WP3 – G1

Speed and Distance Management

Modes impact on SDM

Extracts from subset 26 chapters 4 and 3 (National values).

Perimeter of the extracted requirements:

- Brakes commands
- Speed and distance supervision
- MRSP
- Display
- Information
- *Personal notes*

model
further modeling
no modeling

Isolation

4.4.3.1.1 In Isolation mode, the ERTMS/ETCS on-board equipment shall be physically isolated from the brakes

No Power

4.4.4.1.1 When the ERTMS/ETCS on-board equipment is not powered, the equipment shall be in the No Power mode.
4.4.4.1.2 The ERTMS/ETCS on-board equipment shall permanently command the emergency brake.
4.4.4.3.3 If it is required to move a loco in NP mode as a wagon, ETCS brake command must be overridden by external means.

System Failure

4.4.5.1.2 The ERTMS/ETCS on-board equipment shall permanently command the Emergency Brakes.

Sleeping

4.4.6.1.3 As the engine is remote controlled by the leading engine, its ERTMS/ETCS on-board equipment shall not perform any train movement supervision.

4.4.6.1.12 In case of balise group message consistency error (refer to 3.16.2.4.4 and 3.16.2.5.1), the ERTMS/ETCS onboard equipment shall not command the service brake.

Stand By

4.4.7.1.5 The ERTMS/ETCS on-board equipment shall perform the Standstill Supervision.

Shunting

4.4.8.3.1 The ERTMS/ETCS on-board equipment is responsible for the supervision of the shunting mode speed limit, and that the engine with the active antenna is tripped when passing the defined border of the shunting area (only if there is a defined border: balise group not in the list given by trackside, or balise group giving the information “stop if in shunting”).

A.3.2: Shunting mode speed limit = 30km/h = V_NVSHUNT

4.4.8.1.1 … In Shunting mode, The ERTMS/ETCS on-board equipment supervises the train movements against:
a) a ceiling speed: the shunting mode speed limit
b) a list of expected balise groups (if such list was sent by the trackside equipment). The train shall be tripped if a balise group, not contained in the list, is passed (When an empty list is sent, no balise group can be passed. When no list is sent, all balise groups can be passed)
c) “stop if in shunting mode” information. The train is tripped if such information is received from balise groups
d) Intentionally deleted

4.4.8.1.10 The ERTMS/ETCS on-board equipment shall display the train speed and, only on driver request, the permitted speed. The display of the permitted speed shall also be stopped on driver request.

Full supervision

4.4.9.3.1 The ERTMS/ETCS on-board equipment is fully responsible for the train protection (except for the 2 situations described below).
4.4.9.3.2 The driver is responsible for respecting the EOA when approaching an EOA with a release speed.
4.4.9.3.3 When “ENTRY IN FULL SUPERVISION” is displayed to the driver, the driver is responsible for respecting speed restrictions that apply for the part of the train that is not covered by SSP and gradient data.

4.4.9.1.3 To be in Full Supervision mode, SSP and gradient are not required for the whole length of the train, but shall be at least available from the FRONT END of the train.
4.4.9.1.4 Once in Full Supervision mode, if SSP and gradient are not known for the whole length of the train, an indication “ENTRY IN FULL SUPERVISION” shall be clearly displayed to the driver until SSP and gradient are known for the whole length of the train.
4.4.9.1.4.1 Note: this indication may also be displayed in case the train length has been increased, see 3.18.3.8.

4.4.9.1.5 The ERTMS/ETCS on-board equipment shall supervise train movements against a dynamic speed profile.

4.4.9.1.6 The ERTMS/ETCS on-board equipment shall display the train speed, the permitted speed, the target distance and the target speed to the driver (this list is not exhaustive – refer to chapter 4.7 “DMI depending on modes”).

Unfitted

4.4.10.1.2 The ERTMS/ETCS on-board equipment shall supervise train movements against a ceiling speed: the lowest of the maximum train speed and the Unfitted mode speed limit for unfitted area (national value).

A.3.2: Unfitted mode speed limit = 100km/h = V_NVUNFIT

4.4.10.1.3 The ERTMS/ETCS on-board equipment shall also supervise temporary speed restrictions.

4.4.10.1.4 The ERTMS/ETCS on-board equipment shall display the train speed to the driver.

Staff Responsible

4.4.11.1.3 The ERTMS/ETCS on-board equipment shall supervise train movements against :
a) a ceiling speed: the staff responsible mode speed limit
b) a given distance (regarding its origin location see 4.4.11.1.3.1). The ERTMS/ETCS on-board equipment shall supervise braking curves with a target speed of zero to the end of this distance. If the train overpasses this distance (see next note) the ERTMS/ETCS on-board equipment shall trip the train
c) a list of expected balise groups, if this list has been sent by the RBC. The train shall be tripped if over-passing a balise group that is not in the list. (When an empty list is sent, no balise group can be passed. When no list is sent, all balise groups can be passed)
d) balise groups giving the order „stop if in SR". This order shall immediately trip the train, unless the over-passed balise group is included in a list of expected balises as defined in item c)
e) running in the direction opposite to the train orientation (reverse movement protection)

A.3.2: Staff Responsible mode speed limit = 40km/h = V_NVSTFF
A.3.2: Max permitted distance to run in Staff Responsible mode = no limit = D_NVSTFF
Note : for testing, I think we need to introduce a value.

4.4.11.1.3.1 The ERTMS/ETCS on-board shall determine the start location of the SR distance as follows:
a) If the National/Default value determines the max permitted distance to run in SR mode, the starting point of this distance shall refer to the estimated position of the train front when SR mode was entered, or, already in Staff Responsible mode, when Override was activated.
b) If the max permitted distance to run in SR mode is determined by the value transmitted by the RBC, or entered by the driver, the start location of the distance shall refer to the estimated position of the train front when the distance information is received or entered.
c) If the max permitted distance to run in SR mode is determined by the value transmitted by EUROLOOP, the distance information transmitted by EUROLOOP shall be referred to one or more reference balise groups. On-board shall evaluate the distance to run in SR mode by matching the reference balise groups given with the LRBG.
In case the LRBG is, due to a change of orientation, in front of the train when the distance to run in SR mode is to be determined from the EUROLOOP information, the complete distance to run in SR mode shall be determined as the distance given by EUROLOOP plus the distance between the estimated train front end and the LRBG.
4.4.11.1.4 Note: Since the gradient is unknown, the supervision of the braking curves in Staff Responsible mode does not ensure that the train will not pass the given distance.

4.4.11.1.5 The ERTMS/ETCS on-board equipment shall give the possibility to the driver to modify the value of the SR mode speed limit and of the given distance. This shall be possible only at standstill.

4.4.11.1.5.1 If a train movement is detected while the driver is entering the SR speed/distance limits, the ERTMS/ETCS on-board equipment shall trigger the brake command.

4.4.11.1.6 In level 2/3, the driver shall have the possibility to request a new distance to run in Staff Responsible, by selecting "Start". This triggers an MA request.
4.4.11.1.6.1 Note: Once the SR distance is covered, the driver may have to go further.

4.4.11.1.6.2 When entering SR mode, the value applicable for SR mode speed limit and the value applicable for SR distance shall be the corresponding National/Default values. Exception for SR distance: SR mode is authorised by RBC giving an SR distance.

4.4.11.1.6.3 While in SR mode, the value applicable for the SR mode speed limit shall be, if available, the last value entered by the driver.

4.4.11.1.6.4 While in SR mode, the value applicable for the SR distance shall be, if available, the last value received by the ERTMS/ETCS on-board equipment amongst:
a) the distance to run in SR entered by the driver;
b) the distance to run in SR given by trackside.

4.4.11.1.6.5 When "Override" is selected, the SR mode speed limit value and the SR distance value previously entered by driver or given by trackside, if any, shall be deleted. The corresponding National/Default values shall enter in force.

4.4.11.1.6.6 If the train is in SR and receives a new distance to run in SR mode from the RBC, the stored list

of expected balise groups, if any, shall be deleted or shall be replaced by the list of expected balise groups sent together with the distance to run in SR.

4.4.11.1.6.7 If an ERTMS/ETCS on-board equipment in SR mode, after having received from EUROLOOP max permitted distance to run in SR mode information, detects the main signal balise group being part of this information then it shall ignore any new max permitted distance to run in SR mode information from that loop.

4.4.11.1.7 The ERTMS/ETCS on-board equipment shall display the train speed and the (when active) override (permission to pass a signal at danger, trip inhibited). The permitted speed, target distance and the target speed shall be displayed only on driver request, until the driver requests to stop their display.

4.4.11.3.1 The ERTMS/ETCS on-board equipment supervises a ceiling speed and a SR distance if finite (and if level 2/3, might also supervise a list of balises).

On Sight

4.4.12.1.3 The ERTMS/ETCS on-board equipment shall supervise train movements against a dynamic speed profile.

A.3.2:On Sight mode speed limit = 30km/h = V_NVONSIGHT

4.4.12.1.4 The ERTMS/ETCS on-board equipment shall display the train speed to the driver (this list is not exhaustive). The permitted speed, target distance,target speed and release speed (if any) shall be displayed only on driver request, until the driver requests to stop their display.

4.4.12.1.6 To be in On Sight mode, SSP and gradient are not required for the whole length of the train, but shall be at least available from the FRONT END of the train.

4.4.12.1.7 Once in On Sight mode, if SSP and gradient are not known for the whole length of the train, an indication “ENTRY IN ON SIGHT” shall be clearly displayed to the driver until SSP and gradient are known for the whole length of the train.

Trip

4.4.13.1.2 The ERTMS/ETCS on-board equipment shall command the emergency brakes (no brake release is possible in Trip mode).

Post Trip

4.4.14.3.1 The ERTMS/ETCS on-board equipment is responsible for supervising that the train moves only backwards and that the backward movement does not exceed the maximum permitted distance (national value).

4.4.14.1.2 Once in post trip mode, the onboard equipment shall release the Command of the emergency brake.

4.4.14.1.3 The train shall only be authorised to move backwards a given distance (national value). The ERTMS/ETCS on-board equipment shall supervise this national distance for reverse movements, and shall command the service brakes if the distance is over- passed.
The driver shall be informed about the reason for the brake application.

A.3.2: Distance to be allowed for reversing in Post Trip mode = 200 m = D_NVPOTRP

4.4.14.1.3.1 Note: The ERTMS/ETCS onboard equipment performs the Reverse Movement Protection (as in PT mode, the "normally allowed movement" is backwards, then the Reverse Movement Protection avoids the train running in forward direction when in PT mode). This implies that the given distance to run backwards in PT is considered as a directional data, oriented backwards.

4.4.14.1.3.2 After the release of a brake command initiated due to an overpassed distance allowed for

moving backwards in Post Trip mode, the ERTMS/ETCS on-board equipment shall command the service brake for any further movement in the direction opposite to the train orientation.

4.4.14.1.9 In case of balise group message consistency error (refer to 3.16.2.4.4 and 3.16.2.5.1), the ERTMS/ETCS onboard equipment shall not command the service brake.

Non Leading

4.4.15.1.2 The ERTMS/ETCS on-board equipment shall not perform any train movement supervision in Non-Leading mode.

4.4.15.1.6 The ERTMS/ETCS on-board equipment shall display the train speed to the driver.

National system mode

4.4.17.3.1 No train supervision functionality is provided by the ERTMS/ETCS on-board equipment.

Reversing

4.4.18.3.1 The ERTMS/ETCS on-board equipment supervises a ceiling speed and a distance to run in reverse direction.

4.4.18.1.3 The ERTMS/ETCS on-board equipment shall supervise train movements against :
a) a ceiling speed: the Reversing mode speed limit given from trackside
b) a distance to run in the direction opposite to the train orientation, given from trackside. The emergency brake shall be commanded if overpassing this distance

No National Value found. I suggest V_REVERSE = 30km/h and D_REVERSE = 200m

4.4.18.1.4 After the release of a brake command initiated due to an overpassed reversing distance, and while the reversing distance is still overpassed, the ERTMS/ETCS on- board equipment shall command the emergency brake for any further movement in the direction opposite to the train orientation.

4.4.18.1.5 The ERTMS/ETCS on-board equipment shall display the train speed, the permitted speed and the remaining distance to run.

4.4.18.1.6 In case the SBI supervision limit is exceeded (refer to chapter 3 table 5, triggering condition t4), the ERTMS/ETCS on-board equipment shall command the emergency brake instead of the service brake. For the revocation of the brake command, refer to 3.13.10.2.4.

4.4.18.1.8 Note: The ERTMS/ETCS onboard equipment performs the Reverse Movement Protection (as in RV mode, the "normally allowed movement" is backwards, then the Reverse Movement Protection avoids the train running in forward direction when in RV mode). This implies that the given distance to run in reversing is considered as a directional data, oriented backwards.

4.4.18.1.10 In case of balise group message consistency error (refer to 3.16.2.4.4 and 3.16.2.5.1), the ERTMS/ETCS onboard equipment shall not command the service brake.

4.4.18.1.12 In case the ERTMS/ETCS system version number X transmitted by any balise is greater than the highest version X supported by the onboard equipment (refer to 3.17.3.5), the information from this balise shall be ignored, the train shall not be tripped and the driver shall not be informed.

Limited Supervision

4.4.19.3.1 The ERTMS/ETCS on-board equipment is responsible for the background supervision of the train movement to the extent permitted by the information provided by trackside.

4.4.19.1.3 The ERTMS/ETCS on-board equipment shall supervise train movements against a dynamic speed profile.

A.3.2: Limited Supervision mode speed limit = 100 km/h = V_NVLIMSUPERV

4.4.19.1.4 The ERTMS/ETCS on-board equipment shall display the train speed. If the permitted speed is lower than both the Limited Supervision mode speed limit and the maximum train speed, the permitted speed and the target speed shall be indicated (this list and the conditions are not exhaustive – refer to chapter 4.7 “DMI depending on modes”).

4.4.19.1.6 To be in Limited Supervision mode, SSP and gradient are not required for the whole length of the train, but shall be at least available from the FRONT END of the train.

Passive shunting

4.4.20.3.1 The ERTMS/ETCS on-board equipment of an engine in Passive Shunting mode has no responsibility for the train protection.

4.4.20.1.3 As the engine is coupled to a leading engine, its ERTMS/ETCS on-board equipment shall not perform any train movement supervision.

4.4.20.1.15 In case of balise group message consistency error (refer to 3.16.2.4.4 and 3.16.2.5.1), the ERTMS/ETCS onboard equipment shall not command the service brake.