or barriers. But, if stop signals are not available for the purpose, exclusively signal or signals is/are installed for protecting important Level crossings.

In the case of the Automatic Block system, the question of inside or outside station limits does not arise; stop signals on either side of the Level crossing if available at appropriate distances from the Level crossing are made use of to function as gate signals also. In the event the stop signal on one or the other side of the Level crossing is not located at the correct distance, the signal or signals as the case may be, are shifted to new location, but if this cannot be done for operational reasons, separate gate signals are provided. Some specific cases of gates or barriers located inside station limits will now be discussed.

18.6.1 LEVEL CROSSINGS AT CLASS 'B' STATIONS

There are three possible positions for Level crossings inside the station limits of stations on the single line: -

(a) Between Outer and Home not infringing the signal overlap

(b) On the signal overlaps

(c) On reception lines.

Although (b) and (c) are undesirable positions, but still exist.

In the case of (a) assuming the L.C. gate is between down Outer and up Advanced starter (as shown fig. below). The Outer signal shall also work as gate signal, which must be placed minimum 400 Mts in rear of the L.C. gate. For quick opening of gate after train has passed it, the gate should be interlocked only with down Outer (instead of Dn. Home signals) and with up-Advanced starter for up direction trains.

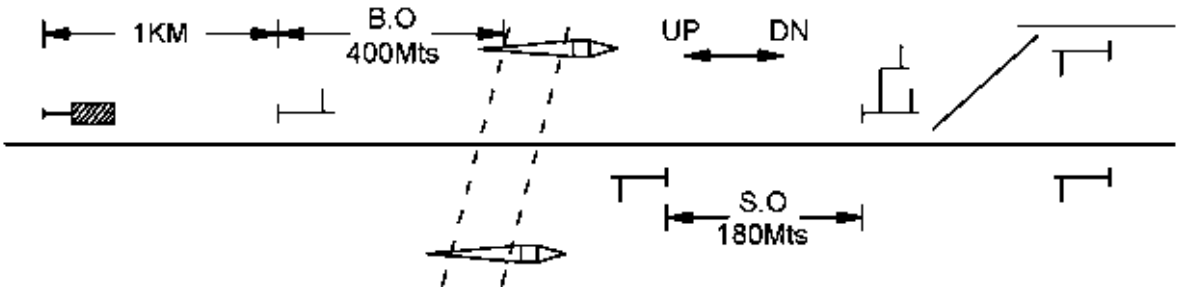


Fig. 18.6.1 (a) L.C Gate is between outer and Advanced starter

In the case of (b) if the L.C. gate is on the signal overlap i.e. between up Advanced starter and down Home (as shown in Fig. below) no signals are required to be shifted whereas the interlocking will be extended up to up Home signals in addition to the Down Home signals, up Advanced starter and starters.

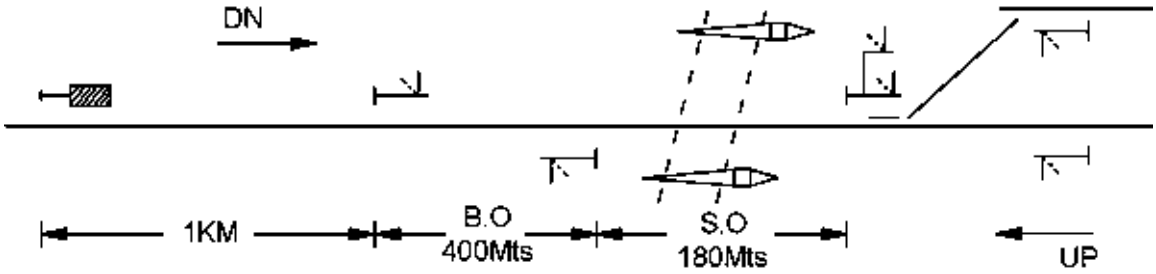


Fig: 18.6.1(b) LEVEL CROSSING IN CLASS „B“ STATIONS

In the case of (c) if the L.C. gate is interlocked with up and down Home signals. This may be noted that in all the above cases the signal controlling L.C. gate is not provided with `G' Marker.

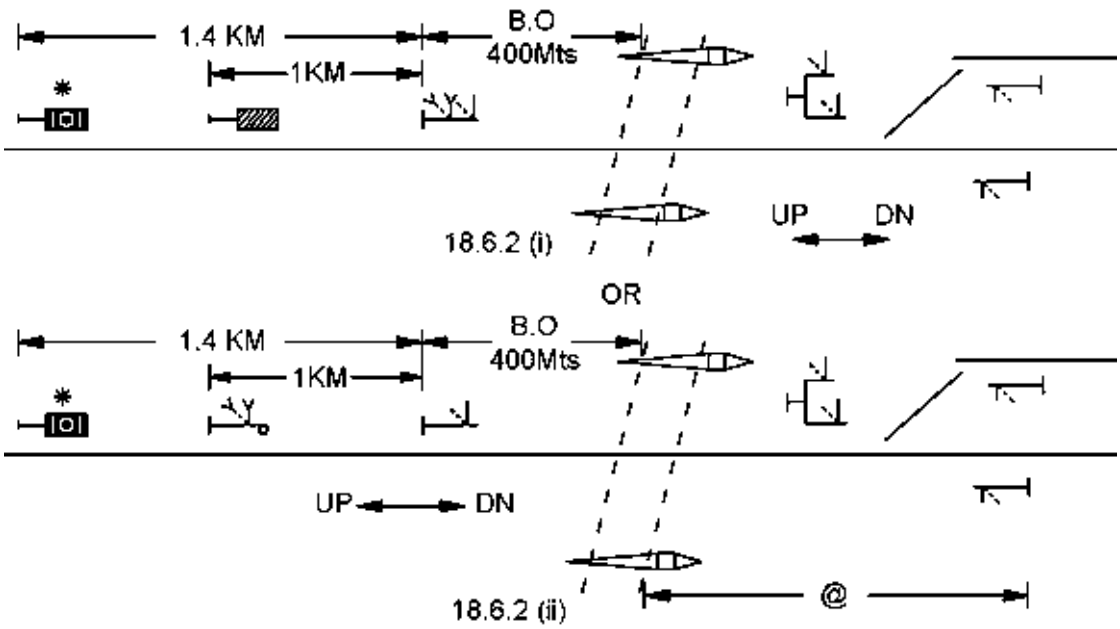
The L.C. gate located inside the station limits of a double line class `B' are protected in a similar way.

18.6.2 LEVEL CROSSINGS AT CLASS `A' AND `C' STATIONS

(a) **CLASS `A':** Taking the case of a Level crossing located between the DN Warner and the DN Home of a Class `A' station the interlocking arrangement should be as shown in Figure below.

In the Dn direction, a gate stop signal has to be provided at not less than 400m from the Level crossing. This signal may be provided on the same post of the Warner as shown in figure (i) or on a separate post by itself and the Warner shifted as shown in figure (ii).

In the Up direction, the gates are interlocked with the starter signal and where the distance between the starter and the Level crossing is less than 180m the interlocking should be extended to the Up Home signal also.



* Necessary when the speed of the Goods train is more than 72 KMPH

@ If the distance is less than 180 Mts interlocking should be extended to Up Home Signal Fig.18.6.2 Level crossing situated between Warner and Home at Class „A“ station

**CLASS `C':** In the case of a Class `C' station, where the gate is in a similar location as above the Interlocking of the gate in the Up direction should be achieved by the Up Home signal as there is no Starter signal in Class `C' station.

18.7 LEVEL CROSSING LOCATED WITHIN STATION LIMITS IN MAS SIGNALLING

A typical layout with MAS signalling as shown in Fig. 18.7, may have a Level crossing at any location it is possible within the station limits is marked as (1) (2) & (3).

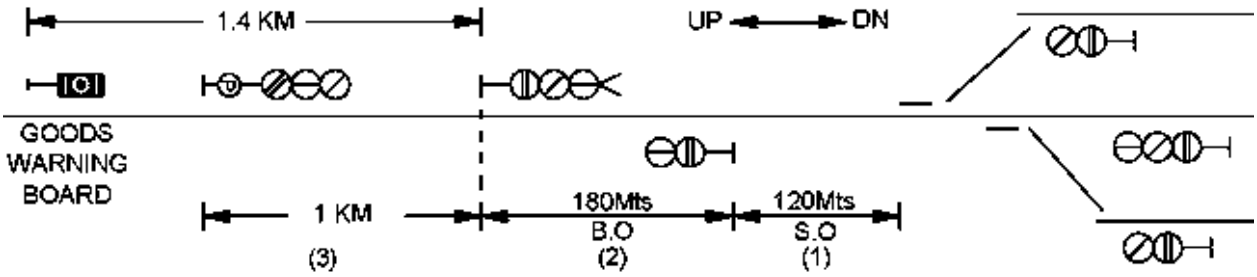


Fig.18.7

In the case of (1) if the gate is located on signal overlap i.e. between the up Advanced starter and the outer most trailing points on single line, as shown in fig.18.7 above the location of signals need not be changed as shown below Fig.18.8 . The gate shall be interlocked with down Home signal, up Starter, up Advanced starter and up Home signal.

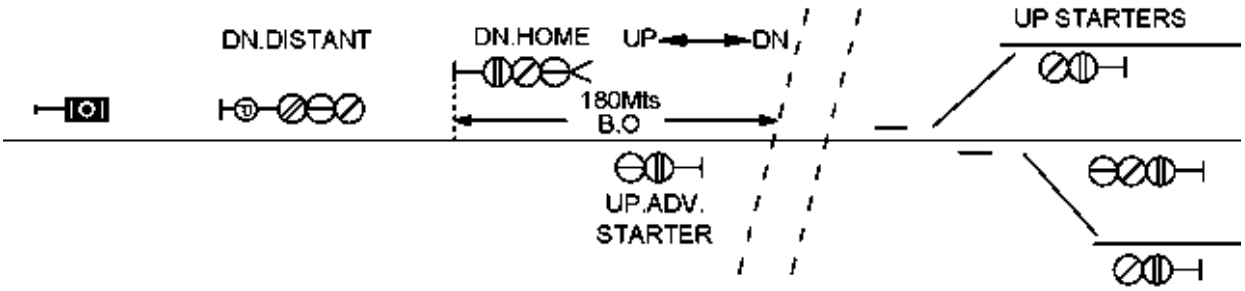


Fig.18.8

On Double line as per Fig.18.9 the down Home signal, which is 180 Mts from the facing point or BSLB, will now be shifted at 180 Mts from the L.C gate. Consequently the Distant signal also to be located at 1 KM from Home. The interlocking arrangements will be same as shown for single line above.

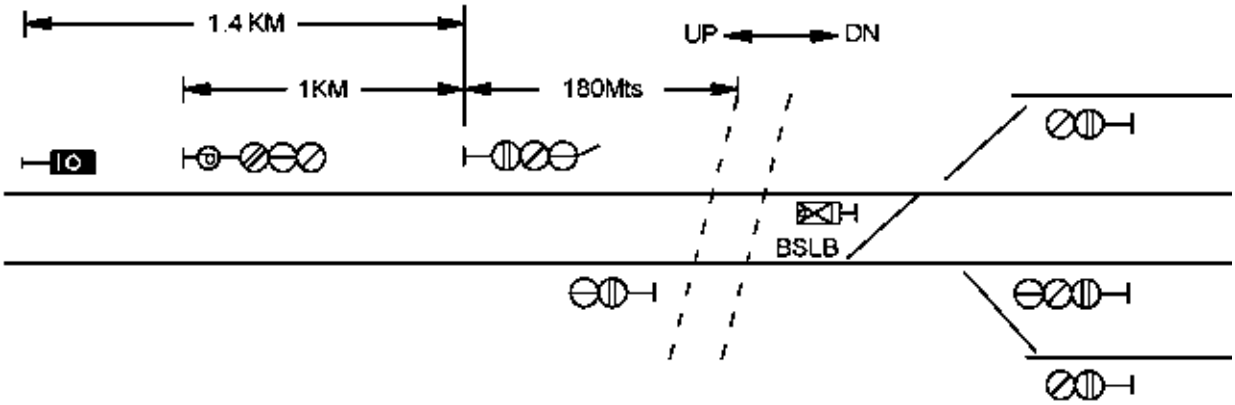


Fig.18.9

(b) if the L.C gate is between the down Home signal and up Advanced starter on single line Fig. 18.10 or double line Fig. 18.11. The down Home signal only need to be located at 180 Mts in rear of the L.C gate and the down Distant at 1KM in rear of the down Home signal. The gate should be interlocked with down Home signal and up Advanced starter only (see fig. below).

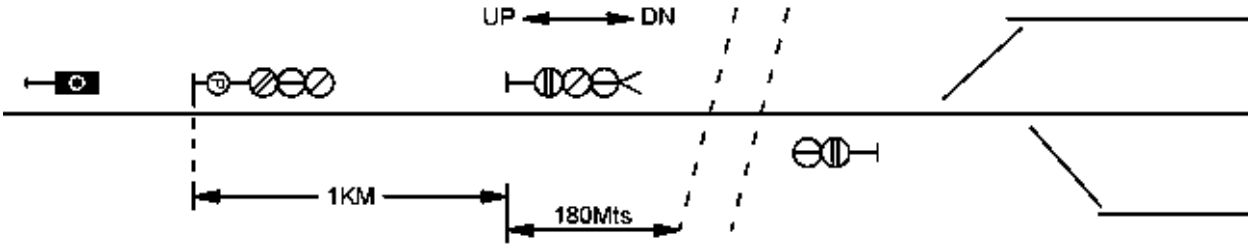


Fig.18.10

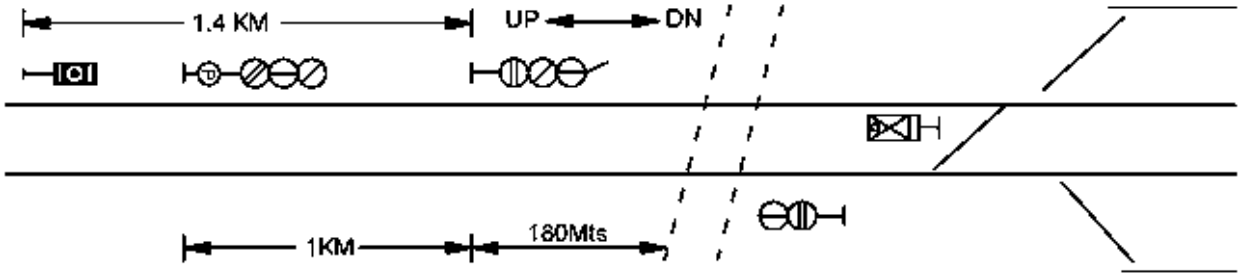


Fig.18.11

(c) In the case, where the Level crossing is located between down Home signal and the down Distant, the interlocking arrangement may depend upon the vicinity of gate from the Home signal. If the gate is just in rear of the Home signal the Home may be shifted at 180 Mts in rear of the gate and the Distant at 1KM. in rear of the Home signal, as in the case above whether Single line or Double line. This arrangement is applicable for single Distant territory.

(i) But if the L.C gate is little away from the down Home signal say less than a train length (approx. 300 to 400 Mts) it is better to provide the Home Signal at 180 Mts in rear of the gate and a routing Home signal near the points as shown in the Fig. Below Fig. 18.12 (i).

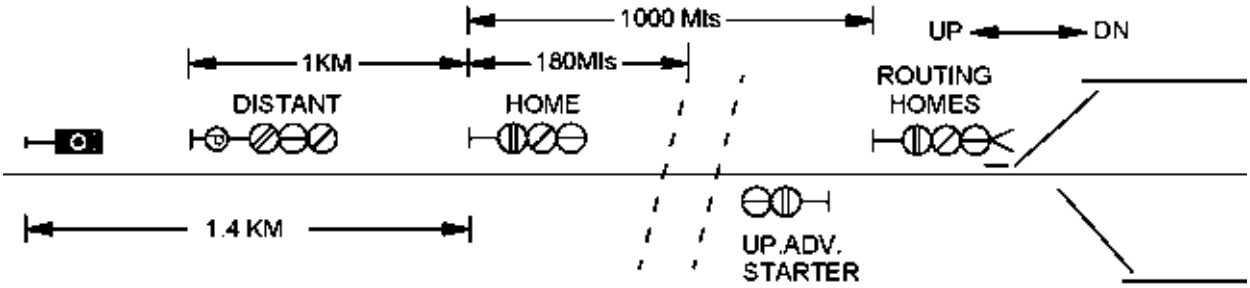


Fig.18.12 (i)

The gate shall be interlocked with down Home signal and the up advanced starter and with routing Home signal if required. The Home signal as permitting the entry of trains into the station shall be interlocked with routing Home signal and shall not have `G' marker.

(ii) Another situation is that when the L.C. gate is located more than a train length in rear of the Home signal and less than BD. (1KM) between gate signal and Home signal. The gate stop signals in both directions have to be provided with `G' marker at 180 Mts in rear of the L.C gate as shown in fig. below 18.12 (ii).

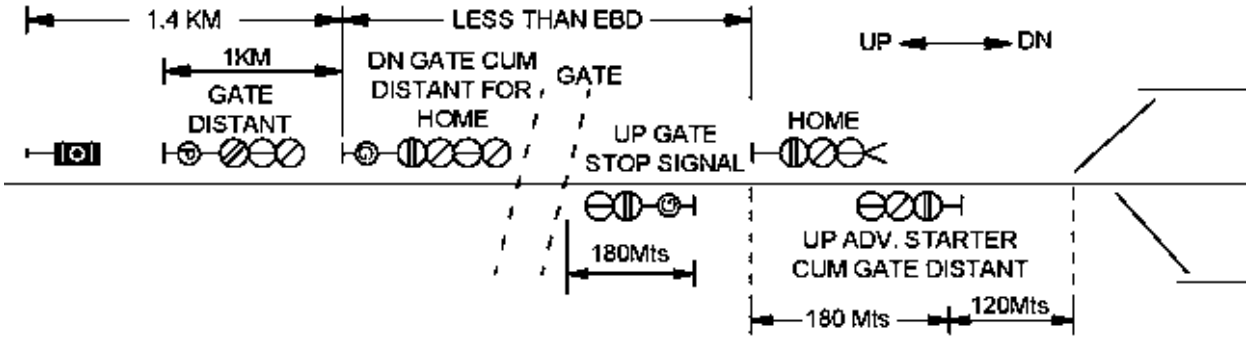


Fig.18.12 (ii)

At that time the up advanced starter shall work as advanced starter cum gate distant, capable of showing red, yellow and green (0-45-90). The gate cum distant for down home will have red, yellow and green.

(iii) If the L.C gate is just ahead of the DN Distant Signal and far in rear of Home signal as in the case of (3) of Fig. 18.7. The gate stop signals with `G' markers are provided on either side of the L.C. gate at 180 Mts, similar to that of (ii) above. The down distant will have only yellow and green aspects, the YY (attention) aspect can be dispensed with, since the distance between the down gate signal and the down Home is more than BD. The interlocking arrangements will be the same as mentioned for 18.12 (ii) above.

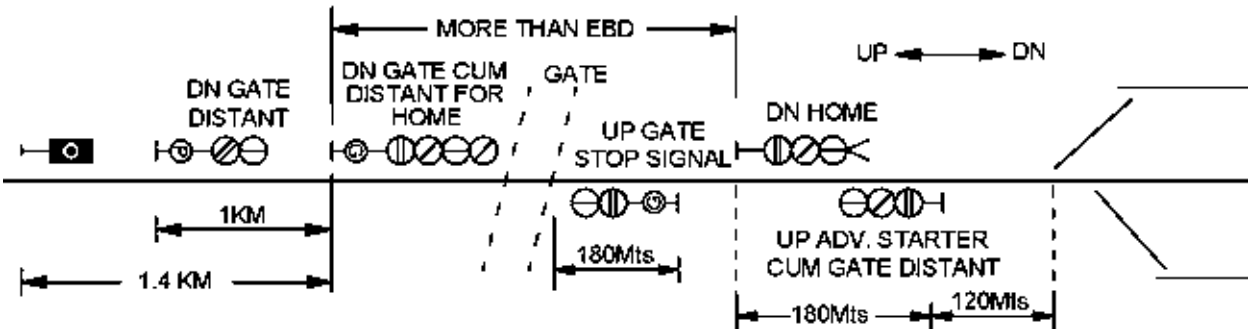


Fig.18.12 (iii)

Owing to these reasons, the DN distant signal is being shifted to a very long distance from the place of operation, so this can be a motor operated, or under approved special instructions this can be a colour light, while all other signals at the station are semaphore signals.

Introducing a gate stop signal capable of showing stop, caution and clear aspects and shifting the down Distant signal so as to have BD in rear of the gate stop signal. The arrangement shown in fig. 18.12 (ii) & (iii). This may be noted that the Distant signal shall show all the three aspects in the case of (ii) and shall show only Caution and Clear aspects in the case of 18.12 (iii) since BD is available between down Gate and down Home signals.

The aspects required for condition obtaining in Fig. (ii) are shown below: -

LEVEL CROSSING GATES

Sl, No	Version	GATE Distant	GATE HOME cum DISTANT	HOME	Indication
1.	existing revision	Y	R	R	Gate is open Stop at Gate Home
2.	existing revision	YY	Y	R	Stop at DOWN Home
3.	existing	YY	YY	Y-U	Enter on Loop Line. Stop at Starter
	revision	YY	YY	May be Y-U OR Y	Gate is closed and required to ☐ Stop at main line or loop line starter or ☐ Run through on loop line
4.	existing	YY	G	Y	Enter on MAIN Line. Stop at Starter
	revision	YY	YY	May be Y-U OR Y	Gate is closed and required to ☐ Stop at main line or loop line starter or ☐ Run through on loop line
5.	existing	G	Y	-	LC gate is closed and Enter on main line
	revision	G	G	G	LC gate is closed and Run through on main line
6.	Aspect of gate home cum distant signal as per Rly Board Letter No 2009/ safety (A&R)/19/24 dated 06/12/2010				

The aspects required for conditions obtaining in Fig. (iii) are shown below:

Sl, No	Version	GATE Distant	GATE HOME cum DISTANT	HOME	Indication
1.	existing revision	Y	R	R	Gate is open Stop at Gate Home
2.	existing revision	G	Y	R	Stop at DN Home
3.	existing	G	YY	Y-U	Enter on Loop Line. Stop at Starter
	revision	G	YY	May be Y-U OR Y	Gate is closed and required to ☐ Stop at main line or loop line starter or ☐ Run through on loop line
	existing	G	G	Y	Enter on MAIN Line. Stop at Starter

4.	revision	G	YY	May be Y-U OR Y	Gate is closed and required to ☐ Stop at main line or loop line starter or ☐ Run through on loop line
5.	existing	G	Y	-	LC gate is closed and Enter on main line
	revision	G	G	G	LC gate is closed and Run through on main line
6.	Aspect of gate home cum distant signal as per Rly Board Letter No 2009/ safety (A&R)/19/24 dated 06/12/2010				

CONTROL OF LEVEL CROSSINGS IN AUTOMATIC SIGNALLING SECTIONS

Some other aspect control of combined signal as per new Railway board letter No 2009/safety (A&R)/19/24 Dated 27-07-2011 are as follows,

Intermediate Block Signal (IB) - cum Distant signal:-

(a) Whenever the Block section ahead is not clear - Red.

(b) When the train is required to stop at the Home signal of station ahead - Yellow.

(c) When the train is required to stop at the Main line or Loop line Starter or is required to pass through via Loop line – Double Yellow.

(d) When Block section ahead is clear train is to pass run through the station via Main line – Green.

Last Stop Signal-cum Distant signal of L.C gate:-

(a) When the Line clear has not been obtained from the station in advance – Red.

(b) When the Line clear has been obtained and the L.C gate is open to road traffic - Yellow.

(c) When the Line clear has been obtained and the L.C gate is closed to road traffic – Green.

Last stop Signal-cum Distant Signal of Intermediate Block Signal (IB)

(a) When the Line clear has not been obtained from the station in advance –Red.

(b) When The Block section is clear for an adequate distance beyond intermediate Block Signal (IB) and the train is required to stop at Intermediate Block Signal(IB) –Yellow

(c) When the train is required to pass run through Intermediate Block Signal(IB) – Green.

18.8 CONTROL OF LEVEL CROSSINGS IN AUTOMATIC SIGNALLING SECTIONS:

BOARD'S DIRECTIVE: (Board's letter No.77/W3/SG/LX/2 dated 16.3.79)

(a) All Level crossing gates shall be interlocked irrespective of the classification.

(b) All Level crossings shall be provided with warning Bells operated by the approaching trains.

(c) Approach locking should be provided on the control lever of the Level crossing so that, only when the portion of the track/tracks between the Level crossing and the signals protecting the Level crossing are clear, the gates can be opened.

(d) Flashing lights to be provided.

It may be seen from the above that all the Level crossings irrespective of classification in Automatic Signalling sections shall be interlocked, provided with Warning Bells and Approach locking. In addition, as per extant directions in vogue, lifting barriers are to be provided.

The lifting barriers at the Level crossings can be operated locally either by winch or by electric motor. In busy sections where Automatic signalling is provided, the Lifting barriers are electrically operated for quicker operation thereby eliminating the mechanical wire transmission required for operating barriers from the winch.

LEVEL CROSSING GATES

(i) Interlocking: Interlocking of Level crossing gates in Automatic signalling territory is compulsory for protection of Rail and Road traffic. Signals at adequate distance from the Level crossing shall be provided on either side and the signals can be cleared only after the Level crossing is closed and locked against road traffic.

The gate signals thus controlled by Level crossings have `A' Marker lights in addition to `G' Marker disc. The `A' Marker light will be lit only after the Level crossing is closed and locked against road traffic. Normally no train shall pass a signal at `ON' without proper authority when `A' Marker light is extinguished. But where `A' Marker light is provided in conjunction with `G' Marker disc and `A' Marker light is not burning, the Driver is authorised to pass the gate signal at `ON" after stopping the train at the signal for one minute by day and two minutes by night and then proceed cautiously to stop short of the Level crossing to ascertain the cause. If the L.C gate is closed, the driver may start the train and proceed cautiously up to the next signal and then obey the aspect of the next signal. If, however, the Level crossing is not closed due to Gateman not being available or for any other reason, the Driver will ensure the closing of the Level crossing gates against road traffic before passing the Level crossing and arrange for opening the Level crossing for road traffic after passing the Level crossing completely.

If however `A' Marker light is lit, with the Signal at `ON' the driver need not stop at the Level crossing but proceed as per the normal rules pertaining to automatic signals.

(ii) WARNING BELLS: Provision of Warning Bells is compulsory at all Level crossings in Automatic Signalling sections. The Warning Bells shall be operated by approaching trains and, track circuits are used for this purpose. The treadles or track circuits are provided at appropriate distance from the Level crossing to enable the gateman getting the warning of the approaching train well in advance so that the Level crossing can be closed and locked immediately and gate signals cleared. The warning distance shall be so judiciously chosen that

- ☐ The Level crossing is not closed too early; affecting the road traffic
- ☐ The clearance of the signal is not delayed affecting the train traffic

(iii) APPROACH LOCKING: Railway Board directives stipulates that all the Level crossings in Automatic signalling sections are approach locked. Generally a single lever frame is provided at the Level crossing for operating the Lifting barriers. The lever when reversed feeds the electric motor of the lifting barrier and causes the Lifting barrier to lower across the road. When the boom is lowered, the circuits for clearing of signals are completed and the signals are cleared.

When it is necessary to raise the lifting barrier for road traffic to pass over the crossing, the lever must be placed to its normal position. This can only be done if there is no train in the immediate vicinity. If a train has approached as near as to have passed beyond the service braking distance i.e. a point of hundred Mts on the approach side of the signal at which the first warning aspect is given, the lever can only be replaced to their normal check lock position and it should not be possible to restore it to its full normal position. The lifting barrier will, therefore, remain locked although the protecting signal aspects might have been returned to `ON'.

Flashing Lights are provided at the Level crossing with Lifting barrier to warn the Road Traffic when a train is approaching the Level crossing with gates opened. When the gates are closed, the flashing lights become steady.

CONTROL OF LEVEL CROSSINGS IN AUTOMATIC SIGNALLING SECTIONS

Note:

1. *All Level crossing gates irrespective of classification, on Automatic sections Single/Double, Treble and Quadruple lines shall be interlocked and provided with warning bells operated by approaching train. In addition, Approach locking to be provided on control levers.*

2. *Flashing lights to be provided, where power supply is available, and at all important Level crossing gates provided with lifting barriers.*

(iv) EXCEPTION: Non-interlocked `B' and `C' class gates with heavy traffic can be kept normally open to Road Traffic provided the following conditions are satisfied:

- ☐ The Level crossing should not be on a Suburban section.
- ☐ The section concerned should not have Automatic block signalling.
- ☐ Level crossings should be equipped with lifting barriers.
- ☐ The Level crossings should be provided with a telephonic connection with the Station Master and should have a system of exchange of private numbers.
- ☐ The Railway track at the Level crossing should be straight on either side to afford a clear view of an approaching train.
- ☐ As long as the gate is kept open to road traffic a red flag by day and red light (by using Trolley Lamp) during night should be displayed towards the approaching trains on either side of the Level crossing.
- ☐ The Level crossing shall be provided with whistle Boards on either side at adequate distance to alert the Loco pilot of approaching train to give audible warning regarding the approach of the train to the road users.

REFERENCES:

(a) Rly.Board's letter No.77/W-3/SG/LX/2 dated 16.3.79.

(b) Rly.Board's letter No.77/W-3/SG/LX/2 dated 01.11.80.

(c) Rly.Board's letter No.83/W1/LX/16 dated 26.02.83.

(d) RAIC 1968 para 121 (Board's letter No.77/W3/SG/LX/2/0 dated 17.7.80

LEVEL CROSSING GATES

Review Questions

Subjective Questions

1. What is an interlocked gate and classify the LC Gate on the Basis of department of operator, type of barrier and TVU?

2. Draw lay out of an interlocked LC gate in Block section and indicate location of signal, boards and markers.

3. Draw lay out of an interlocked LC gate located between Starter and Advanced starter on double line station provided with MACLS and write down signal to be interlocked with Gate.

Objective Questions

State true OR false

1. If LC Gate is interlocked with Advanced starter then a G maker shall be provided below Advanced starter. (False/ True)

2. Permissible distance between the LC Gate and place of operation is 150 Mts. (False/ True)

3. Interlocked gate signals shall be located at Block overlap (False/ True)

4. If gate is within overlap of a Home signal but beyond 180 Mts from starter then Home signal can taken to „OFF“ even though LC Gate is in open condition in Single line section (False/ True)

* * *

CHAPTER 19: SECTION CAPACITY

19.1 The maximum number of trains that can be dealt on a given section of Railway during the period of twenty four hours is called the Section Capacity. This is calculated as number of trains that can be run each way on single line during this period. On double line sections it is worked out separately. A train takes some amount of time to run between two Block stations. This is called "Running time of the train". In addition to this time there is little more time is required for the purpose of closing the section by normalising the signals and points behind the train and reporting to the station in rear, granting/receiving line clear for the next train, setting route taking `OFF' signals etc. This additional time is taken as 5 minutes and is called the "Block Operation Time". For calculating section capacity, total time of 24 hours is divided by "Running Time" of any slowest train over this section, plus "Block Operation Time".

Scott's formula is the simplest for this purpose which is as under:

Scott"s FORMULA:

$$C = \frac{1440}{T + t} E^{\frac{1}{2}}$$

Where, C = Section Capacity

T = Running Time of slowest train

t = Block operation time E = Efficiency factor (80)

Calculating the section capacity on the basis of above formula taking into consideration of slowest train on the section which would generally be a goods train. EX: GIP Railway, refined this formula further and calculated the available capacity for running of goods train. In this formula the total time consumed in running of passenger trains is deducted from the total time available to calculate how many trains that can be run in the remaining time. The formula is as under:

$$C_g = \frac{1440 - (T_P + t)}{T_q + t} E^{\frac{1}{2}}$$

In this formula efficiency factor (K) is taken as 50% as number of gaps between passenger trains may not be usable for running of goods trains. South Eastern Railway had employed once an American consultant to suggest more accurate formula for working out the section capacity. This formula is known as STEINBECK's formula which is as under:

$$C = \frac{1440}{S} y$$

Where, S = Ta + Tb + O + W

Ta = Running time on `a' side

Tb = Running time on `b' side

O = Block operation time for two trains W = Waiting time for next train

y = Efficiency factor (70)

All these formulae are however, theoretical and do not take into consideration of physical features over the entire section.

Indian Railways therefore adopt „chart plotting“ method which is the most practical way of assessing section capacity. For this purpose, running of trains is plotted on time-distance graph relating to the section. The time of all scheduled passengers trains are plotted on the graph and in the gaps between different scheduled trains as many goods trains are inserted as possible to give the maximum section capacity.

19.2 Section capacity mostly depends upon proper evaluation and detailed study of present and future traffic requirements to obtain the optimum utilisation of fixed assets. On single line section the line capacity can be augmented by improving `T' and `t' of Scott's formula, as well as the `E' factor, T can be reduced by

a) Reducing the length of Block section by providing additional crossing stations or Intermediate Block signalling.
b) Increasing speed by providing better mode of traction, tracks, rolling stocks and signalling.

`t' may be reduced by introducing

(i) Higher standard of interlocking

(ii) Tokenless block instruments, Axle counter based Block working

(iii) Panel interlocking

(iv) CTC and Automatic signalling

`E' (Efficiency factor) can be improved by proper time tabling, punctuality, staff efficiency, upkeep of equipments efficient operation, adequate number of loop lines, suitable length of Block section by spacing of block posts or stations and IBS on double line, etc. Simplification of rules, training of staff is also the factors to improve the operating efficiency.

19.3 The ultimate objective of increasing section capacity is to carry more traffic, not merely to increase number of trains, but to effect more reliable source of remuneration as well.

* * *

CHAPTER 20: PRINCIPLES OF SIGNAL ENGINEERING

20.1 Safety of passengers and efficiency of operation being the twin purposes for which fixed signals are installed, in no other field of technology is the formulation of principles and their observance of greater importance than in the field of Signal Engineering. A consideration of its role and functions will indicate that the following may be regarded as its fundamental principles:

1. **Each and every apparatus and circuit employed in a signalling system shall be so designed that a failure is occurring in any of all the component parts of the system results in the signal or signals controlled by the system displaying their most restrictive aspects.**

   Explanation: This principle is being widely observed but there are exceptions. For instance, when the front contacts of a relay stick or the broken wire lock of a double wire points mechanism fails to function, unsafe failures would result, but to minimise the effect of such failures, other precautions are taken. In the case of track relays, it is ensured that relay is operating satisfactorily by making use of both its front and back contacts in vital circuits having a cyclic time sequence. In regard to broken wire locks, the detector is used also to function as a lock. A constant attempt is being made to comply with this principle by improving upon the techniques employed.

2. **Reliability, simplicity and expansive capabilities shall be important considerations in the design of apparatus, circuits and systems.**

   Explanation: The specifications for signalling apparatus employed in vital circuits are far more exacting then the specifications for similar apparatus employed in other fields. Unless maximum reliability is provided, frequent failures will cause serious delays to the movement of trains and in cases where the first principles cannot be complied which lead to serious accidents.

   Simplicity is essential to facilitate easy maintenance without having to interrupt traffic and affecting quick repairs. As traffic density grows, the size of the signalling system will correspondingly increase. It should be possible to begin with a system of small size and extend it to meet changing conditions. Only if the system is originally employed has expansive capabilities, will it serve the interests of economy.

3. **The aspects of fixed signals shall be distinctive and unambiguous.**

   Explanation: Aspects of fixed signals should obviously, be capable of being readily and unmistakably determined. There should be no possibility of one aspect being mistaken to another.

   Signals are, as far as possible, located to the left of and adjoining the track to which they refer. In the case of converging roads, there is a separate signals for each line located in rear of the fouling point to afford maximum protection to opposing movements. In the case of diverging junctions, there should only be one post, and the signals mounted on this post so arranged as to be applicable to the lines on consecutive order from left to right, the signal at the left extreme being applicable to the extreme diverging line. Signals applicable to the through line are placed higher than the signals applicable to other lines.

4. **One aspect shall have only one name and one indication, conversely for a given indication the same aspect shall be used everywhere and at all times.**

   Explanation: A given signal aspect must transmit the same indication at all times, at all places and under all conditions, so that a Driver will know instantly what it means and whether or not it is properly displayed.

5. **The action required by a signal indication shall be definite and capable of easy implementation.**

   Explanation: This is an important principle. The indication of proceed aspect must be clearly and unambiguously stipulated in the rules, preferably in terms of the speed at which the signal in advance may be approached. The point at which action on an indication should commence must be well defined and not left to the Driver"s discretion. Signals should be so located with respect to each other that the indication of a signal displaying a restrictive proceed aspect can be complied with by means of a normal brake application initiated at the signal itself and as a result either the train comes to a stand without undue loss of speed at the signal in advance displaying stop or the speed is reduced to the rate prescribed for the signal in advance, where reduced speed is required.

6. **Each and every signal shall afford the sighting distance required, of it.**

   Explanation: For obvious reasons this principle supersedes the older assumption that every signal shall afford the maximum possible sighting distance.

7. **The number of fixed signals provided shall be the minimum for each route.**

   Explanation: This supersedes the older assumption that the number of signals in a yard should be the minimum. The correct principles is that the number of signals per route should be the minimum required to obtain a given track capacity.

8. **The overlaps required for each system of aspects shall be clearly specified.**

   Explanation: Although the proceed aspect of a signal authorises the movement of a train at the speed indicated by its aspects only up to the signal next in advance, a specified overlap distance in advance of a stop signal must also be maintained clear before the stop signal in rear can display a proceed aspect. While the overlaps in the Two aspect system may be chosen arbitrarily having regard to practical considerations, there should be a gradual reduction in the overlaps as the number of aspects increase.

* * *

Annexure 1

INTERMEDIATE SIDINGS

App1.1 INTRODUCTION

Sidings taking off from running lines and located between Block stations known as outlying or intermediate sidings. The most frequent justification for siding is either a ballast or stone quarry when the siding is used for departmental purposes or to serve an industry located too far away from a Block station, then it is known as an assisted siding.

The problem is to afford adequate protection to the siding points inserted on the running line. Working the siding as a Block station is the simplest and the best solution from the safety point of view, but is at the same time the most expensive initial as well as recurring costs. This solution is, therefore, adopted only where movements over the siding are too frequent and/or in the case of Double line sections in which access into and out of the sidings have to be provided from both main lines Up and Down. In this context, it may be mentioned that the switching out of Block stations when not in use during certain portions of the day is comparatively easier in Double line than in Single line, a subject which will be dealt with separately.

An outlying siding location is not, for reason of economy, „Manned". The responsibility for movements into and out of sidings and most important of all, after such operations are completed, for ensuring that the running line or lines are clear and then the correct re-setting of the points to the normal position (i.e. for the running lines) is placed on the guard of the train entering or coming out of the siding. In U.K. the use of track circuits to prove that running lines are clear is compulsory but not yet in India. Therefore, the points of outlying siding whether facing or trailing whether in double line or single line is not permitted to remain un-interlocked.

App1.2 MINIMUM EQUIPMENT

The minimum equipment prescribed for points is as for Standard I without detection (since the provision of fixed signals is not compulsory) as shown below: -

Facing Points, Single and Double Line:

A gauge tie plate where steel sleepers are not provided a facing point lock, or equivalent mechanism, the plunger of which shall lock each switch independently. The control of the points shall be by means of key or other suitable device which must secure the bolting mechanism of the point in the plunged or locked position when the points are set and locked for the running line.

A speed restriction of 50 KMPH is imposed for all movements on the running line over facing points. Where the section speed is higher than this, the restriction is indicated by a `S' marker at the points, Speed indicator placed not less than 30 Mts in rear of the marker, A caution and termination indicators. (See App 1.2) neither of which need be lighted.

Where the sanctioned speed of the section does not exceed 50 KMPH, the marker at the points and the indicators need not be provided. (SEM-1988 para 7.75.3).

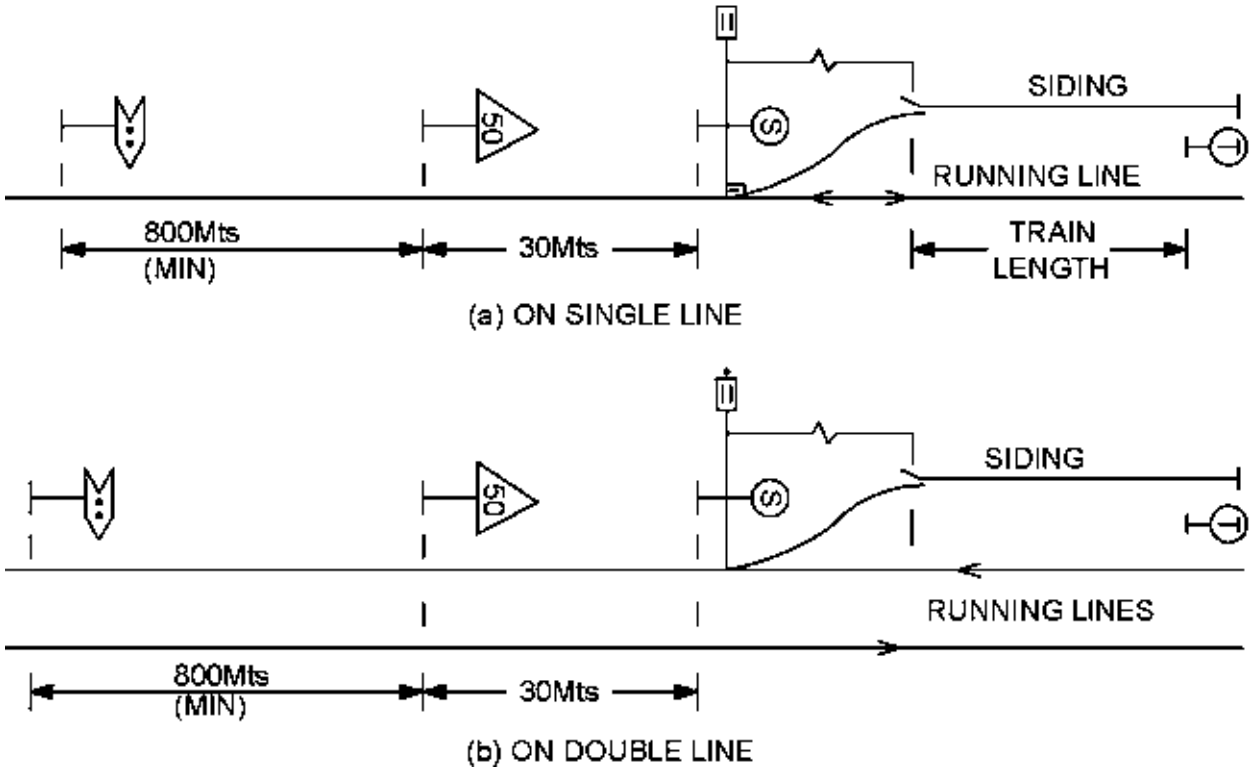


Fig. App1.2 Facing Point of Outlying siding, minimum requirements using 'S' marker and speed indicator for speed higher than 50 KMPH

App1.3 TRAILING POINTS, DOUBLE LINE

A gauge tie plate where steel sleepers, are not provided, a suitable type of key lock or equivalent mechanism, the key of which can only be extracted when the points are set and locked for the running line, an `S' marker at the points which need not be lighted. No speed restriction is imposed as points are trailing. See figure.

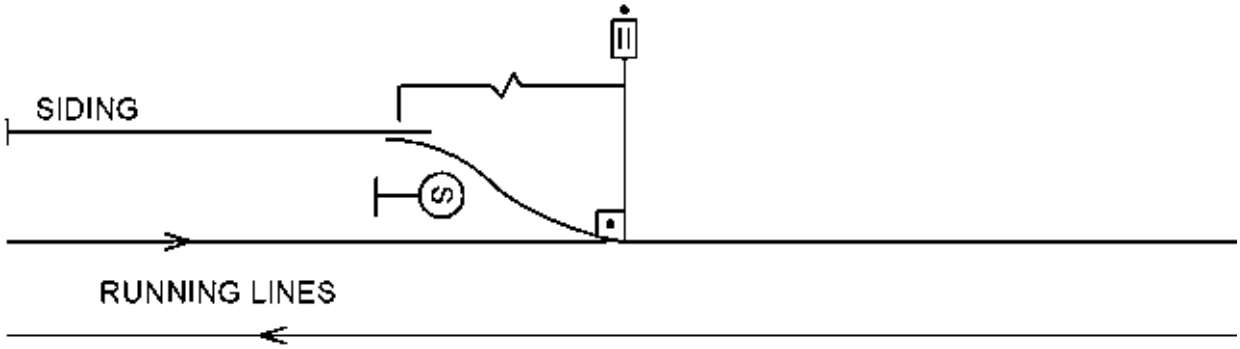


Fig.App1.3 Trailing Points of outlying sidings Double line provided with minimum equipment (No speed restriction)

App1.4 EQUIPMENT FOR SPEEDS OVER 50 KMPH

If the speed restriction of 50 KMPH over facing points is to be avoided the point equipment should conform to Standard III requirements and a stop signal adjacent to the points detecting each switch and facing point lock or equivalent mechanism provided. A Warner or Warning Board should also be provided at minimum B.D. in rear of the stop signal in the case of Two aspect signalling and a Distant in the case of MAUQ.

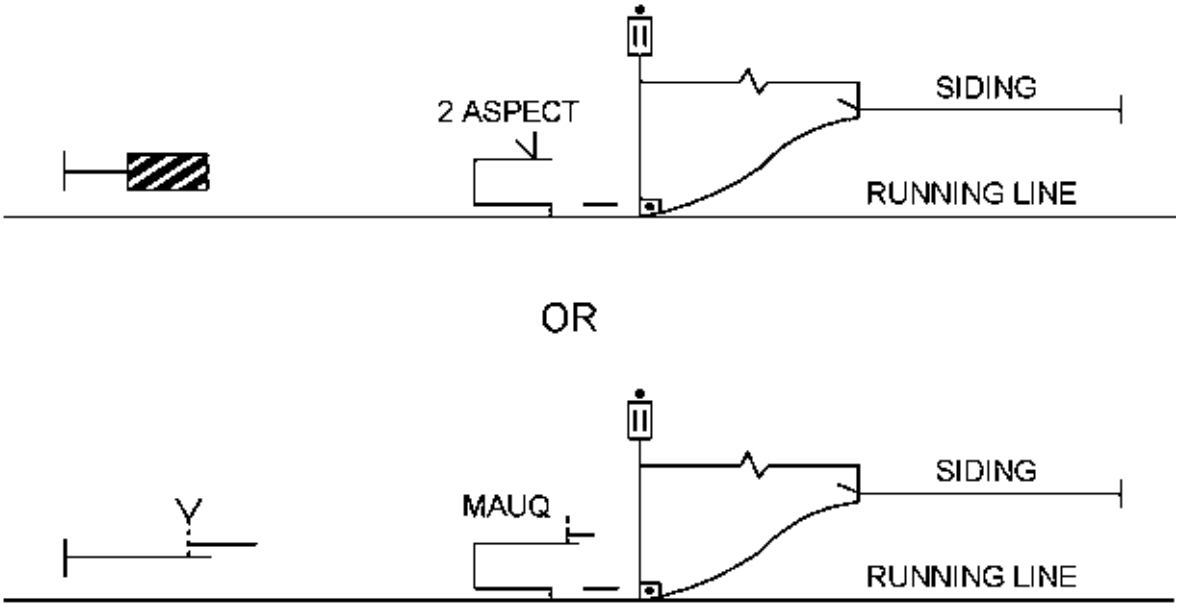


Fig. App1.4 Facing points of outlying sidings Single or Double line signalling for speed above 50 KMPH

App1.5 POINTS CONTROL THROUGH BLOCK INSTRUMENTS

The rules stipulate that the points should be controlled through the Block system in use only in the case of facing points on the Single line over which there is no speed restriction. It also recommends, as a desirable practice for a similar provision in the case of facing points over which a speed restriction of 50 KMPH is imposed, as well as, in the case of Double line, trailing points. In actual practice, however, wherever Single line Block instruments are available, the points which are normally set and locked for the running line are released by token and in the case of trailing points on the Double line, railways devise their own methods of controlling the points through the Block instruments of the section. Where Block instruments are not in use, approved special instruction describing the working and control of the Siding, are included in the working rules of the adjacent station (known as the parent station) which controls the movements into and out of the siding.

In the case of sidings located on busy sections, in which shunting has to be performed, it would be advantageous to provide means for clearing the section after a train has been berthed on the siding. On the Double line as the Lock & Block system cannot be restored to the normal position until and unless the train has actuated a treadle or Track circuit located near the Home Signal of the receiving station, the section cannot be cleared with the train berthed in the intermediate siding. Interlocking may, however, be provided between the Block instruments and the points, so that the points cannot be unlocked without the Block instruments being in the Train On Line position. Should the facility of clearing the Block section with a train berthed in the intermediate siding be considered necessary, the intermediate siding is worked as Block station and switched out when the use of the siding is not required. There are, however, double line Block instruments which provide for an occupation key to enable trains to enter Block Section in the right direction and return to the same station. This occupation key when removed from the instrument locks the instruments in the normal position. In such cases the occupation key may be exploited for sending trains into intermediate siding and clearing the section after the train is berthed in the siding. This train can only return to the station from which it entered the block section, travelling in the wrong direction. The arrangements in force in one railway on sections fitted with Carson's instruments are shown in the figure.

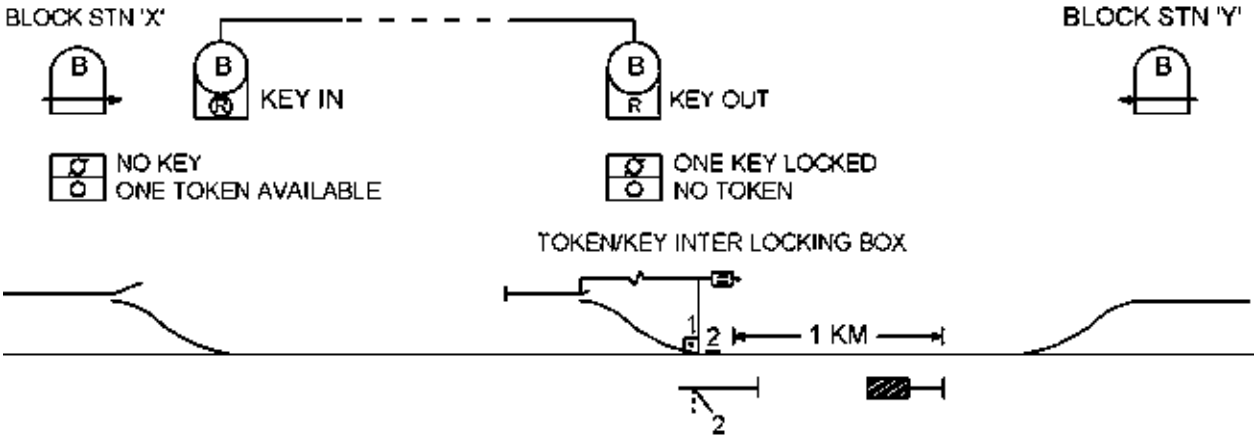
In the case of single line sections, two alternative methods are available for clearing the
Block section with a train berthed in the intermediate siding, which is briefly dealt below:

App1.6 Based on the use of token/key interlocking boxes and electrically transmitted keys. Please see figure. Block Section is „X – Y“ with a siding between stations „X & Y“. At station „X“ a token key interlocking box with a spare token locked in it and at the siding, a similar box, but with the points key locked in it are provided. An HKT circuit is provided between Station „X“ and the „Siding“, a key is locked in the HKT at „X“ and, therefore, there is no key in the HKT and at the „Siding“. A train proceeds from „X“ or „Y“ with a token and is stopped at the siding and the token is exchanged for the points key on the token key interlocking box, the points key is used to unlock the points the train then enters the Siding. The points are then reset to normal; and after ensuring that the running line is clear, the key is transmitted to „X“. The key is exchanged at „X“ for a token (in the token exchanger at the Station) which is used to clear the section. When the train has to come out of the siding, the guard informs „X“ on the telephone of the fact X obtains a token exchanges it for the key and transmits the key to the „Siding“. The key is used for unlocking the siding points, the train enters the running line, the points are reset to normal and the key released from the points exchanged for the token originally deposited in the token key interlocking box. The train proceeds with the token to either „X“ or „Y“. This system allows of a train either from `X' OR `Y' using the siding and the train from the siding proceeding to either `X' or `Y'.

The disadvantages are

(1) only one train can be dealt with in the siding at a time and

(2) at least two line wires one for HKT circuit and the other for telephone are required between „X“ and the „siding“.



1. Points key from token/key interlocking box releases lock on lever No.2 which works FPL & Signal FPL can be plunged when points are for the Main line Telephone provided between
   Siding and station „Y“.

2. Single line section using token/key interlocking boxes electrically transmitted keys.

Fig. App1.6 Points Control Through Block Instrument (Intermediate Siding)

App1.7 BASED ON THE USE OF TWO AUXILIARY BLOCK INSTRUMENTS

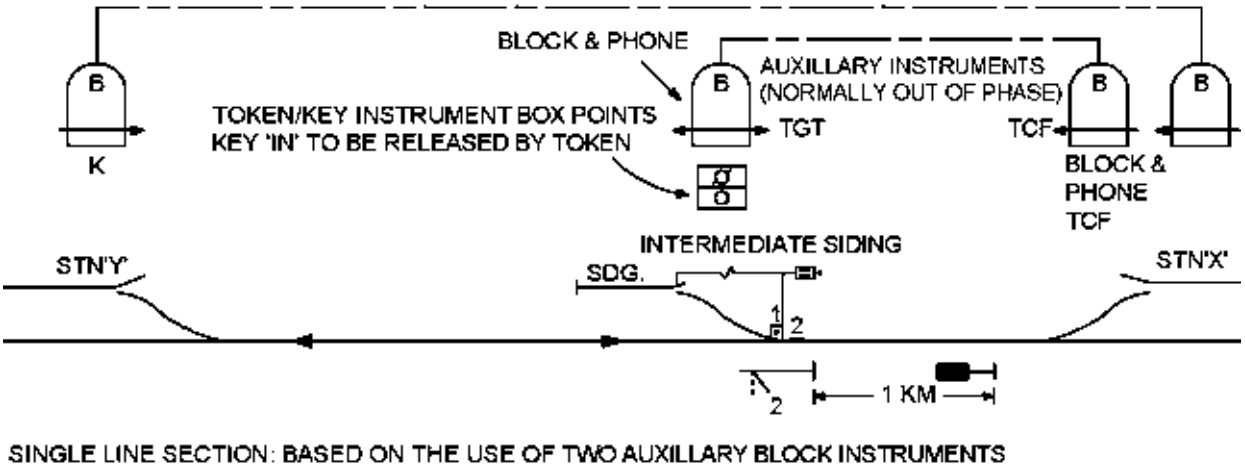


Fig. App1.7 Points Control Through Block Instrument (Intermediate Siding)

A separate auxiliary Block instrument circuit is established between station „X" and the „Siding", the instruments being of the same type as used in „X" and „Y", but arranged to be out of phase so that a token cannot be extracted from either of the two. A token key interlocking box in which the points key is normally locked is provided at the Siding.

A train from either „X" or „Y" may proceed to the Siding. On arrival at the siding the token is exchanged for the points key. After the train enters the siding and the running line is ensured to be clear, points are reset and locked normal and the key exchanged for the token. The token is then inserted into the Block instrument which brings the pair of auxiliary instruments in phase and enables a station „X" to extract a token from the auxiliary instrument at his station. This token is then used for clearing the section on the block circuit „X-Y". The auxiliary instruments are now again out of phase. A similar procedure is adopted for coming out of the siding. This system permits any number of trains being berthed in the siding, but requires an extra line wire for the extra pair of Block instruments.

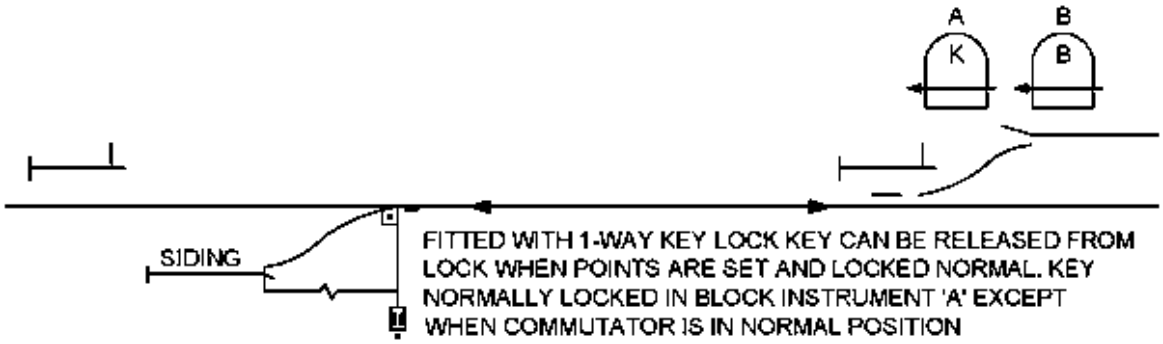


Fig. App1.8 Control of Siding within Station Limit of Un-Interlocked Station

App1.8 GENERAL

As a precaution against unauthorised interference, all bolts, studs pins, etc of apparatus used for locking and control of siding points are rivetted over or otherwise adequately secured.

In view of the rule that all passenger running lines must be isolated from goods and stabling lines, isolation must be provided and the isolating traps locked for all movements on the running lines at all outlying sidings. A trap indicator has to be provided but it is not lit during night hours.

* * *