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RID: **18th session of the RID Committee of Experts' working group on tank and vehicle technology**

(Video-conference, 6 and 7 October 2020)

Subject: **Extra-large tank-containers – Questions relating to safety**

Comments on the proposal transmitted by Germany (OTIF/RID/CE/GTT/2020/INF.1)

Transmitted by CEFIC

On paragraph 4

1. *"The subject of the risk assessment was a 45' B-TC with tank code L4BH, loaded onto a 45' iCTW and a 52' iCTW. However, according to INF.2 from the 16th session of the working group on tank and vehicle technology, there are also varieties of the B-TC that are 52' long, and tank codes L4DH, L10BH and L10DH.*

   There is thus no clear explanation of the extent to which the variant chosen in the risk assessment is representative of the other variants or the extent to which the other variants can be classified as less critical in all relevant aspects."

2. General remark: Firstly, the tests and the equipment used for the tests were discussed in detail and agreed in a Steering Committee meeting before performing the tests. The German delegation (BMVI, EBA, BAM) was a member of the Steering Committee and was part of this discussion and agreement. In particular, the 45' and 52' BTC were discussed in detail and Germany did not ask for tests of different tank types. Therefore, the question raised now by the German delegation after the tests have been successfully completed is more than surprising, as the German delegation agreed on this more than a year before the tests.

3. For practical reasons, the extent of the risk assessment was limited to the most representative B-TC tank types with L4BH tank code, which were considered as the most critical compared to the L4DH, L10BH and L10DH tank types. All B-TC types so far are comparable as far as frame and tank-frame design are concerned. The L4DH tanks are similar to the L4BH types as far as impact on the tank is concerned. Due to the absence of a bottom outlet, they are considered to be less critical. The L10BH and L10DH types do have higher shell thicknesses based on the higher calculation pressure of the tank and are thus also considered as less critical than the type submitted to the risk assessment. The 52’ B-TC differs from the 45’ B-TC in terms of its overall length, but its shell thickness, tank diameter, frame design, equipment, etc. are similar.

4. From the “running safety” point of view: as the maximum gross masses are the same, the bigger container has a comparable influence on running safety to the smaller one.

5. From the “sloshing” point of view: larger containers can cause slightly higher forces when half loaded, with the same liquid density. Assuming that the density in the larger tank is lower, the forces are lower.

6. From the “impact” point of view: if the larger tank is fully loaded and is not braked during the impact process, the impacting system and the impacted system have the same speed at the end of the impact process. Based on the theory of inelastic collision, more kinetic energy will be transferred into inner energy, where most of it is plastic energy during the deformation. Based on the similar total gross weight, resulting in similar forces, damage can be expected to be similar.

7. Therefore, the comment raised by the German delegation is not correct. All results are clearly discussed in the study and the results are representative for all B-TC types in use.

<u>On paragraph 5</u>

8. *“The B-TC/iCTW are compared with two conventional tank-containers on a conventional carrying wagon and a tank-wagon.*

   The objects compared are not comparable with regard to the materials used or the equivalent wall thicknesses (see also WP1, page 34, WP4, page 415 of the risk assessment). Simply focusing on comparable tank codes introduces too big a variation in terms of wall thicknesses, which means that it is not possible to make a meaningful comparison of the safety levels.”

9. See also the general remark above.

   The aim of the risk assessment was not to compare the different tank types based on the tank codes but was intended to compare stainless steel liquid tank types used by BASF:
   1) Conventional rail tank-wagons
   2) Conventional 20’ ISO tank-containers
   3) Conventional 24’ or 26’ swap body units
   4) The new B-TC design

   which were available at the time the risk assessment was started and are used in practice.

10. The objective was clearly to include a B-TC with 3.4 mm shell thickness to be compared with ADR/RID/IMDG approved tank-containers with minimum 4.2 mm shell thickness and with a rail tank-wagon with minimum 4.5 mm shell thickness.

11. Due to the differences in minimum shell thickness requirements between tank-containers and tank-wagons in RID, a comparison between B-TC and tank-wagons with 3.4 mm shell thickness was not possible and was not the aim of the study. In the risk assessment performed, BASF went far beyond the requirements of such a risk assessment. However, it was not the aim of the BASF study to answer questions not relating to the topic of B-TCs.

12. Furthermore, the provisions relating to the minimum required shell thickness have changed over the years, as have the stainless steel types used in the tank manufacturing, based on improvements and increased material characteristics, leading to the realistic situation that was considered.

13. With regard to the thickness of the tank heads, there should be a differentiation between <u>minimum thickness</u> and <u>nominal thickness</u>. The shape of the head used is an important factor in the nominal thickness needed. The calculated minimum thickness of the head is the thickness which must remain on the most critical spot after formation of the head. From this, the nominal thickness of the head is determined (= thickness needed <u>before forming</u>) based on the shape of the pressure head, as the formation of the head locally reduces the thickness.

14. Therefore, the point raised by the German delegation is not correct and is based on a misinterpretation of the objectives of the risk assessment.

<u>On paragraph 6</u>

15. *"There is also a lack of explanation as to how such a wide discrepancy between equivalent wall thickness and actual wall thickness can be reached for B-TC and tank-containers and the extent to which certain concessions had perhaps to be made in risk assessments here compared with more conservative conditions for the tank-wagon. In the tests carried out though, these aspects are not considered further."*

16. See also comment on paragraph 5.

17. The effective shell thickness used often depends on the availability of plate material in relation to the quantities needed. Therefore, it is likely to be the case that for smaller tank series, the thickness of the shell used is higher than the thickness needed. Furthermore, the tank owner (e.g. rental company) can choose to have a specific corrosion allowance included depending on the products to be carried.

18. The equivalent wall thickness is calculated based on the properties of the material used for the manufacturing of the B-TC.

19. The comment by the German delegation is not correct

<u>On paragraph 7</u>

20. *"There is some lack of precision in the statements on work package WP1. For example, in contrast to what is said in the risk assessment, the spigots do not secure the B-TC and classic tank-containers against becoming detached and overturning (WP1, page 13) and at the moment, the same provisions of RID still apply to B-TC and tank-containers. WP1, page 19 (Minimum shell thickness); page 24 (design and testing requirements) and page 31 (degree of filling)."*

21. This is correct, the B-TC and conventional ISO-TC are not secured against overturning by the spigots of container carrying wagons. This has been the case since intermodal transport started some 50 years ago in Europe. Therefore, there is a lot of experience and this is not a problem at all in intermodal traffic.

<u>On paragraph 8</u>

22. *"With regard to the degree of filling, it is said that from the point of view of rail transport, it only needs to be ensured that the total weight of the iCTW with the B-TC does not exceed 90,000 kg (see also section 4.2.5 of work package WP1 on page 31). As the gross weight of the B-TCs tested is limited to 75,000 kg and the iCTWs used weigh around 16,500 kg, the recommended threshold of 90,000 kg is exceeded (see also section 3.3.4 of work package WP1 on page 25)."*

23. The B-TC are designed for a maximum gross weight of 75 tonnes to cope with future improvements and reduced tare weights of carrying wagons in the future. When using carrying wagons with 16.5 tonnes and 90 tonnes gross weight the B-TC can only be used up to 73.5 tonnes gross weight.

24. There is a difference between conventional rail wagons and intermodal rail wagons. In intermodal transport the transport unit changes, so it is not 1:1 related to the wagon. In each and every intermodal transport operation, it is theoretically possible to overload a container wagon. As an example, you can load three 20' TC with a gross weight of 36 tonnes each on a 60' container wagon able to carry a payload of 72 tonnes. It is the obligation of the party responsible for the loading to prevent overloading. More than 50 years of good experience with intermodal traffic in Europe shows that this is not a problem at all.

25. For internal transport using the AGV, the gross weight of 75 tonnes can be used.

<u>On paragraph 9</u>

26. *"In the risk assessment under "hazard 5", non-compliance with the permissible load dimensions and selection of the correct carrying wagon are investigated. The conclusion (without any analysis or discussion) is as follows: "These hazards are mostly the result of human error and are at the same level as for tank-containers and conventional tank-wagons", see also section 4.3.2 on page 35.*

    Conventional tank-containers are carried on conventional carrying wagons. Extra-large tank-containers require special carrying wagons. So long as there is no clear marking, there is also the risk that extra-large tank-containers are loaded onto carrying wagons that are not equipped for the carriage of extra-large tank-containers.

    The question therefore arises which measures or stipulations can ensure the correct use of carrying wagons until there is marking for the carrying wagons. From the regulatory perspective, this question should be viewed in the abstract in relation to a generally applicable solution, even if the conclusion is reached that in the specific case of BASF's usage, suitable in-house processes are implemented."

27. See also example above in intermodal traffic with three 20' ISO tank-containers on one container carrying a 60' wagon. Working correctly or incorrectly is not a question of regulation, but of processes and experience. Therefore, the point raised calls the whole intermodal business into question.

28. Markings are currently being discussed with the International Union of Railways for inclusion in their IRS, and the discussions will look at the retrospective fitting of these markings to suitable wagons.

29. Fully loaded B-TCs can currently be handled at BASF Ludwigshafen only, whereas empty B-TC could be handled at any terminal. External transport of B-TC is performed on corresponding carrying wagons only and is strictly monitored by BASF.

30. There is currently no risk at all, and markings will soon be available.

<u>On paragraph 10</u>

31. *"In WP2 and WP3, the tests carried out focus on an assessment of the surge movements. The aim here is to demonstrate an acceptable risk for any degree of filling (by derogation from the current limits that apply under RID) in rail transport. To this end, tests and simulations were carried out on a specific track geometry with a 100%, 50% and 0% degree of filling."*

32. As stated on page 252, the filling degree of 50% is the most critical concerning Y/Q based on *Jönsson, L.-O.: Method to evaluate safety against derailment due to sloshing in partially filled railway tank vehicles. In: Spiryagin, M., Gordon, T. J., Cole, C. U. McSweeney, T. (publishers): The dynamics of vehicles on roads and tracks. Proceedings of the 25th Symposium of the International Association of Vehicle System Dynamics (IAVSD 2017), Rockhampton, Queensland, Australia, 14-18 August 2017. Boca Raton: CRC Press, Taylor & Francis Group 2018, p. 907–912*.

33. Therefore, the minimum, maximum and the most critical have been checked.

<u>On paragraph 11</u>

34. *“However, there is no explanation as to why the track geometry chosen and the associated execution of the tests can provide generally applicable evidence as regards surge movements in the tank on any infrastructure. What is required here is further consideration and explanation of the infrastructures that actually exist in the RID area, together with their maximum permissible speeds, depending on the curve radius (non-EU, as partially contained in WP3, page 300) and some information on the transferability of the findings obtained in this respect. It also remains unclear why divergent curve radiuses were modelled for the simulations (WP2, page 65; WP3, page 258), whereas the practical tests were carried out on a curve radius of 190m (WP2, page 67).“*

35. The tests are carried out on basic infrastructure at a shunting yard and represent standard movements. As they were carried out for system validation for WP3, it was not necessary to test the most critical status. The latter was done by simulation, with a small S-curve according to UIC 530-2. To include sloshing from previous movements, initial sloshing is replicated in the simulation, so different states in the critical infrastructure are tested.

36. The 500 m curve scenario was chosen due to the mean value for small curve radii in DIN EN 14363. With its cant, it represents a typical curve. The end of the curve, with decreasing cant during braking, shows the critical state; therefore, it is not necessary to check all radii. The maximum speeds (according to the infrastructure) depend on radius and cant (r = sqrt(11,8*v^2/(u+du)), but the maximum speeds (according to the wagon) depend on the cant decrease at the end of the curve, so it is not necessary to know all the existing radii, but the track transition curves, and here the most critical (shortest allowed with 1:400) is tested. To include sloshing from previous movements, initial sloshing is replicated in the simulation; therefore, different states in the critical infrastructure are tested.

37. With both infrastructure types (shunting yard, mainline) tested in critical states, it can be assumed that all states up to the given maximum velocity behave in the same way or less critically.

<u>On paragraph 12</u>

38. *“There is also no information on the transferability of the findings obtained to other tank/vehicle combinations, divergent tank volumes, different densities of goods loaded and degrees of filling other than the 50% that was tested. With regard to the latter point, reference is made to ORE report B57 from 1962, which deals primarily with the assessment of surge plates. Contrary to the source drawn on here, that report identifies a 75% degree of filling as a critical case – this at least provides an indication that further analysis of the effects of different degrees of filling on surge movements is necessary.”*

39. The stated source could not be accessed. Does it refer to the wheel force Y/Q as critical, or fluid forces within the tank? The source referred to in the comment on paragraph 11 states the critical filling degree of 50% regarding the Y/Q force, which was tested and simulated.

40. In addition, the German delegation's interpretation of the text is not correct. The figure of 75% given in the text says nothing about what the most critical percentage value is. It states only that 75% is critical. As we tested the critical filling degree of 50% in accordance with the stated source (see 32), the results can be transferred to other, less critical, filling degrees.

41. In addition, the comparison between tank-wagons and B-TCs with container carrying wagons shows that the performance of the container carrying wagons with B-TCs is better than with tank-wagons. The risk is therefore the same or even lower. As a result, there are only two possible logical conclusions from the tests. Firstly, that the minimum filling degree for tank-containers during rail transport be dispensed with or secondly, that a minimum filling degree also be required for tank-wagons.

On paragraph 14

42. *"Basically, it should be pointed out again that the various test objects had no comparable equivalent wall thicknesses (WP1, page 34, WP4, page 415), so it is not possible to com-pare the safety levels in this respect, and in particular, the calculation of safety margins (WP5, pages 415 and 419) can hardly be meaningful."*

43. The objective of the risk assessment was to compare the different tanks in use at BASF to determine the safety level in various scenarios.

44. The calculated safety margin takes material properties (Rm) into account. Due to the repeated and similar test scenarios of the impact tests (with similar impact forces), it provides an indication of how the different materials coped with the impact.

45. The results indicate that tanks with a higher equivalent wall thickness (which is based on material properties and actual wall thickness) are more stable.

46. The result also clearly shows that wall thickness alone is not the only criterion for tank stability and that there are different points to be considered. The result also clearly shows that the minimum tank wall thickness for tank-containers stated in the regulations is correct and sufficient, and there is no reason, argument or necessity to change this. In addition, the higher volume cannot be used as an argument because the B-TC shows better performance in the tests compared to tank-wagons and intermodal ISO tank-containers. The results are clear and meaningful.

On paragraph 15

47. *"The relevant minimum end wall thickness of 6.49 mm (metal sheet before shaping 7.90 mm) of the Van Hool 45' B-TC is derived by taking into account the dynamic forces (2g) and the maximum load in the calculation under operating conditions (in accordance with the supplied calculation of the tank). It should be noted that for the Magyar 45' B-TC tank-container, only 5.20 mm is given for the end wall thickness, although the same tank material was used and the tanks have almost the same dimensions (Magyar's calculation is not available and Appendices 1 and 2 to the data sheets for both the B-TCs and iCTWs in Chapter 2.1, page 11 and Chapter 2.3, page 14 are missing and are not listed in the table of contents either). Owing to the presumably different calculations, the wall thicknesses of the ends cannot be compared with each other."*

48. The difference in the minimum end wall thickness calculation between Van Hool and Magyar is based on the different shape of the manufactured heads. Both comply with EN 14025.

49. Such differences can be found with all tanks, and the way the tank is manufactured is equally important. Here, the German delegation states indirectly that tank wall thickness is not sufficient as a sole criterion.

50. The tests are comparable and the German delegation's observation and interpretation are wrong.

On paragraph 16

51. *"For the investigations on impacts, reference is made to standard EN 15227 (WP5, page 444). However, according to RID 6.8.2.1.2, the relevant standard for these stresses is standard EN 12663-2. What is missing here is a more precise description of what requirements are contained in standard EN 15227, how they differ from the stipulations of standard EN 12663-2 and what effects this has on the test results."*

52. In DIN EN 15227:2016-12, the impact process is defined; chapter 2 "Normative References" shows, when using DIN EN 15227:2016-12, where strength requirements are defined, EN 12663 must be used at the same time.

On paragraph 17

53. *"As a protective option for the shell, the effect of minimum distances between the headstock plane and the most protruding point at the shell extremity was investigated. The findings reached in this case relate solely to the penetration of the shell, but for B-TCs and tank-containers, they do not take account of any of the piping and fittings situated in front of the tank end or of any possible damage and the resulting leakages. However, in order to assess the risk from impacts, assuming such protective measures if necessary, failure of the external piping and fittings would also have to be taken into account."*

54. According to the provisions of RID/ADR, L4BH tanks should be fitted with three bottom closure devices, where the first valve is an internal stop valve. The purpose is to ensure that the product does not leak after major impact damage on the bottom outlet.

55. The B-TC are equipped with an internal closing foot valve with shear groove, to avoid damaged external pipework affecting the tightness of the foot valve.

56. The impact tests also show that there is no problem at all and that due to modern construction, the B-TC are even safer than tank-wagons constructed in accordance with older requirements.

On paragraph 18

57. *"In the investigations on side impacts, the only scenario considered was "tank-wagon hits the various test vehicles sideways on". The extent to which this scenario can be carried over to side impacts from other vehicles or loads with the B-TC, particularly more aggressive shapes and detachable elements of construction, such as box containers, is not considered and remains open. Moreover, the findings obtained in this scenario cannot be carried over to the opposite case where the "test vehicle hits the tank-wagon sideways on". Of particular interest here would be the impact of a B-TC on a tank-wagon with internal solebars, as in this set-up, there would be direct contact between the end of the B-TC tank and the tank of the tank-wagon. Failure of the external piping and fittings positioned in front of the tank end of B-TCs and tank-containers would also have to be taken into account here."*

58. Multiple accident scenarios are possible. No scenario can cover all possible accidents. The selection was made based on experience by TU Berlin and the equipment available. One of the important findings from this simulation was the positive protective effect of the external solebars of carrying wagons used for TC.

59. The results of the tests show clearly that the B-TC have a lower risk and a higher safety level compared to tank-wagons. Therefore, the issue raised by the German delegation is irrelevant.

On paragraph 19

60. *“The findings obtained from the risk assessment investigations are underpinned by findings from records of test vehicles in real continuous operation. However, the transport operations used for this only cover certain routes, for which there are no sufficient assessments in terms of whether the findings can be carried over to any other transport operation. Both the infrastructure and operational aspects should be considered here and should be seen in context with the particular characteristics within the scope of application of RID.”*

61. The tested routes represent a major share of BASF's rail transport operations where the B-TCs are used. Critical track geometries, which can be found across the RID application area, are analysed by means of the different simulations of WP 3.

62. The point raised by the German delegation is completely wrong and shows no knowledge of intermodal transport. It is not correct that container carrying wagons are solely transported on certain rail routes. They are transported on the whole rail network and are approved for the whole rail network. The statement by the German delegation therefore calls intermodal traffic into question as a whole.

On paragraph 20

63. *“One finding obtained is that above 5 km/h impact speed, strength threshold values for the sub-frame of the carrying wagon are exceeded. However, the ability to be hump shunted cannot be derived from this finding, as the relevant regulations do not currently differentiate between impact speeds. To offset this, the risk assessment proposes longer intervals between subframe inspections, but these are not currently implemented in the regulations and must be discussed separately before B-TCs and iCTWs are operated in hump shunting. As the risk assessment comes to the conclusion that there is an acceptable risk, assuming an increased probability of detection, this point at least would have to be reassessed.”*

64. The carrying wagons are officially approved for use on hump-yards and underwent all the necessary tests in accordance with EN 12663-2. Shorter inspection intervals are a suggestion which could be implemented by the respective ECM.

65. In addition, other container carrying wagons are also in practice shunted via hump operation. This has already been the case for more than 50 years. The tests now show that these practices are not risky, as we found no damage on the wagon or spigots, even though the wagons were shunted more often than a normal wagon would ever be. The BASF study therefore shows that there is no risk at all and that there is no need to challenge the practice. We are only proposing to check the spigots more often in order to improve safety further, but this should not be interpreted to mean that current processes are not safe.

On paragraph 21

66. *“In the risk assessment, there are no comparative considerations of the extent of damage in the event of penetration of the tank in relation to the likelihood of such damage occurring. For this type of damage, the increased volume of the tank also increases the extent of any damage; the extent to which the risk here is also comparable for B-TCs and tank-wagons with comparable equivalent wall thicknesses and tank volumes remains open.”*

67. It should also be considered that B-TC and classical tank-containers have a structural framework and are loaded ‘onto’ the carrying wagons, and are thus not ‘locked’ in the complete train. If a major collapsing accident were to occur in rail transport, the tank-container or B-TC is most likely to come loose from the carrying wagon and will experience less impact damage from the remaining train mass. The minimum shell thickness formula, which also takes EN 13094 Annex B into account, is a reference to the resistance to penetration.

68. If we look at the risk, we have to consider the volume on each wagon and not only the tank. The safety level of tank-containers (B-TC, ISO-TC) on container carrying wagons is higher than tank-wagons (side impact test). Therefore, the German delegation's interpretation is wrong.

<u>On paragraph 22</u>

69. *"In the risk assessment, the way the B-TCs performed in a collision was investigated using two different collision scenarios – a frontal collision and a side collision. The wall thicknesses of the ends of the tanks tested in frontal collisions were in the range of 5.2 mm to 7.9 mm. The wall thicknesses of the cylindrical part in the sideways collisions were in the range of 3.4 mm to 6.3 mm. The failure performance in the event of stresses caused by penetration correlates with the wall thickness. In our view, it is not possible from the investigations to draw any conclusion with regard to the minimum wall thicknesses of 3.0 mm for tank-containers and 4.5 mm for tank-wagons, as no evidence with regard to the minimum wall thicknesses required was provided. In addition, the minimum wall thickness has a major effect on the stability of tanks that have a large self-supporting length."*

70. Again, the aim of the risk assessment was a comparison of how the B-TC with 3.4 mm shell thickness would withstand the different impact scenarios in relation to the more conventional tank types used.

71. Not only the shell thickness, but also the external reinforcements contribute to the overall stability of the tank.

72. In addition, the German delegation is not logical in this respect and there is a contradiction in its own argumentation between paragraph 22 and paragraph 15.

73. The results are clear and meaningful and the result is that the B-TC on a container carrying wagon is safer than tank-wagons.

<u>On paragraph 23</u>

74. *"Furthermore, the test conditions in this respect are questionable. Chapter 2, "Procedure", of work package WP5 says on page 447: "For a realistic test, the corner fittings of the tank-container were not blocked by the spigots. Movement along the longitudinal axis was therefore possible". In practice, this seems to be a realistic scenario, but does not reflect the strictest test conditions, as prescribed for example for the dynamic collision test for portable tanks in accordance with the Manual of Tests and Criteria, Part IV, section 41 (or in accordance with standard ISO 1496-3). According to this, the container to be tested must be so placed in the impact test that the strictest test conditions result. The container has to be fixed onto the testing platform in such a way that it is secured to prevent movement in any direction when all 4 corner fittings are used."*

75. Wrong interpretation. The B-TC are approved after performing a dynamic collision text in accordance with ISO 1496-3. The aim of the risk assessment was not to repeat the dynamic collision test, but to compare the differences between the tank types in circumstances that were as realistic as possible.

<u>On paragraph 24</u>

76. *"With regard to the test conditions, it should also be noted that in section 2.1.1 of work package WP5, on pages 448/449 the weight of the impacting wagon is documented as 80.22 tonnes. The sum of the tare weight of the wagon of 22.3 tonnes and the load consisting of 10 blocks of 4 tonnes and 3 blocks of 1 tonne gives a total weight of around 65 tonnes. This reinforces the thesis that the test results or even the testing scenario do not enable any conclusions to be drawn with regard to the wall thicknesses required."*

77. This calculation omits the steel construction which keeps the blocks in position. Furthermore, the text describes estimates only, as the weights of the single blocks varied. Each block was weighed separately, resulting in a total weight of the impacting wagon of 88.22 tonnes.

78. The aims of the risk assessment impact test was to create a repeatable and identical impact scenario for every tank type tested.

<u>On paragraph 25</u>

79. "*In severe accidents involving rail tank-wagons, the tank-wagon can also overturn onto the cylindrical surface of the tank. In this respect, the possible behaviour of the shell in the event of penetration (comparison of lateral position with 3.0 mm and 4.5 mm wall thickness), bearing in mind possible leakage of the product (risk = frequency x consequence) would also have to be considered."*

80. The question remains as to where the difference in minimum required shell thickness (3.0 mm vs 4.5 mm) between tank-containers and tank-wagons originates. The structural framework of tank-containers experiences most of the forces during transport, some of which are transferred to the tank. The transfer of forces in tank-wagons is of a totally different nature. Furthermore, the framework of tank-containers should also cope with the forces applied during stacking (for B-TC up to 375 tonnes!). Shell thickness also relates to tank diameter; originally, tank-wagons were built with higher tank diameters than classical tank-containers, thus requiring a greater shell thickness.

81. Considering the wall thickness calculation and EN 13094 Annex B, possible penetrations are taken into account.

<u>On paragraph 26</u>

82. "*Possible leakage of the product in severe railway accidents and the resulting increased consequence compared with conventional tank-containers were not considered in the risk assessment submitted. Consequently, the discussion on the minimum wall thickness for extra-large tank-containers should also take account of the possible consequences of a catastrophic failure. Increasing the minimum wall thickness is one way of offsetting an increased consequence when the risk is the same."*

83. B-TC and ISO tank-containers are approved for multimodal transport in accordance with ADR/RID and some also in accordance with the IMDG Code. The likelihood of an accident occurring in road transport is much higher than in rail transport. As demonstrated and proved in the tests, the minimum shell thickness is not the only criterion and tank-containers are safer than tank-wagons due to the way they are constructed. The tests also prove that this is the case.

<u>On paragraph 27</u>

84. *"As a result, the various volumes should be considered in a risk assessment. There also needs to be further discussion of the safety level if these large tank-containers are to be used on the roads and the safety gain provided by the special carrying wagons is lost (e.g. in the event of frontal collisions)."*

85. In RID, there is no difference in perception between a 60 m^3 tank-wagon and a 90 m^3 tank-wagon, so a different approach for B-TC would not be objective. B-TC will always require a carrying substructure or vehicle in order to be moved. In this case the B-TC should be seen as a 'load' and the specific requirements could be assigned to the carrying vehicle, depending on the area of operation, gross weight, dimensions, speed, etc.

On paragraph 28

86. *"In conclusion, loading B-TCs onto carrying wagons that are not equipped for them is considered to be a generally accepted risk on the basis of the wagon inspection carried out in each case. This analysis is at the least questionable, because carrying wagons thus equipped constitute a new system that has not yet been used and they have not so far been specially marked either. The effects of such a scenario are not given further consideration."*

87. As described in the risk assessment, B-TCs are loaded onto corresponding carrying wagons at BASF only and transport operations are strictly monitored. Furthermore, as mentioned before, corresponding markings are planned and are currently being discussed with the UIC.

88. In addition, this statement by the German delegation calls whole intermodal transport into question and more than 50 years of experience shows that this system works. Consequently, this is only a misconception and no arguments support it.

On paragraph 29

89. *"The existing provisions of dangerous goods law for tank-containers have been developed on the basis of a tank-container with a maximum capacity of around 36,000 litres. Germany is of the view that for extra-large tank-containers, which are more than twice the size of conventional tank-containers and which correspond to a tank-wagon in terms of volume, in principle the stricter provisions for tank-wagons must also partly apply. For a comparison of the provisions applicable to tank-wagons and tank-containers, see also documents OTIF/RID/CE/GTP/2018/1 (Germany) and -2018/2 (United Kingdom). It cannot be concluded from the risk analysis that it is not necessary to adapt the provisions with a view to extra-large tank-containers."*

90. The proposed change would be a structural and illogical change in the dangerous goods regulations. In ADR/RID, there are no limitations as to a tank capacity of 36,000 litres. Intermodal tank-containers with volumes exceeding 40 m³ designed for products with low density have existed for decades. The volume of the tank is not necessarily the determining factor. Neither is there within RID a difference in perception between 60 m³ and 90 m³ tank-wagons. The capacity of a tank-container is based on the limiting maximum gross of the transport modes used. The weight restriction for tank-containers is mainly dominated by the maximum allowable gross weight for road transport. Deducting the tare weight of the tank-container, truck (HGV) and semi-trailer results in the maximum allowable payload. Depending on the different product densities to be carried, the volume of the tank will be optimised.

On paragraph 30

91. *"It should be checked whether a new definition should be introduced for extra-large tank-containers so that extra-large tank-containers can be taken into account accordingly in the provisions for the construction, approval, use and loading onto corresponding carrying wagons."*

92. B-TC remain intermodal transport equipment and should be considered as tank-containers. It is illogical to create an extra category based on a preset volume or gross weight. If extra requirements for B-TC are necessary, they could be implemented by means of 'special provisions' in order to cover the maximum variety possible, instead of stipulating volumes smaller or bigger than 36 m³ for instance.

On paragraph 31

93. *"Moreover, a tank-container in accordance with Chapter 6.8 is an intermodal means of transport which is designed for carriage by road and rail. As a result, this or that provision should not be dispensed with on a mode-specific basis. Consequently, we see no need to dispense with the provisions of, for example, 4.3.2.2.4 (degree of filling) just for the rail transport part."*

94. The logic to allow partial loads clearly comes from the rail transport mode and has nothing to do with the transporting object itself. If tank-wagons are allowed for partial loading, then this should also be allowed for tank-containers when performing rail traffic only.