

TECHNICAL INSTRUCTION

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NETWORK RAIL - SIGNAL ENGINEERING Excess Signal Spacing Risk Assessments

Relevant Standard: GK/RT0034, NC pending standards change 05/184/NC (TRACKER 3599)

Purpose

The minimum spacing of signals is critical to enable trains to brake from a first caution to a red signal. When excessive distances are provided there is a risk that a driver may forget the fact that they are approaching a red signal or misjudge braking by delaying it too long. This instruction lists issues to be considered when undertaking risk assessment to comply with the conditions under which the NC was granted for braking in excess of 50% over the minimum.

Definitions

Braking distance is the minimum distance in accordance with the graphs and tables within GK/RT0034.

Excess Spacing applies to trains where the signal spacing exceeds the minimum for the permissible speed.

Assessing excess spacing risk

Network Rail have applied to RSSB and obtained a non-compliance pending standards change to allow excess signal spacing up to 50% without risk assessment and from 51% to 100% (up to 1000m where signal spacing is 500m or less) subject to a standard overrun risk assessment being undertaken.

For situations where excess spacing over 100% is required due to physical constraints, etc. then there is a requirement to undertake a specific risk assessment looking at a number of issues. This may form part of an overrun risk assessment or be a separate exercise. This instruction details the issues which should be considered as part of the process, however the list is not exhaustive and the experts undertaking the assessment should look at each example and its particular characteristics.

The evaluation of the amount of excess braking should be based on the primary appendix of GK/RT0034 used (i.e. A if used, B if A not used) and does not need to include situations where excess braking cannot be avoided, e.g. routes through junctions.

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Risk Factors to be considered

The issues identified fall into a number of sub-headings:-

1. Driver distraction (particularly between the caution signal and the point where trains need to start braking)
 - Platform duties – where the starter may be at yellow,
 - Rising gradients – the need to apply power to keep the train moving,
 - Changes in speed – particularly increases in speed,
 - AWS warnings – repetitive cancellations for advance warning of speed restrictions,
 - Loss of reference – tunnels or twisting routes may make it hard to judge position,
 - Poor adhesion – driver concentrating on controlling the train or keeping it moving,
 - Joining a faster line or increase of speed following a junction – risk that the caution signal is forgotten and over-ridden by the increase in speed,
 - Distance to run – a long distance from a station start or a junction gives opportunity to forget a caution signal.
2. Signal Sighting
 - Poor visibility of red signal – with the risk that a driver has forgotten the caution or mistaken the distance travelled, good visibility of the red is essential, (N.B. good sighting is preferable to regular spacing of signals),
 - Line speed – at lower speeds drivers tend to “drive on sight”,
 - Likelihood of signal at danger – if it is unexpected then a driver may take longer to react.
3. Aspect Sequences
 - Correct arrangements – can the over-braking be reduced by changing to two aspect or three aspect sequences?
 - Number of warnings – three aspect only gives one caution, four aspect gives two,
 - Transitions – 3 to 4 (either plain line or slow line to main line) can cause confusion and risk of assuming double yellow on first 4 aspect since it normally is (conditioning),
 - Parallel lines – drivers on slow lines can often drive at full speed on double yellow, risk that when they change to fast line they may forget.
4. Spacing and Location
 - 4 aspect – a shorter final caution (i.e. yellow to red less than double yellow to yellow) raises the risk as the ratio approaches the 1/3, 2/3 rule,
 - Speed reduction – a significant drop in speed often means the new speed is hard to judge,
 - Gradient change – a change from rising to falling on the approach to the red signal makes it harder to recover from a misjudgement,
 - Read through – drivers tend to look ahead to prepare themselves, this may form a distraction.
5. Junction controls
 - Approach release – regular approach to red aspects which release may condition drivers to expect the signal to clear, this is worse where the release point is close to the signal.

Compliance Requirements

A risk assessment for excess signal spacing over 100% (or 1000m where the minimum signal spacing is 500m or less) shall be undertaken prior to scheme plan approval for all signalling schemes where the braking distance or line speed is altered.

Staff to be Briefed

Signalling Project Engineers and Designers.

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