Consultation comments and responses

Document Title: AC Energy Subsystem and Interfaces to Rolling Stock Subsystem.

Document number: RIS-2715-RST

Consultation closing date: 07 October 2022

1. Responders to consultation

No	Name	Company
1	Robert Wilkins	Mottmac
2	Richard Ward	Angel Trains
3	David Galloway (on behalf of Network Rail)	Network Rail
4	Maya Petkova	Mottmac
5	Colin Place	Aegis Engineering

2. Summary of comments

Code	Description	Total
-	Consulted	5
CE	Critical errors	0
ED	Editorial errors	18
TY	Typographical errors	2
OB	Observations	9
-	Total comments returned	34

Classification codes for a way forward:

- DC – Document change
- NC – No change

3. Collated consultation comments and responses

No	Page	Clause	Comment	Suggestion	By	Way forward	Page	Clause	Response
1	18	G.4.4.4	The statement refers back to this standard but with no details.	Requirement should point to a specific location or be removed.	1	NC	18	G 4.4.4	(ED) The standard has not been amended following the receipt of this comment because it is believed that the reference has been misread. The reference is to RIS-2712-RST, a separate standard on Driver Controlled Operated (DCO) On-Train Camera Monitoring (OTCM) systems, not a reference back to within RIS-2715-RST.
2	7	2.1	How can ratings be determined without fault duration figures? Touch voltages can be determined but x-section rating determined by adiabatic means is not possible.		2	NC	7	2.1	(OB) The standard has not been amended following the receipt of this comment because the LOC&PAS NTSN in clause 4.2.8.4 requires compliance with the electrical protection requirements in section 11 of BS EN 50388:2012 for protection against electrical hazards which cover short circuit fault protection, specifically section 11.2. Note 2 in this section provides information on fault duration values. Additionally, for information, BS EN 50388-1:2022 provides updated values and is included in the draft revision to the LOC&PAS NTSN as a reference.
3	7	G 2.1.8	"Possibility of fault currents occurring that have the potential to cause an electrical fire". Does this mean engineers should use larger cable or equivalent braid? What is the threshold temp – 120^0c or more and what is the calculation based on?	*(Copied from GL/RT 1210 comments as it is considered relevant here also.)* Performing calculations adds cost, without data calculations cannot obviously be undertaken so add further cost given engineers will factor in a significantly conservative bond capacity into designs. Corollary, there is the chance that safety is compromised if bonding is underrated for purpose. Although it is understood that sourcing appropriate data must be challenging for it not to have been included, there would be significant benefit to moving back to guidance offered in withdrawn documents such as GM/RC2514 Iss 3 (Clauses RC003 et al).	2	DC	7	G 2.1.5	(ED) The comment received has been accepted but the standard change is different to the suggestion because it is believed that the wording of the guidance is inappropriate and misleading following further review and additional comments received by industry. This will be changed to "these cross sections have been shown to be sufficient to prevent an electrical fire".
4	12	G3.3.6	Due to the installations of existing signalling systems, the ac transformer inrush may also need to consider the requirements on the route the train intends to operate.	Add text: 'Due to the installations of existing signalling systems, the ac transformer inrush may also need to consider the special requirements on the route the train intends to operate.'	3	DC	12	G 3.5.5	(ED) The standard has been amended and incorporates the suggested change(s).

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5	13	G3.4.1 Table 2	Harmonic current limits at the bottom two lines are set too high, which will affect the safe operation of the infrastructure. Explanation: For the maximum train current demand of 300 A (defined in Standard GM/RT2111), the proposed harmonic current of 0.1% limit will makes the harmonic current values being 300 mA (300 A * 0.1% = 0.3 A) for the frequencies of greater than the order of 21 and beyond (i.e. greater than 1050 Hz). At this frequency band, the 300 mA will affect the safe operation of certain track circuits, for example, TI21 (EBI 200). According to Network Rail's standard 'Methodology for the Demonstration of Compatibility with TI 21 Track Circuits' (NR/GN/SIG/50008), 'The TI 21 is a jointless track circuit operating in the audio frequency band, in the range 1532 Hz to 2610 Hz.' The 'Worst case train current limits' are described as 'Applying the 50% interference allowance, the maximum rail current permitted by a single train becomes 91.4 mA'. Although the above standard is non mandatory from July 2012, the maximum permitted interference current for TI 21 track circuit of 91.4 mA, which is far less than 300 mA, shall be considered. To reflect this, a revised percentage level is therefore proposed. Please see Note at the bottom of this comment sheet.	The original last two rows of Table21, 50>h>21 | 0.1 >50 | 0.1 The revised text for the last two rows of Table 2: 30>h>21 | 0.1 >30 | 0.03 The amended limits shall be set up as an achievable target for AC mode vehicles. Pease see Note at the bottom of this comment sheet.	3	DC	13	Table 2	(OB) The standard has not been amended following the receipt of this comment because the change proposed relates to the interface to other infrastructure subsystems, such as signalling, and is beyond the scope of RIS-2715-RST.

6	13	G3.4.2 and G3.4.3	The switching frequency current of the rail vehicle shall not be permissible to exceed the values above the power harmonic frequency current as stated in Section G3.4.1. Explanation: In terms of the interference levels presented to the railway infrastructure, the permissible harmonic current of the switching frequency of the rail vehicle should not exceed the general requirement set up in Section G3.4.1. This shall be an achievable target for the protection of the infrastructure (from overvoltage and high current emissions affecting signalling). And at the same time, this will prevent the damage on the train in extreme situation of overvoltage. See the statement in Clause 3.4.4. A few points to highlight. The excessive interference current of the switching frequency emitted from a train may present a risk the safe operation of the infrastructure: (1) The comment above (in Item 1) for Section G3.4.1 is an example of such risk presented to the TI21 (EBI 200) track circuit. (2) Over voltage presented on the contact line due to the current emission from a train may cause risk to other trains in the same feeding section, the railway infrastructure and in extreme situation, to the Distribution Network Operators. The detailed explanation is given below. In Table 3, the permitted harmonic current for the frequencies of 'Above 450 Hz' is 1% (bottom row). The maximum train current demand of 300 A is defined in Standard GM/RT2111. This makes the harmonic current values being 3 A (300 A * 1% = 3 A). For frequencies 'Below 300 Hz', the 15.5 percent permitted level is much higher than the values of 7.60% and 3.50%, which are set up for the corresponding power frequencies of 250 Hz and 350 Hz in Section G3.4.1 Table 2. For frequencies 'Above 450 Hz', 1 percent permitted level is much higher than the values proposed for the corresponding power frequencies of above 450 Hz in Section G3.4.1 Table 2. Please see Note at the bottom of this comment sheet.	The original text in G3.4.2: 'It is permissible to exceed …' Revised text for G3.4.2: 'It is not permissible to exceed …' Remove Table 3 and amend the text in Section G3.4.3 to: 'The permitted switching frequency harmonics shall not exceed the permitted level set up in Section G3.4.1 Table 2. When the switching frequency does not match the power harmonic frequencies, the most stringent requirement of the two adjacent values in Table 2 shall apply.' [Note: Table 2 with the amended last two rows, as per Comment No. 1] Also, please see Note at the bottom of this comment sheet.	3	DC	13	G 3.4.2	(OB) The comment received has been accepted but the standard change is different to the suggestion because different text has been provided by Network Rail for this comment which changes it from a requirement to guidance.

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7	14	G3.4.4	The impact on the functionality of equipment that may cause risk for the safe railway operations shall also be addressed.	Revised text: 'Equipment can malfunction / damaged as a result of poor harmonic current control. This may impose risk for the safe railway operations.'	3	DC	14	G 3.4.4	(ED) The standard has been amended and incorporates the suggested change(s).
8	14	G3.4.5	Harmonic currents generated by trains shall be controlled from the source to minimise the impact on the infrastructure, including those exported into the national supply grid. These harmonics cannot be solely controlled by the IM and ac supply authority. The vehicle manufacturer and the Operator must control generation at source.	Revised text: 'Harmonic currents generated by trains can be excited via the overhead line system and can also be exported into the national supply grid. Without harmonic current control from the source, i.e. to minimise these harmonics on the train, it is not possible for these harmonics to be controlled by the IM and ac supply authority. Consequently, this may affect the normal operation of the relevant systems, including the overhead line system, the lineside system as well as the ac power supply network. Where new vehicles are introduced or existing modified it is for the Proposer of change (Railway Undertaking) to manage this issue.' Or, Remove.	3	DC	-	-	(OB) The standard has been amended and incorporates the suggested change(s) – this guidance has been deleted.
9	14	G3.4.8	This is contradicted to Clause 3.4.6, which states that 'Rail vehicle switching frequency related currents are constant.' allow the values that can be exceeded transiently. If the values are exceeded, without an agreed definition on 'transient', further analysis shall be necessary to understand the cause of the exceedance. Also, Table 3 shall be removed. See Comment No. 2.	Revised text: ''The values in Table 2 shall not be exceeded. If the values are exceeded, further analysis shall be necessary to understand the cause of the exceedance.'	3	DC	14	G 3.4.6	(OB) The comment received has been accepted but the standard change is different to the suggestion because different text has been provided by Network Rail for this comment which changes it from a requirement to guidance.
10	14	G3.4.9	Table 3 shall be removed. See Comment No. 2. The values in Table 2 and Table 3 are for harmonics generated by the vehicles and assume a sinusoidal input waveform.	Revised text: 'The values in Table 2 ~~and Table 3~~ are for harmonics generated by the vehicles and assume a sinusoidal input waveform.'	3	DC	14	G 3.4.7	(OB) The standard has been amended and incorporates the suggested change(s).
11	14	3.5	A new clause shall be added to require the verification of the high frequencies (overhead contact line resonance) on the route the train intends to operate	Add Clause G3.5.4 'Verification of the high frequencies (overhead contact line resonance) on the route the train intends to operate shall be implemented. Monitoring the infrastructure shall also be considered.'	3	NC	-	-	(OB) The standard has not been amended following the receipt of this comment because it has been proposed to delay the inclusion of this comment until the 12-month review period.
12	14	3.5	A new clause shall be added to require the consideration of the accumulated harmonics effect due to multiple trains / units within the electrification feeding section.	Add Clause G3.5.5 'The harmonics effect due to multiple trains / units runs within the electrification feeding section shall be considered.'	3	NC	-	-	(OB) The standard has not been amended following the receipt of this comment because it has been proposed to delay the inclusion of this comment until after the publication of the update to the LOC&PAS NTSN, which may include this through reference to BS EN 50388-1:2022.

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13	14	3.5	A new clause shall be added to consider train borne EMC monitoring facilities been incorporated.	Add Clause G3.5.6 'The capability of accommodating train borne EMC monitoring facilities shall be considered for all ac electric vehicles for the measurements of harmonic currents and voltage at the primary side of the main transformer(s).'	3	DC	15	G 3.5.6	(OB) The comment received has been accepted but the standard change is different to the suggestion because this would set out a requirement for the rolling stock community which would result in additional costs to manufacturers. This will be included as guidance in issue one and reviewed as part of the 12-month review.
14	14	3.5	The EMC SG believe that the acceptance criteria limits for high voltage instability provided in 765399rep01_D Overhead Line Resonance (precursor/phase 1 of T1225 (2022) should be included in the standard for completeness, and that the guidance without the limits is not useful.	Note, stage 1 report concludes the limits of EN50388:2022 as applicable to UK.	4	DC	14	G 3.5.1	(ED) The comment received has been accepted but the standard change is different to the suggestion because BS EN 50388-1:2022 is now permissible for use. The acceptance criteria limits given in T1225 (2022) are more onerous than those set out in BS EN 50388-1:2022 and therefore should not be referenced as the values for inclusion, however the guidance has been amended to add clarity to the matter than BS EN 50388-1:2022 provides limits that were previously not available in BS EN 50388-1:2012.
15	14	3.5	A reference to where to obtain the models and methodologies given in T1225, such as from SPARK, would be beneficial so industry know where to obtain them from.		4	DC	15	G 3.5.5	(ED) The standard has been amended and incorporates the suggested change(s).
16	7	2.1.1/ G2.1.3/ G.2.1.6	This requirement is nothing to do with short circuit fault protection. It belongs in another section.	Create a specific section for these clauses.	5	DC	10	2.4	(ED) The standard has been amended and incorporates the suggested change(s).
17	7	G2.1.8	The text above the table does not make sense. '…have been calculated with the possibility of fault currents occurring that have the potential to cause an electrical fire.' It sounds like use of these cross sections will cause an electrical fire?	Reword. These cross sections have been shown to be sufficient to prevent an electrical fire (is that what is meant?)	5	DC	7	G 2.1.5	(ED) The standard has been amended and incorporates the suggested change(s).
18	7	Table 1	The table doesn't make sense. I think it is intended to be a tabulation of clauses G2.1.12-G2.1.14 in GMGN2611 issue 2, but something has been lost. What is the meaning of the 'target system' column? What is the meaning of the bond type column- shouldn't it be number of bonds per vehicle? Why if 120mmsq is enough for a single bond and 95mmsq enough for two parallel, then 120mmsq is needed for more than two parallel?	Reconsider the entire table. G2.1.12-G2.1.14 in GMGN2611 issue 2 made sense.	5	DC	7	Table 1	(ED) The standard has been amended and incorporates the suggested change(s).
19	8	G2.1.13	I don't understand what is meant by the statement about 35mm sq bonds. Surely the statement about two bonds applies whatever the size?	Remove the second sentence.	5	DC	7	G 2.1.9	(OB) The standard has been amended and incorporates the suggested change(s). Note that this is however against G2.1.12, not G2.1.13.
20	8	G2.1.16	The sentence about vehicles dedicated to dc electrified lines doesn't make sense in this standard which is about vehicles which run under 25kV electrification.	Reword- 'This permits rail vehicles which can operate over dc electrified lines to be bonded between the rail vehicle….'	5	DC	8	G 2.1.13	(ED) The standard has been amended and incorporates the suggested change(s).
21	11	G3.2.2	Poor English: The limits for which regeneration occurs at shall be adjustable in a maximum of 500 V steps.	The upper voltage limit for regeneration shall be adjustable in a maximum of 500 V steps.	5	DC	11	3.2.2	(ED) The standard has been amended and incorporates the suggested change(s).

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22	12	G3.3.4	This reasoning seems a bit spurious. The point is that if the circuit breaker is closed before the pantograph is raised the pantograph will switch the current, which it is not designed to do. This is likely to damage the OCL and/or the carbons. The inrush will be the same whether the pantograph or the circuit breaker does the switching.	Reword.	5	DC	12	G 3.3.4	(OB) The standard has been amended and incorporates the suggested change(s).
23	12	G3.3.5	What are the two conditions mentioned here? Pantograph up and line voltage in range? In that case the circuit breaker will reclose as soon as the line voltage is restored- is that the intention? Is this intended to tie up with EN50388 clause 11.3?	Clarify what is intended here.	5	DC	-	-	(ED) The comment received has been accepted but the standard change is different to the suggestion. This rationale has been removed as it was confusing and did not relate to the requirement.
24	12	G3.3.6	The requirements in BS EN 50388–1:2022 clause 11.4 are unrelated to signalling systems.	Reword- 'BS EN 50388–1:2022 clause 11.4 **also** sets out requirements for…'	5	DC	12	G 3.3.5	(ED) The standard has been amended and incorporates the suggested change(s).
25	13	G3.3.8	This clause needs to be tied together with G3.3.5.	Merge the two clauses.	5	NC	-	-	(ED) The standard has not been amended following the receipt of this comment because G3.3.5 is rationale and G3.3.8 is guidance. G3.3.5 gives the reason why the requirement is in place, and G3.3.8 gives the technical criteria required for it to be achieved.
26	14	Table 3	'Switched' should be 'Switching'		5	DC	14	Table 3	(TY) The standard has been amended and incorporates the suggested change(s).
27	14	G3.4.6	This isn't really true. It depends on the design of the converter.		5	DC	-	-	(OB) The standard has been amended and incorporates the suggested change(s) – guidance deleted.
28	14	G3.4.9	If the 'input waveform' were sinusoidal there would be no harmonics. I think you mean the line voltage is sinusoidal.	Change to sinusoidal line voltage.	5	DC	14	G 3.4.7	(ED) The standard has been amended and incorporates the suggested change(s).
29	14	G3.4.10	What does 'understand' compatibility mean?	Change to 'give an indication of compatibility'	5	DC	14	G 3.4.8	(ED) The standard has been amended and incorporates the suggested change(s).
30	14	G3.5.1	Quotes both old and new versions of EN50388, presumably in error.	Remove reference to 2012 version.	5	NC	-	-	(OB) The standard has not been amended following the receipt of this comment because reference is given to both editions of the standard in question to show where content has moved from BS EN 50388-1:2012 to BS EN 50388-1:2022, where the content is broadly the same but structured in different parts of the document. The original remains references due to continued reference in the LOC&PAS NTSN.
31	14	G3.5.1	'high frequency voltage instability' is not an accurate term to describe the issue. A resonance can be entirely stable but still cause overvoltage. EN50388 refers to 'harmonic and dynamic effects' which is more general and accurate.	Change to '…requires an assessment to be undertaken to demonstrate that harmonics and dynamic effects do not cause unacceptable overvoltages in accordance with the process set…'	5	DC	14	G 3.5.1	(ED) The standard has been amended and incorporates the suggested change(s).
32	14/15	G3.5.2 and G3.5.3	Missing 'The'	The models and methodology….	5	DC	14	G 3.5.2 and G 3.5.3	(TY) The standard has been amended and incorporates the suggested change(s).

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33	14	3.5	The T1225 project spent some time considering pass/fail values for harmonic overvoltages. These are covered in the Ricardo report 765399repo01_D which is for some reason not stored in the T1225 folder on the RSSB website but in another folder entitled OTH-RES. That report also needs to be referenced. The guidance report referenced is only a guide to using the model to calculate overvoltage.	Add reference to the OTH-RES project or make sure the OTH-RES project folder is merged with the rest of T1225.	5	DC	15	G 3.5.4	(OB) The standard has been amended and incorporates the suggested change(s).
34	17	4.3.1	Discusses isolating the ADD without any clue being provided as to the purpose of the ADD.	Add some narrative, reference GMRT2111. Is this needed at all given that the actual requirement repeats GMRT2111 G4.5.8?	5	DC	23	Definitions	(OB) The comment received has been accepted but the standard change is different to the suggestion because the guidance in GMRT2111 was not appropriate. G 4.5.8 from GMRT2111 has now been deleted, and a definition for ADD added to the backmatter of the standard.