



CHAPTER 3

Interlocking

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11 Interlocking Principles

- Safe Routes through an Interlocking
- Interlocked Route between Neighbored Interlocking

11.1 Safe Routes through an Interlocking

- The term “interlocking” is used with **meanings**.
 - ◆ Firstly, “an interlocking” is the interlocking plant where points and signals are interconnected in a way that each movement follow the other in a proper and safe sequence.
 - ◆ Secondly, the principles to achieve a **safe interconnection** between points and signals are also generally called “interlocking”.

11.1 Safe Routes through an Interlocking

- **The *route*** a train could use through an interlocking must meet the following conditions:
 - ◆ All points must be set properly and **locked**.
 - ◆ Conflicting routes must be locked.
 - ◆ The track must be clear.

- **This is provided by the following functions:**
 - ◆ Interlocking between points and signals.
 - ◆ **Route locking**.
 - ◆ Locking conflicting routes.
 - ◆ **Flank protection**.
 - ◆ Track clear detection.

11.1 Safe Routes through an Interlocking

- On railways where the signals for **train movements** are separated from those for **shunting movements** (**main** and **shunt signals**), the **interlocked routes** for train movements are also considered separately from those for shunting movements.
 - ◆ Some of the **requirements** for a **train route** are **not in effect** for a **shunt route**. So, a route may govern a shunting movement into an occupied track.
 - ◆ And, flank protection (protection against **inadmissible** movements on **converging tracks**) is usually also not required for shunt routes.
- There are also railways, where interlocked routes are only required for train movements, *while* shunting movements are carried out without protection by the interlocking system.
 - ◆ This is especially typical for **ancient** German interlocking system.
 - ◆ On North American railways where train movements are not as **strongly separated** from shunting movements, the same interlocked routes may be used both for train and shunting movements.

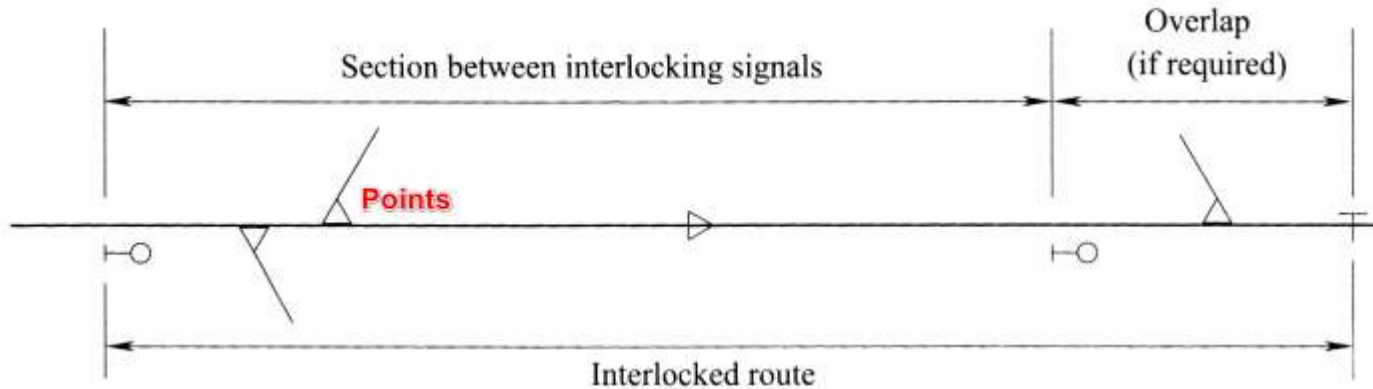
11.1 Safe Routes through an Interlocking

- A train route **starts** always **at** an interlocking signal (the **entrance signals** of the route). The exit of a route can be:
 - ◆ Another interlocking signals (the exit or **destination signal** of the route).
 - ◆ The end of the interlocking or **home signal limits**.
- Interlocked routes with an entrance and an exit signal are routes between **successive** interlocking signals within the same interlocking or home signal limits.
- On railways where overlaps are required, **even** the points within the overlap behind the exit signal will be interlocked to the entrance signal.
- Because the **clearance of the section** between the entrance and the exit signal is checked by the interlocking system, this kind of an interlocked route also directly ensures a **safe train separation**. Thus, there is no need to install a block system between these signals.

11.1 Safe Routes through an Interlocking

- Interlocked routes with **tile** exit at the end of the interlocking or home signal limits govern train movements to leave these limits.
 - ◆ Such a route cannot **ensure** a safe train separation. The route **leads into** a section of line that may be protected by a block system or by **written** or **verbal instructions**.
- On North American railways, the route will always end at a controlled signal **facing in the opposing direction** that limits the interlocking.
 - ◆ Sometimes, this signal is called an “**exit signal**”, but this should not **be confused with** the usage of the term “**exit signal**” at interlocking routes between adjacent interlocking signals of the same direction as explained above.
- On European railways, the exit of the route is a track section behind the last points of the route.
 - ◆ As an **essential** difference to North American practice, this track section is not necessarily **associated with** an opposing controlled signal (Fig. 11.1).

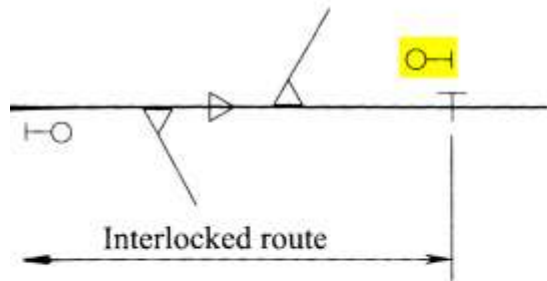
11.1 Safe Routes through an Interlocking



(a) Route between adjacent interlocking signals within interlocking or home signal limits

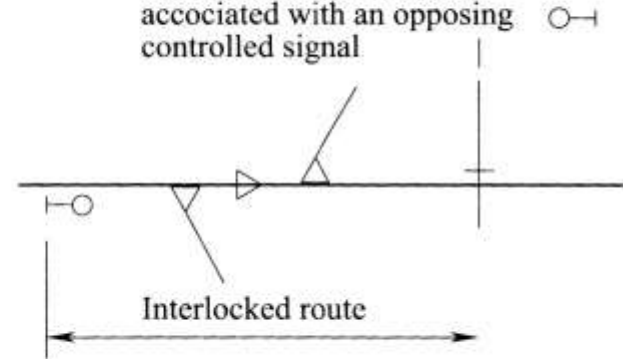
North American Practice:

Always opposing controlled signal at the end of the route



European Practice:

Route exit not necessarily associated with an opposing controlled signal



(b) Route to leave interlocking or home signal limits

Fig. 11.1 Interlocked train routes in a signal-controlled operation

11.2 Interlocked Route between Neighbored Interlocking

- On some railways, an interlocked route may also be established between neighbored interlocking without intermediate block signals.
 - ◆ That means an interlocked route is used **instead of** a block system to protect the block section between two interlockings.
 - ◆ This may be useful, when neighbored interlocking are controlled by the same interlocking system.
 - ◆ Although the entrance and the exit signal of such a route **belong to** different interlocking (Fig.11.2), they are technically controlled **as if** belonging to the same interlocking.

11.2 Interlocked Route between Neighbored Interlocking

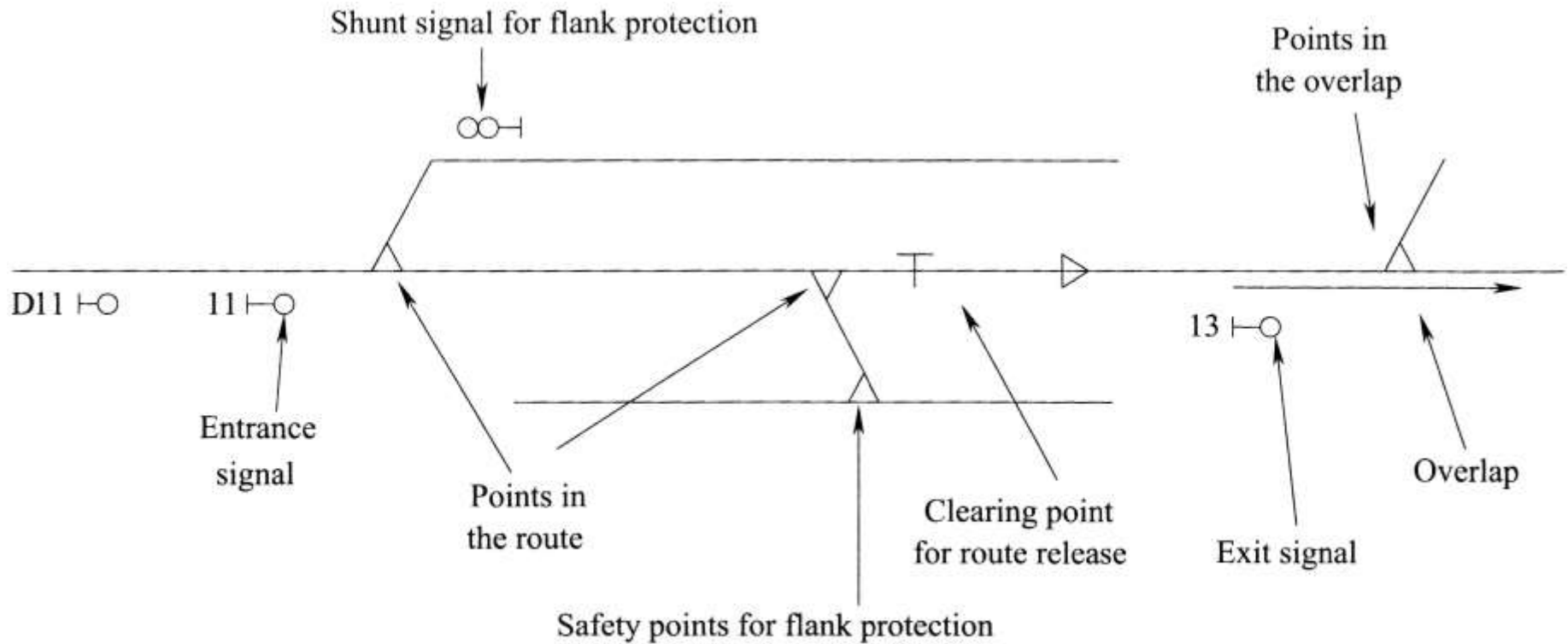


Fig. 11.2 Element of a route with entrance and exit signal

Homework

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- ◆ 4