# UAB Geležinkelio tiesimo centras

APPROVED
by the Director of UAB Geležinkelio
tiesimo centras
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No.

# RULES FOR ASSESSING THE TECHNICAL CONDITION OF FREIGHT WAGONS AND DETERMINING REPAIR INTERVALS

2023

# TABLE OF CONTENTS


1. General Provisions ..... 4
2. Maintenance and Repairs of Freight Wagons ..... 5
3. Extension of the Service Life of Freight Wagons ..... 6
4. Assessment of the Technical Condition of Freight Wagons ..... 6
5. Technical Diagnostics of Bogie Side Frames and Bolsters ..... 7

**ANNEXES:**

1. Overhaul Intervals for Freight Wagons ..... 9
2. Mileage and time limits for depot repairs of freight wagons, measured from the date of manufacture or the previous repair to the next repair (mileage-based accounting) ..... 10
3. Time limits for depot repairs of freight wagons, measured from the date of manufacture or the previous repair to the next repair (mileage-based accounting does not apply when the bogie structural members are no more than 36 years old) ..... 11
4. Time limits for depot repairs of freight wagons, measured from the date of manufacture or the previous repair to the next repair (mileage-based accounting does not apply when the bogie structural members are older than 36 years but no older than 39 years) ..... 12
5. Locations of wagon owner country markings on wagon components ..... 13
6. Assessment of the technical condition of hopper-dispenser wagons ..... 14
7. Condition Inspection Card for hopper-dispenser wagon No. XXXXXXXX ..... 17
8 Measurement data on the body thickness of hopper-dispenser wagon No. XXXXXXXX ..... 19
9. Frame thickness measurement data for hopper-dispenser wagon No. XXXXXXXX ..... 20
10. Layout diagram of body test locations for a hopper-dispenser wagon (body wall thicknesses) ..... 21
11. Layout diagram of frame test locations for a hopper-dispenser wagon (frame wall thicknesses) ..... 22
12. Layout diagram of frame welded-joint test locations for a hopper-dispenser wagon (external defects in the frame welded joints) ..... 23
13. Layout diagram of test locations for a hopper-dispenser wagon (internal defects in the frame welded joints) ..... 24
14. Ultrasonic Thickness Measurement Test Report ..... 25
15. Visual Testing Report ..... 26
16. Ultrasonic Testing Report ..... 27
17. Initial Test Data Report ..... 29
18. Initial Test Data Report for Adjustable Supports ..... 30
19 Assessment of the technical condition of flat wagons ..... 31
20. Technical Condition Inspection Card for flat wagon No. XXXXXXXX ..... 34
21. Ultrasonic Thickness Measurement Test Report ..... 37
22. Visual Testing Report ..... 39
23. Diagram showing the layout of test locations on a flat wagon frame (external defects in the welded joints of a flat wagon frame) ..... 40
24. Diagram showing the layout of test locations on the side walls of a flat wagon frame (thicknesses of the flat wagon frame side walls) ..... 41
25. Diagram showing the layout of test locations on the side walls of a flat wagon frame (internal defects in the welded joints of a flat wagon frame) ..... 42
26. Ultrasonic Testing Report ..... 43
27. Initial Test Data Report ..... 45
28. Initial Test Data Report for Adjustable Supports ..... 46
29. Procedure for assessing the technical condition of dump wagons ..... 47
30. Technical Condition Inspection Card for dump wagon No. XXXXXXXX with four unloading cylinders ... 50
31. Diagram showing the layout of test locations on the side walls of the underframe of a dump wagon (thickness of the side walls of the underframe of a dump wagon) ..... 52
32. Diagram showing the layout of test points on the upper frame of a dump wagon (thickness of the upper frame walls of a dump wagon) ..... 53
33. Diagram showing the layout of test points on the underframe of a dump wagon (external defects in the welded joints of the dump wagon’s underframe) ..... 54
34. Diagram showing the layout of test locations for welded joints on a dump wagon frame (internal defects in welded joints on a dump wagon frame) ..... 55
35. Ultrasonic Thickness Measurement Test Report ..... 56

36. Visual Testing Report ..... 60
37. Ultrasonic Testing Report ..... 61
38. Initial Test Data Report ..... 63
39. Initial Test Data Report for Adjustable Supports ..... 64
40. Procedure for assessing the technical condition of refrigerated service wagons ..... 65
41. Investigation of the technical condition of refrigerated service wagon No. XXXXXXXX ..... 69
42. Measurement data on the thickness of the body panels of refrigerated service wagon No. XXXXXXXX ..... 71
43. Measurement data for the frame thickness of refrigerated service wagon No. XXXXXXXX ..... 73
44. Diagram showing the layout of test points on the walls of a refrigerated service wagon frame (thickness of the refrigerated wagon frame walls) ..... 75
45. Layout diagram of test locations for welded joints on refrigerated service wagons (external defects in welded joints on refrigerated wagons) ..... 76
46. Schematic diagram showing the layout of test locations for welded joints on the frame of a refrigerated service wagon (internal defects in the welded joints of the refrigerated wagon frame) ..... 77
47. Ultrasonic Thickness Measurement Test Report ..... 78
48. Visual Testing Report ..... 81
49. Ultrasonic Testing Report ..... 82
50. Initial Test Data Report ..... 84
51. List of companies authorised to perform scheduled repairs on freight wagons ..... 85
52. List of companies authorised to perform technical diagnostics on freight wagons ..... 86

## 1. GENERAL PROVISIONS

1.1. The Rules for Assessing the Technical Condition of Freight Wagons and Determining Repair Intervals (hereinafter – the Rules) establish the procedure for assessing the technical condition of freight wagons used on the 1,520 mm gauge network and owned or otherwise lawfully held by the private limited liability company Geležinkelio tiesimo centras (hereinafter – Geležinkelio tiesimo centras), and the intervals for their scheduled repairs. These Rules must be followed by the employees whose work involves the maintenance and repair of the freight wagons of UAB Geležinkelio tiesimo centras and by the employees of the company carrying out technical diagnostics and repairs on the wagons.

1.2. Compliance with these Rules must ensure that freight wagons are in proper technical condition and operate reliably.

1.3. UAB Geležinkelio tiesimo centras operates the following wagon models:

- Hopper-dispenser wagons;
- Flat wagons;
- Dump wagons;
- Refrigerated service wagons.

1.4. The freight wagons of UAB Geležinkelio tiesimo centras are divided into two fleets:

1.4.1. **T6** fleet – freight wagons whose operating area is restricted because the service life of the wagons or their bogie bolsters and side frames has been extended. Freight wagons in the **T6** fleet may be used only in Lithuania, Latvia, Estonia, Belarus, Ukraine and Moldova. Freight wagons in the **T6** fleet are repaired and, after scheduled repair, accepted and inspected in accordance with the instructions and rules approved by *GTT* and the *GTT Wagon Fleet* Commission *("РД 32 ЦВ 169-2017 Freight Wagons for 1,520 mm Gauge Railways. Depot Repair Manual"* and *"РД 32 ЦВ 168-2017 Guidance Document. Freight Wagon Overhaul Manual"* and subsequent amendments thereto); their repair intervals are specified in **Annexes 1–3** to these Rules.

1.4.2. **T1** fleet – wagons whose operating area is restricted because their service life has been exceeded by a factor of 1.5. They may be used **only within the territory of the Republic of Lithuania**. Such wagons are repaired after assessment of their technical condition and, after scheduled repair, accepted and inspected in accordance with the instructions and rules approved by *GTT* and the *GTT Wagon Fleet* Commission *("РД 32 ЦВ 169-2017 Freight Wagons for 1,520 mm Gauge Railways. Depot Repair Manual"; "РД 32 ЦВ 168-2017 Guidance Document. Freight Wagon Overhaul Manual"* and subsequent amendments thereto), applying the standards in **Annex 3** to these Rules.

1.5. It is prohibited to use freight wagons and/or bogie bolsters and side frames whose service life has expired. The service life of such wagons and/or their bogie bolsters and side frames may be extended after their technical condition has been assessed during the technical diagnostics of freight wagons. Wagon service life is extended in accordance with the procedure approved and agreed by UAB Geležinkelio tiesimo centras only for the **T1** fleet.

*1.6.* Freight wagon repair, diagnostics of bogie bolsters and side frames, and extension of their service life must be carried out by a company authorised to perform repairs and assigned a conditional identification number (hereinafter – the Repair Company) under the *Procedure for Marking Railway Rolling Stock and Its Components with Conditional Identification Numbers,* approved by *GTT Protocol No. 54 of 18–19 May 2011 (Annex No. 32)*.

1.7. Technical diagnostics of freight wagons are carried out by a company included in the current list of organisations authorised to perform technical diagnostics of freight wagons for service life extension (hereinafter – the Diagnostic Company) (**Annex No. 52**) and holding a valid certificate issued by the *GTT Wagon Fleet* Commission to perform technical diagnostics of freight wagons.

## 2. TECHNICAL MAINTENANCE AND REPAIR OF FREIGHT WAGONS

2.1. Freight wagon maintenance and repair are carried out in accordance with the *Regulations on the Maintenance and Repair System for Freight Wagons Used in International Traffic,* approved by *Protocol No. 57 of the GTT meeting of 16–17 October 2012 (Annex No. 11)* (as subsequently amended), and other *GTT* requirements.

Types of maintenance and repairs applicable to freight wagons:

2.1.1**. Wagon maintenance (TP)** – a set of actions or individual actions to maintain the proper operation of a freight wagon in assembled or transit trains, or an empty wagon being prepared for carriage, without uncoupling it from the train or group of wagons.

2.1.2**. Diagnostic wagon maintenance (TPD)** – a set of operations using diagnostic tools to monitor the technical condition of wagon components. **TPD** is unscheduled maintenance carried out at a company authorised to perform technical diagnostics and repairs on freight wagons. An instruction to carry out TPD is issued by the Infrastructure Manager and/or another body responsible for traffic safety when it is established that a wagon in service or its components were manufactured or repaired in breach of the prescribed process and that their continued use threatens railway traffic safety.

2.1.3. **Current wagon repair requiring uncoupling (ER)** – unscheduled repair needed to maintain or restore a freight wagon's operational capability. During this repair, individual parts of the wagon are replaced or repaired.

2.1.4. **Depot wagon repair (DR)** – scheduled repair needed to restore a wagon's serviceability or part of its service life, during which components of a limited range of types are replaced or repaired and their technical condition is checked.

2.1.5. **Wagon overhaul (KR)** – scheduled repair (except where **KR** is performed under a Technical Decision) needed to restore a wagon's serviceability or all or part of its service life, during which any components, including the basic components, are replaced or repaired. It is performed in accordance with the Technical Decision.

2.2. The repair interval standards for freight wagons in the **T1** fleet are specified in **Annexes 3 and 4** to these Rules.

2.3. The overhaul interval is determined by the period of wagon use from manufacture (**KR**) until its first overhaul (**Annex 1**).

2.4. Depot repair intervals are determined on the basis of:

2.4.1. a combined criterion taking into account the actual work performed and a single criterion for the period of freight wagon use, from the date of manufacture (scheduled repair) until the first (next) scheduled repair;

2.4.2. a single criterion for the period of wagon use, from the date of manufacture (scheduled repair) until the first (next) scheduled repair.

2.5. The combined criterion applies to four-axle wagons with eight-digit numbers carrying loads appropriate to their models and design characteristics, used to carry freight on public railway infrastructure, registered in the prescribed manner in the automated freight wagon fleet database of the Railway Administrations' Information and Computing Centre, and included in the maintenance and repair system that takes account of the actual work performed (**Annex 2**).

2.6. The repair intervals for other wagons not mentioned in paragraph 2.5 are determined using a single criterion (**Annex 3**).

2.7. Wagon repair intervals, based on either the combined or the single criterion, are calculated from the date of manufacture, scheduled repair or repair with service life extension, respectively. This must be documented in the prescribed manner *("Regulations on the System of Maintenance and Repair of Freight Wagons Authorised for Operation on Public Railway Tracks in International Traffic"* and subsequent amendments thereto). It is prohibited to use a loaded or empty wagon in the operating fleet after its repair interval, based on either the combined or the single criterion, has expired. Wagons whose overhaul interval has expired may be used to carry freight until the end of the repair interval following the most recent depot repair, provided that the wagon undergoes overhaul.

2.8. Wagons converted from one kind (type) to another with shorter repair intervals and/or a shorter service life than the base model are assigned the shorter repair intervals and/or service life.

2.9. Scheduled repairs of wagons whose service life was extended during **DR** under a Technical Decision prepared on the basis of technical diagnostic results are carried out using the combined criterion, as specified in **Annexes 2, 3 and 4**.

2.10. For wagons in the T1 fleet whose bogie structural members are no more than 36 years old at the time of depot repair, a depot repair interval of 60 months (5 years) applies.

If the wagon's bogie structural members are older than 36 years but no older than 39 years, a depot repair interval of 24 months (2 years) applies.

When planning depot repair, it must be ensured that the wagon's bogie structural members will be no older than 41 years at the end of the next depot repair interval.

## 3. EXTENSION OF THE SERVICE LIFE OF FREIGHT WAGONS

3.1. The service life of freight wagons is extended upon submission of an application by the wagon owner to the organisation carrying out the work.

3.2. Upon submission of an application by the wagon owner to the organisation carrying out the work, the service life of freight wagons is extended in accordance with the requirements of the *Regulations on the Extension of the Service Life of Freight Wagons Operating in International Traffic,* approved by *Protocol No. 52 of the GTT meeting of 13–14 May 2010 (Annex No. 39)* (as subsequently amended).

## 4. ASSESSMENT OF THE TECHNICAL CONDITION OF FREIGHT WAGONS

4.1. If the owner of a wagon submits an application to the organisation carrying out the work to extend the service life of a freight wagon, and if the wagon's service life cannot be extended due to age restrictions in accordance with the procedure specified in Chapter 3, but UAB Geležinkelio tiesimo centras intends to continue using the wagon in the Republic of Lithuania, an assessment of the wagon's technical condition must be performed, taking into account its remaining service life (hereinafter – the Technical Condition).

4.2. The remaining service life of a freight wagon depends on its technical condition.

When assessing:

- the remaining service life of a hopper-dispenser wagon, follow **Annex 6** (Assessment of the Technical Condition of Hopper-Dispenser Wagons);
- the remaining service life of a flat wagon, follow **Annex 19** (Assessment of the Technical Condition of Flat Wagons);
- the remaining service life of a dump wagon, follow **Annex 29** (Assessment of the Technical Condition of Dump Wagons);
- the remaining service life of a refrigerated service wagon, follow **Annex 40** (Assessment of the Technical Condition of Refrigerated Wagons);

4.3. After carrying out technical diagnostics of the wagons, the Diagnostic Company prepares a Technical Conclusion specifying the scope of scheduled repair required – **DR** or **KR** – and the additional work needed to enable the freight wagons to be used after scheduled repair until the next scheduled repair specified in the annexes to these Rules.

4.4. The Diagnostic Company is responsible for the objectivity, substantiation, reliability and completeness of the technical diagnostics of the freight wagons of UAB Geležinkelio tiesimo centras.

4.5. Scheduled repair (**DR** or **KR**) of the scope specified in the Diagnostic Company's conclusion is carried out by the Repair Company **(Annex 51).** After technical diagnostics and scheduled repair, the wagon may be used until the next scheduled repair specified in **Annexes 3 and 4** to these Rules, only within the territory of the Republic of Lithuania. After repairs, the wagons are additionally stencilled with "**FOR OPERATION IN LITHUANIA**".

4.6. During technical diagnostics, after assessing the technical condition of the freight wagon (taking into account its remaining service life) and determining that the technical condition of the freight wagon, even after scheduled repairs, will not ensure safe operation, the Diagnostic Company will draw up the corresponding Technical Conclusion and submit it to UAB Geležinkelio tiesimo centras. The company then writes off such a wagon in accordance with its established procedures and takes it out of service.

## 5. TECHNICAL DIAGNOSTICS OF BOGIE SIDE FRAMES AND BOLSTERS

5.1. The technical condition of the side frames and bolsters of freight wagons used in the **T6** and **T1 fleets** is assessed during technical diagnostics in accordance with the current *GTT* normative documents governing non-destructive testing and repair of freight wagons and their bogie components: *"РД 32 ЦВ 052-2009 Guidance Document. Repair of Freight Wagon Bogies with Non-Contact Side Bearings"; "ТИ ЦДРВ-32-002-2008 Instructions for Non-Destructive Testing of Cast Components of Model 18-100 Freight Wagon Bogies During Service Life Extension, approved by the Railway Transport Council Commission on 24–26 June 2008"*, except paragraphs 1.5 and 1.6 of those instructions; *"Freight Wagons for 1,520 mm Gauge Railways. Freight Wagon Depot Repair Manual РД 32 ЦВ 169-2017"; "Guidance Document. Freight Wagon Overhaul Manual РД 32 ЦВ 168-2017"; "Process Instructions for Non-Destructive Testing of Cast Freight Wagon Bogie Components During Repair. Magnetic particle method. ТИ НК В.31-2.2019"; "Non-Destructive Testing of Wagon Components. General Provisions. Guidance Document. РД 32.174-2001"; Process Instructions for Non-Destructive Testing of Cast Freight Wagon Bogie Components During Repair. Magnetic particle method. ТИ НК*

*B.31-2.2019", "Non-Destructive Testing of Wagon Components. General Provisions. Guidance Document. РД 32.174—2001".*

5.2. Technical diagnostics of freight wagon bogie structural members are carried out upon submission by the wagon owner of a request to assess their technical condition.

5.3. After repairs, the bogie members are stamped with the marking 833-XX-XX, which means: 833 – the name of the company that repaired the bogie structural member; XX-XX – the repair date. The stamping locations are specified in *РД 32 ЦВ 052-2009 Guidance Document. Repair of Freight Wagon Bogies with Non-Contact Side Bearings*, par. *16*.

5.4. After technical diagnostics of the bogie structural members (see **Annex 5**), they are stamped with the marking TD-XX-XX **XXX**, which means: TD – technical diagnostics; XX-XX – the date until which use is permitted (month and year). The name of the company that carried out the technical diagnostics is placed next to the year – **XXX**.

After repairs, additional stencils are applied to the wagons: **"INTENDED FOR INFRASTRUCTURE MAINTENANCE"**.

**Annex 1**

| Overhaul Intervals for Freight Wagons | | | | | |
|---|---|---|---|---|---|
| **Item No.** | **Type of freight wagon** | **Model** | **Service life (years)** | **Overhaul after manufacture** | **Overhaul after overhaul** |
| 1 | Flat wagon | 13-401 | 32 | 15 | 12 |
| 2 | Flat wagon | 13-4012 | 32 | 15 | 12 |
| 3 | Flat wagon | 13-H452 | 32 | 15 | 12 |
| 4 | Flat wagon | 13-H453 | 32 | 15 | 12 |
| 5 | Flat wagon | 13-470 | 32 | 17 | |
| 6 | Flat wagon | 13-9004 | 32 | 17 | |
| 7 | Dump wagon | 31-638 | 22 | 10 | 7 |
| 8 | Dump wagon | 31-656 | 22 | 10 | 7 |
| 9 | Dump wagon | 31-661 | 22 | 10 | 7 |
| 10 | Dump wagon | 31-673 | 22 | 10 | 7 |
| 11 | Dump wagon | 31-674 | 22 | 10 | 7 |
| 12 | Hopper-dispenser wagon | 20-902 | 25 | 10 | 8 |
| 13 | Hopper-dispenser wagon | 20-X15 | 25 | 10 | 8 |
| 14 | Hopper-dispenser wagon | 20-X351 | 25 | 10 | 8 |
| 15 | Refrigerated | ЦБ5-651-10 | 25 | | |

Annex 2

| Mileage and time limits for depot repairs of freight wagons, measured from the date of manufacture or the previous repair to the next repair (mileage-based accounting) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Item No.** | **Type of freight wagon** | **Model** | **Depot repair after manufacture (mileage-based repair), thousand km** | **Depot repair after manufacture (mileage-based repair), years** | **Depot repair after depot repair (mileage-based repair), thousand km** | **Depot repair after depot repair (mileage-based repair), years** | **Depot repair after overhaul (mileage-based repair), thousand km** | **Depot repair after overhaul (mileage-based repair), years** |
| 1 | Flat wagon | 13-401 | 210 | 3 | 110 | 3 | 160 | 3 |
| 2 | Flat wagon | 13-4012 | 210 | 3 | 160 | 3 | 160 | 3 |
| 3 | Flat wagon | 13-H452 | 210 | 3 | 110 | 3 | 160 | 3 |
| 4 | Flat wagon | 13-H453 | 210 | 3 | 110 | 3 | 160 | 3 |
| 5 | Flat wagon | 13-470 | 210 | 3 | 120 | 3 | 210 | 3 |
| 6 | Flat wagon | 13-9004 | 210 | 3 | 120 | 3 | 210 | 3 |
| 7 | Dump wagon | 31-638 | 210 | 3 | 110 | 2 | 160 | 2 |
| 8 | Dump wagon | 31-656 | 210 | 3 | 110 | 2 | 160 | 2 |
| 9 | Dump wagon | 31-661 | 210 | 3 | 110 | 2 | 160 | 2 |
| 10 | Dump wagon | 31-673 | 210 | 3 | 110 | 2 | 160 | 2 |
| 11 | Dump wagon | 31-674 | 210 | 3 | 110 | 2 | 160 | 2 |
| 12 | Hopper-dispenser wagon | 20-902 | 210 | 3 | 110 | 3 | 160 | 3 |
| 13 | Hopper-dispenser wagon | 20-X15 | 210 | 3 | 110 | 3 | 160 | 3 |
| 14 | Hopper-dispenser wagon | 20-X351 | 210 | 3 | 110 | 3 | 160 | 3 |
| 15 | Refrigerated | ЦБ5-651-10 | 210 | 3 | 150 | 2.5 | 150 | 2.5 |

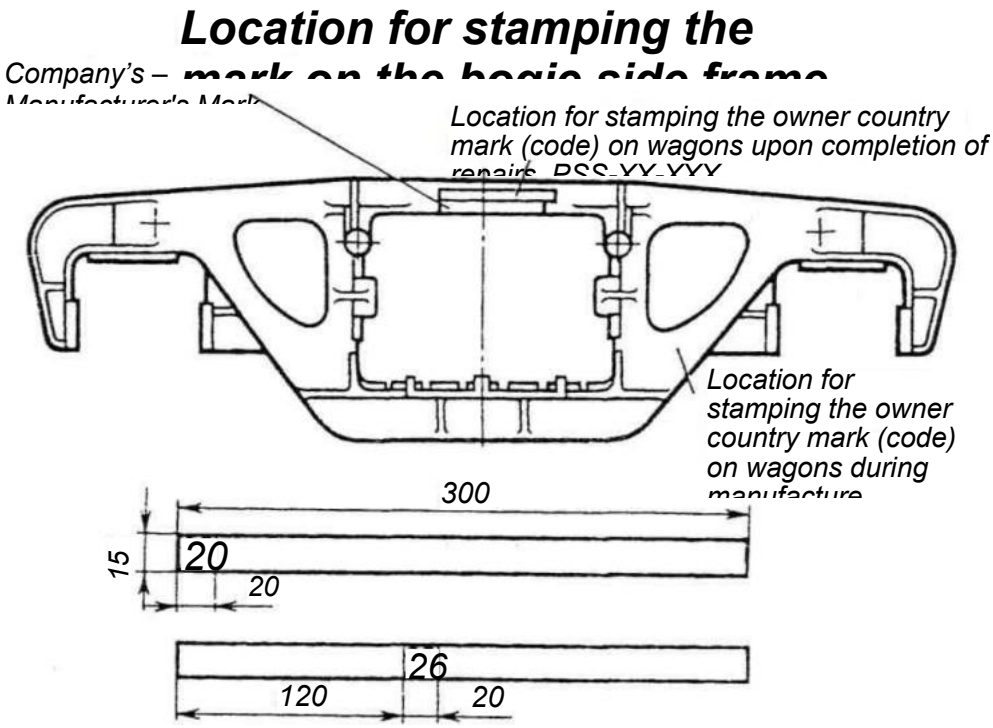
**Annex 3**

| Time limits for depot repairs of freight wagons, measured from the date of manufacture or the previous repair to the next repair (mileage-based accounting does not apply when the bogie structural members are no more than 36 years old) | | | | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Type of freight wagon** | **Model** | **Depot repair after manufacture** | **Depot repair after depot repair, before the first overhaul** | **Depot repair after depot repair, after the first overhaul** | **Depot repair after overhaul** |
| 1 | Flat wagon | 13-401 | 5 | 5 | 5 | 5 |
| 2 | Flat wagon | 13-4012 | 5 | 5 | 5 | 5 |
| 3 | Flat wagon | 13-H452 | 5 | 5 | 5 | 5 |
| 4 | Flat wagon | 13-H453 | 5 | 5 | 5 | 5 |
| 5 | Flat wagon | 13-470 | 5 | 5 | 5 | 5 |
| 6 | Flat wagon | 13-9004 | 5 | 5 | 5 | 5 |
| 7 | Dump wagon | 31-638 | 5 | 5 | 5 | 5 |
| 8 | Dump wagon | 31-656 | 5 | 5 | 5 | 5 |
| 9 | Dump wagon | 31-661 | 5 | 5 | 5 | 5 |
| 10 | Dump wagon | 31-673 | 5 | 5 | 5 | 5 |
| 11 | Dump wagon | 31-674 | 5 | 5 | 5 | 5 |
| 12 | Hopper-dispenser wagon | 20-902 | 5 | 5 | 5 | 5 |
| 13 | Hopper-dispenser wagon | 20-X15 | 5 | 5 | 5 | 5 |
| 14 | Hopper-dispenser wagon | 20-X351 | 5 | 5 | 5 | 5 |
| 15 | Refrigerated | ЦБ5-651-10 | 5 | 5 | 5 | 5 |

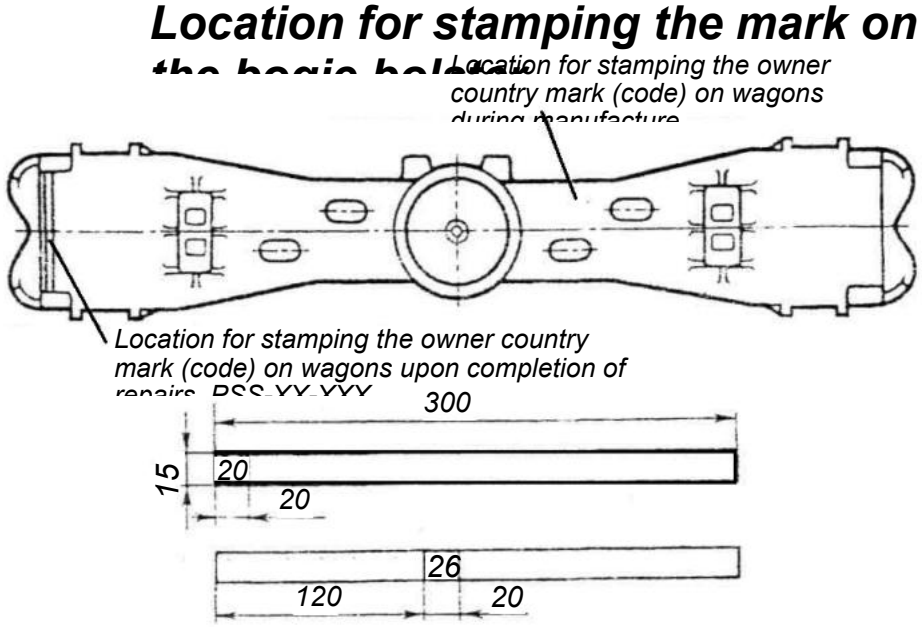
**Annex 4**

| Time limits for depot repairs of freight wagons, measured from the date of manufacture or the previous repair to the next repair (mileage-based accounting does not apply when the bogie structural members are older than 36 years but no older than 39 years) | | | | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Type of freight wagon** | **Model** | **Depot repair after manufacture** | **Depot repair after depot repair, before the first overhaul** | **Depot repair after depot repair, after the first overhaul** | **Depot repair after overhaul** |
| 1 | Flat wagon | 13-401 | 2 | 2 | 2 | 2 |
| 2 | Flat wagon | 13-4012 | 2 | 2 | 2 | 2 |
| 3 | Flat wagon | 13-H452 | 2 | 2 | 2 | 2 |
| 4 | Flat wagon | 13-H453 | 2 | 2 | 2 | 2 |
| 5 | Flat wagon | 13-470 | 2 | 2 | 2 | 2 |
| 6 | Flat wagon | 13-9004 | 2 | 2 | 2 | 2 |
| 7 | Dump wagon | 31-638 | 2 | 2 | 2 | 2 |
| 8 | Dump wagon | 31-656 | 2 | 2 | 2 | 2 |
| 9 | Dump wagon | 31-661 | 2 | 2 | 2 | 2 |
| 10 | Dump wagon | 31-673 | 2 | 2 | 2 | 2 |
| 11 | Dump wagon | 31-674 | 2 | 2 | 2 | 2 |
| 12 | Hopper-dispenser wagon | 20-902 | 2 | 2 | 2 | 2 |
| 13 | Hopper-dispenser wagon | 20-X15 | 2 | 2 | 2 | 2 |
| 14 | Hopper-dispenser wagon | 20-X351 | 2 | 2 | 2 | 2 |
| 15 | Refrigerated | ЦБ5-651-10 | 2 | 2 | 2 | 2 |

## LOCATIONS OF WAGON OWNER COUNTRY MARKINGS ON WAGON COMPONENTS




The markings are stamped on each bogie side frame, above the acceptance markings, starting from the beginning of the designated area. ***ПСС-XX-XXX*** **–** indicates the service life extension, the year in which the service life ends, and the mark of the company that performed the work.




The stamps are applied to the upper visible horizontal surface of the bogie bolster, 20 mm from its end and side edge.

The marks are stamped on the upper visible horizontal surface of the bogie bolster, 20 mm from its end and side edge. ***ПСС-XX-XXX*** **–** indicates the service life extension, the year in which the service life ends, and the mark of the company that performed the work.

Annex 6

## ASSESSMENT OF THE TECHNICAL CONDITION OF HOPPER-DISPENSER WAGONS

The process of assessing the technical condition of hopper-dispenser wagons includes: inspection of the wagon's technical condition; measurement of the thickness of the frame and main load-bearing structures; non-destructive testing of welded joints; calculation of the strength of the body and frame load-bearing structures in accordance with the applicable standards, taking account of thinning of structural members; assessment of remaining service life; and processing of the inspection results.

The technical condition of hopper-dispenser wagons is inspected to identify damage to components and assemblies of metal structures.

The thickness of the main load-bearing structures of the body and frame is measured to determine the actual metal thickness and compare it with the original thickness values (to determine the extent of corrosion during the service life).

Standard strength calculations for the body and frame of hopper-dispenser wagons, taking into account the thinning of the wagon's structural elements, are performed to assess the remaining service life.

The inspections establish the defect or limit-state criteria that prohibit further operation of a hopper-dispenser wagon.

A hopper-dispenser wagon is unserviceable if it has defects that threaten traffic safety, compromise the safety of the cargo being carried and fail to meet environmental protection requirements.

Any defects in the hopper-dispenser wagons identified during the technical condition inspection are recorded in a table (see Table 1). In addition, the technical condition of the running gear, automatic coupler and pivot assemblies, the dispenser's screw locking devices and transport locks, the dispenser supports and the safety levers locking the control valves is inspected.

If the inspection identifies any of the frame defects listed in items 1.1, 1.2, 1.3, 1.5, 1.6, 1.8 and 1.11–1.14 of **Table 1**, the wagon frames are not restored or repaired.

If the hopper-dispenser wagon body has the defects listed in items 2.2, 2.4 and 3.2 of **Table 1**, requiring replacement of more than 50% of the lower rail and more than 50% of the posts and braces, the wagon is not restored or repaired.

**Table 1. Types of defects in the main load-bearing and other components of hopper-dispenser wagons**

| Assembly name | Description of the defect or limit state |
|---|---|
| **1. Frame** | 1.1. Cracks in the centre sill in the area of the support brackets<br>1.2. Cracks in the joints between the centre sill and body bolsters<br>1.3. Cracks in the centre sill in the middle of the wagon<br>1.4. Bulging of the centre sill top plate in the area of the automatic coupler shank<br>1.5. Corrosion reducing the thickness of centre sill sections by more than 30%<br>1.6. Cracks in the welds between the centre sill and body bolsters<br>1.7. Damaged body bolster<br>1.8. Corrosion reducing the thickness of body bolster sections by more than 30%<br>1.9. A broken, bent or deformed end beam.<br>1.10. Broken, bent or deformed side beams<br>1.11. Corrosion reducing the thickness of side beam sections by more than 30%<br>1.12. Frame deviation from the plane (warping) of more than 70 mm per metre of width or 200 mm across the entire width of the frame |

| | |
|---|---|
| | 1.13. Vertical deflection of the longitudinal beams exceeds 200 mm<br>1.14. Horizontal deflection of the longitudinal beams exceeds 100 mm |
| **2. Side wall of the body** | 2.1. Corrosion, deformation, and cracks in the upper sheathing<br>2.2. Corrosion, deformation, and cracks in the lower sheathing<br>2.3. Corrosion, fractures, deformation and cracks in the body bolster posts<br>2.4. Corrosion, breaks, deformation and cracks in the side wall posts (corner and intermediate)<br>2.5. The sheet metal panels are warped, cracked and punctured |
| **3. End wall of the body** | 3.1. Corrosion, deformation and cracks in the upper sheathing<br>3.2. Corrosion, deformation and cracks in the braces<br>3.3. The sheet metal panels are warped, cracked and punctured |
| **4. Brake system fasteners** | 4.1. Loose or broken brake cylinder mounting bracket<br>4.2. A mounting device for an air distributor that has come loose or broken<br>4.3. Loose or broken auxiliary reservoir mounting<br>4.4. Loose or broken mounting of the automatic load regulator<br>4.5. Loose or broken fastening of the brake piping and connecting tubes<br>4.6. Loose or broken fastening of the retaining and protective clamps |
| **5. Handrails and steps** | 5.1. Breaks, bends and damage to handrails and steps |
| **6. Equipment mounted on the end beam** | 6.1. Loose or broken release lever bracket.<br>6.2. Loose or broken release lever holder<br>6.3. Worn or cracked support socket |

Inspection of a hopper-dispenser wagon begins by identifying its model and characteristics, as well as the nature of the cargo carried and its effect on the materials of the wagon's frame and body under different transport conditions.

The technical condition is assessed by visually inspecting the wagon's assemblies and components for cracks and damage to structural members. During the inspection, bolted and riveted joints are checked by tapping with a hammer to detect loose fastenings (with inspection dismantling if necessary).

Any defects found are recorded on *the Technical Condition Inspection Card for the Hopper-Dispenser Wagon* (**Annex 7**), which specifies the hopper-dispenser wagon's details (wagon model, number, year of manufacture, scheduled repair date, and purpose of the wagon). Sketches or photos of the defects may be attached, indicating their location and dimensions.

Cracks, fractures, bends, deflections, twists and ruptures in metal structures are identified visually, and the dimensions of the defects are then measured. Corrosion is detected by measuring the thickness of the components.

The thickness of the main load-bearing members of metal structures is measured regardless of whether defects in these members were identified during a visual inspection.

Defects identified through non-destructive testing are recorded in accordance with the procedures laid down in normative documents.

In accordance with the specified diagrams (**Annexes 8 and 9**), the thickness of the hopper-dispenser wagon body and frame is measured, and non-destructive ultrasonic and magnetic particle testing is carried out on welded joints (**Annex 10**).

In accordance with the specified diagrams (**Annexes 8, 9, 10 and 11**), the thickness of the hopper-dispenser wagon body, frame and frame walls is measured, the welded joints of the frame are visually examined for external defects (**Annex 12**), and non-destructive ultrasonic and magnetic particle testing is carried out on welded joints (**Annex 13**).

Based on the body and frame thickness measurement results, *reports on ultrasonic thickness measurement tests of the hopper-dispenser wagon body and frame* are prepared (**Annex 14**); based on the visual testing results for welded joints, a *Visual Testing Report for Welded Joints* is prepared (**Annex 15**); and based on the results of non-destructive ultrasonic testing of welded joints, an *Ultrasonic Testing Report* is prepared (**Annex 16**).

The deflection of the hopper-dispenser wagon frame's longitudinal beam and the frame's deviation from a plane (warping) are also determined, and *initial data reports for the geometric tests* are prepared (**Annexes 17 and 18**).

After processing and analysing the test data, in accordance with normative technical documents and taking into account the nature of the cargo being transported, a conclusion is reached regarding the suitability of the hopper-dispenser wagon for operation and the extension of its service life:

- not to extend the service life (to write off the hopper-dispenser wagon);
- the service life is extended following depot repair;
- the service life is extended following overhaul;

Following technical diagnostics in the laboratory, a Technical Decision is prepared for each hopper-dispenser wagon, specifying the scope of scheduled repair required and the extended service life of the wagon.

The work specified in the Technical Decision must be completed within 6 months.

**Annex 7**

**Condition Assessment Card for Hopper-Dispenser Wagon No. XXXXXXXX**

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Comments |
|---|---|---|---|---|---|
| | | Overhaul | Depot repair | | |
| * | | | | According to the Freight Wagon Model Handbook | |

- 20-X15, 20-X351, 20-902

**Damage to the main load-bearing structural components of a hopper-dispenser wagon**

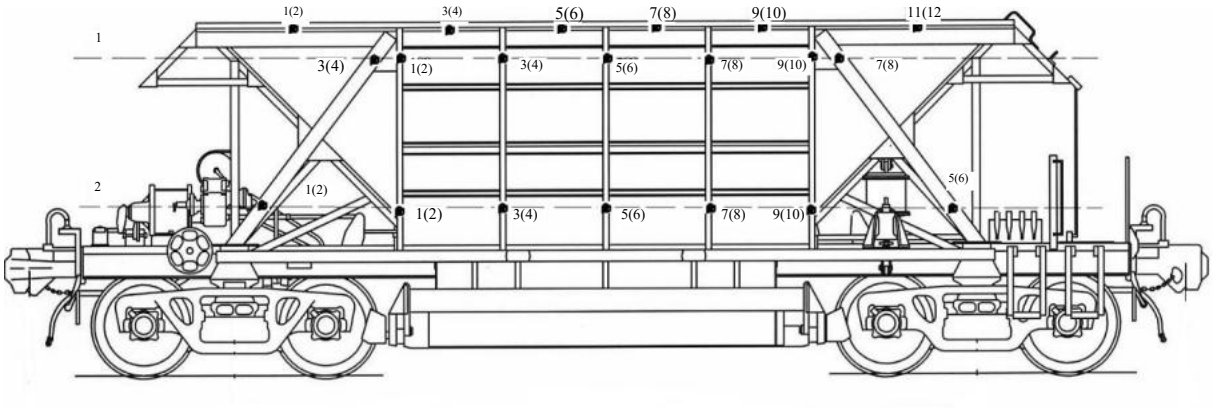
| **1. Frame** | | **3. End wall** | |
|---|---|---|---|
| 1.1. Cracks in the centre sill in the area of the support brackets | | 3.1. Corrosion, deformation and cracks in the upper sheathing | |
| 1.2. Cracks in the joints between the centre sill and body bolsters | | 3.2. Corrosion, deformation and cracks in the braces | |
| 1.3. Cracks in the centre sill in the middle of the wagon | | | |
| 1.4. Bulging of the centre sill top plate in the area of the automatic coupler shank | | 3.3. The sheet metal panels are warped, cracked and punctured | |
| 1.5. Corrosion reducing the thickness of centre sill sections by more than 30% | | **4. Brake system fasteners** | |
| 1.6. Cracks in the welds between the centre sill and body bolsters | | 4.1. Loose or broken brake cylinder mounting | |
| 1.7. Damaged body bolster | | 4.2. Loose or broken air distributor mounting | |
| 1.8. Corrosion reducing the thickness of body bolster sections by more than 30% | | | |
| 1.9. A broken, bent or deformed end beam | | 4.3. Loose or broken auxiliary reservoir mounting | |
| 1.10. Broken, bent or deformed side beams | | 4.4. Loose or broken automatic load-regulator mounting | |
| 1.11. Corrosion reducing the thickness of side beam sections by more than 30% | | 4.5. Loose or broken fastening of the main pipes and connecting tubes | |
| 1.12. Frame deviation from the plane (warping) of more than 70 mm per metre of width or 200 mm across the entire width of the frame | | 4.6. Loose or broken fastening of the retaining and protective clamps | |
| 1.13. Vertical deflection of the longitudinal beams exceeds 200 mm | | **5. Steps and handrails** | |
| 1.14. Horizontal deflection of the longitudinal beams exceeds 100 mm | | 5.1. Broken, warped or damaged steps and handrails | |
| **2. Side wall** | | **6. Equipment mounted on the end beam** | |
| 2.1. Corrosion, deformation and cracks in the upper sheathing | | 6.1. Loose or broken release lever bracket | |
| 2.2. Corrosion, deformation and cracks in the lower sheathing | | 6.2. Loose or broken release lever holder | |
| 2.3. Corrosion, fractures, deformation and cracks in the body bolster posts | | 6.3. Worn or cracked support socket | |
| 2.4. Corrosion, breaks, deformation and cracks in the side wall posts (corner and intermediate) | | NOTES:<br>1. Underline the defect<br>2. Mark a defect with +<br>3. Mark a serviceable item with –<br>4. Mark a rectified defect with p | |
| 2.5. The sheet metal panels are warped, cracked and punctured | | | |

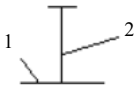
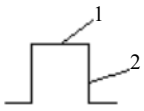
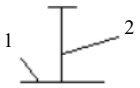
Type of repair ordered: _____

Specified service life: Until _____

_____ _____ (day) ____ (month)
_____ (year)

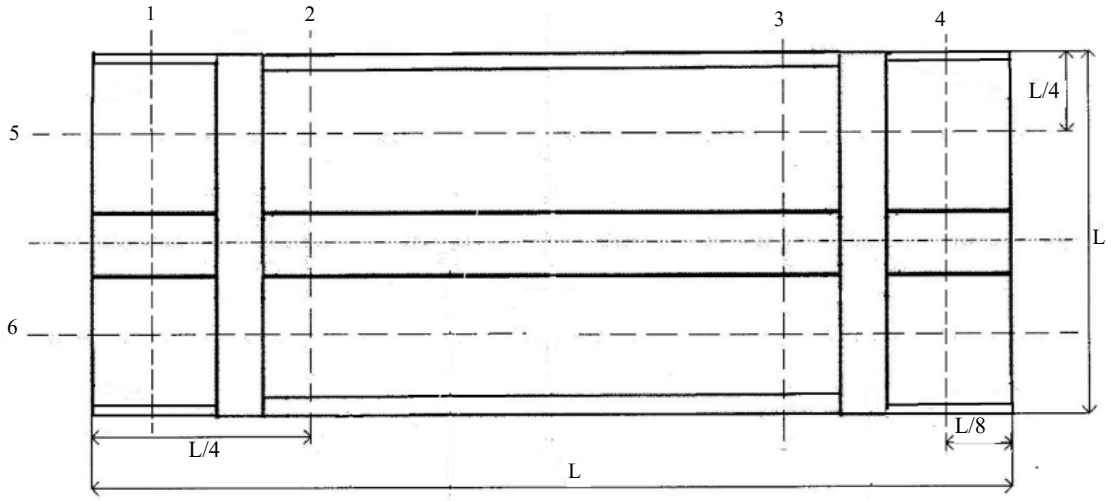
## Body thickness measurement data for hopper-dispenser wagon No. XXXXXXXX

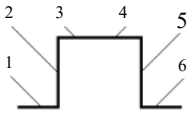
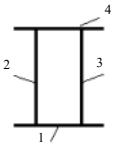



| Point No. | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper sheathing |  | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | |
| | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Body bolster post |  | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | | | | | | | | |
| | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Side wall post, cross-section 1 |  | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | | | | |
| | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Side wall post, cross-section 2 |  | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | | | | |
| | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

**Annex 9**

**Frame thickness measurement data for hopper-dispenser wagon No. XXXXXXXX**

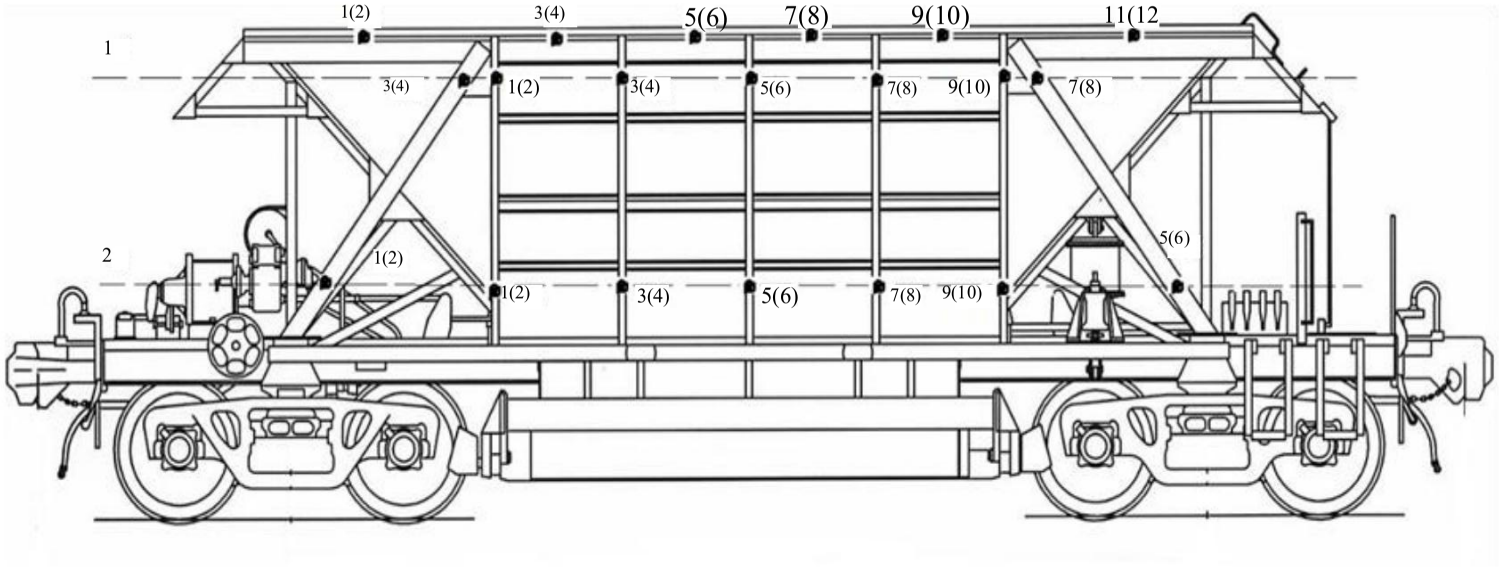



| Name | Measurement location | Section No. | Measurement result, mm | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| Centre sill |  | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | | | | |
| Body bolster No. 1 |  | | | | | | | |
| | | 5 | | | | | | |
| | | 6 | | | | | | |
| Body bolster No. 2 | | 5 | | | | | | |
| | | 6 | | | | | | |
| Side beam |  | | | | | | | |
| | | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | | | | |

Signatures:

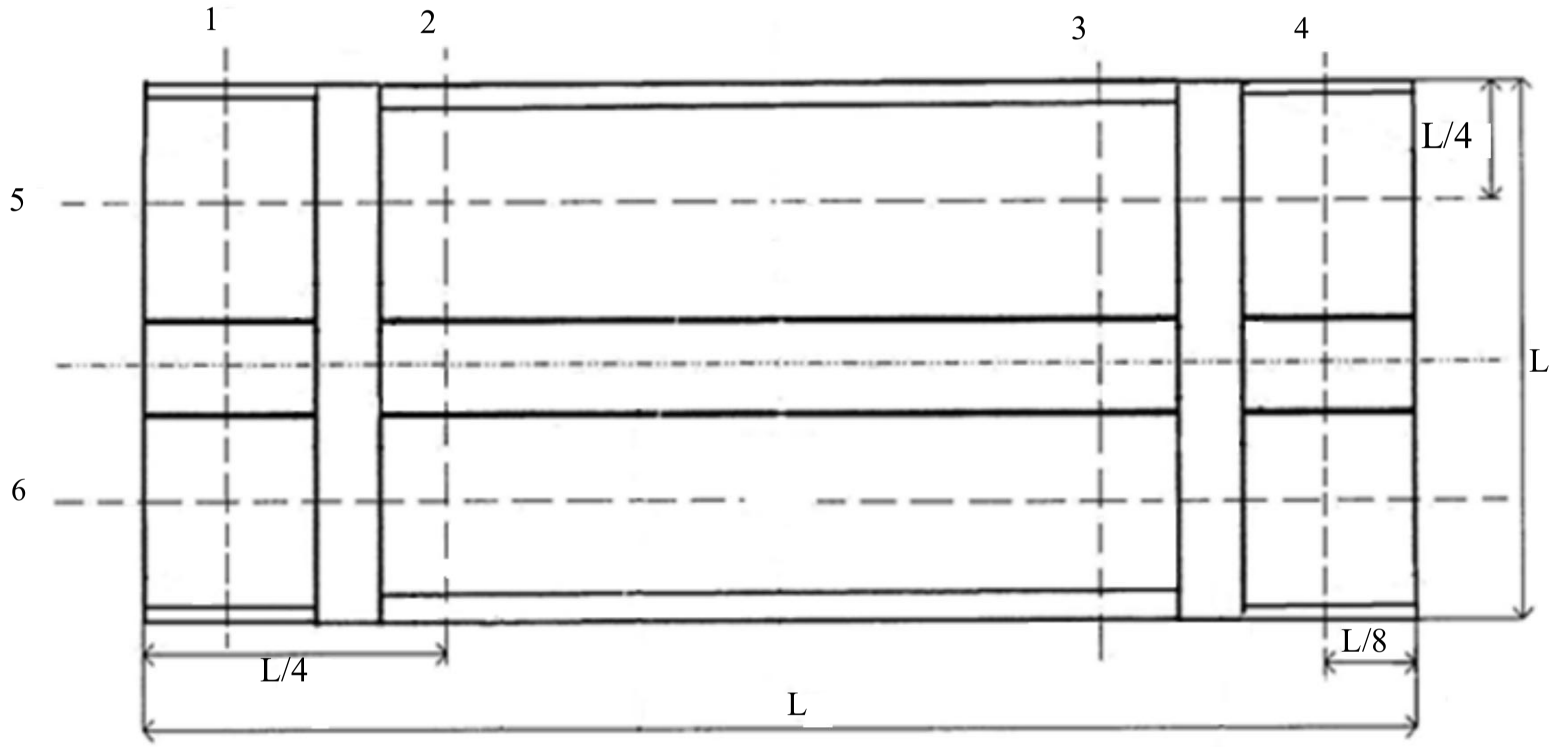
## LAYOUT DIAGRAM OF BODY TEST LOCATIONS FOR A HOPPER-DISPENSER WAGON

(hopper-dispenser wagon body wall thicknesses)



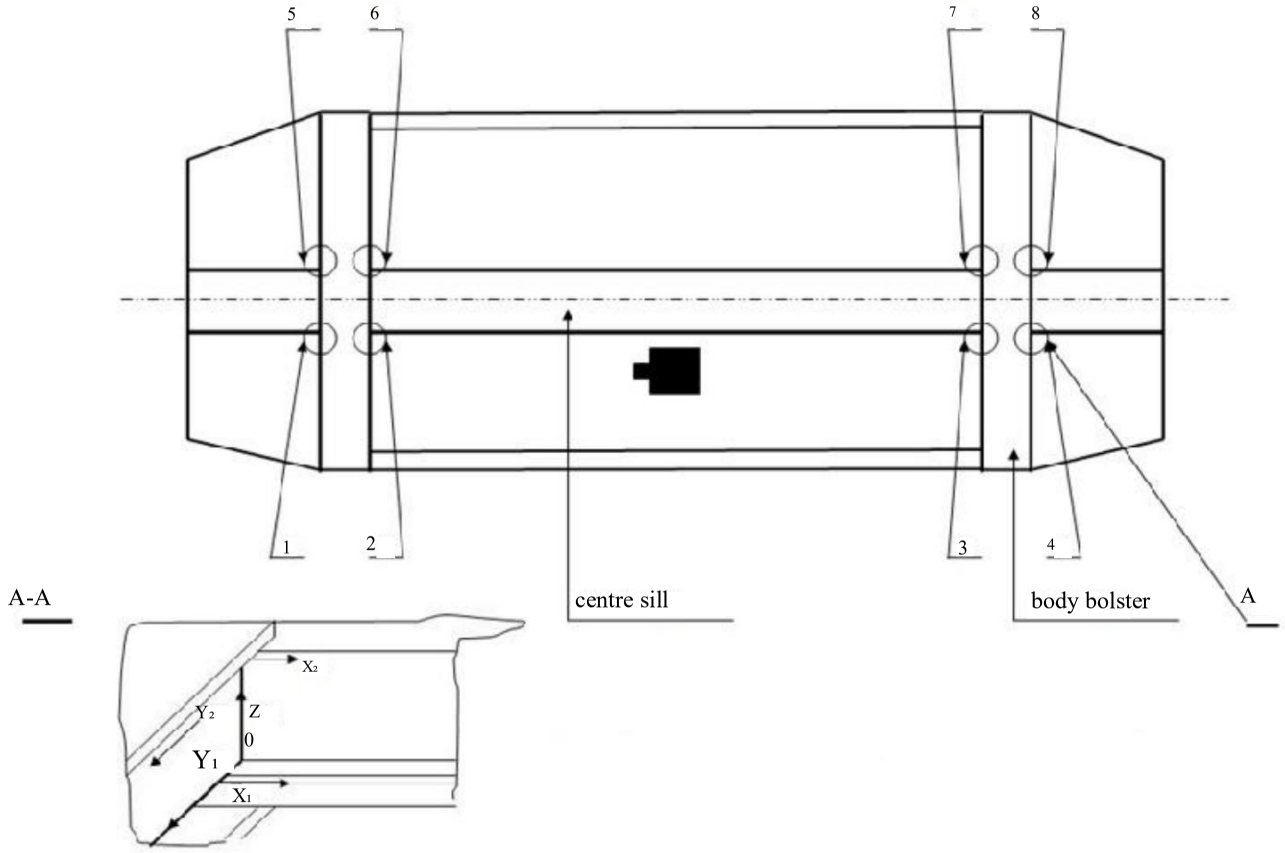
## LAYOUT DIAGRAM OF FRAME TEST LOCATIONS FOR A HOPPER-DISPENSER WAGON

(hopper-dispenser wagon frame wall thicknesses)



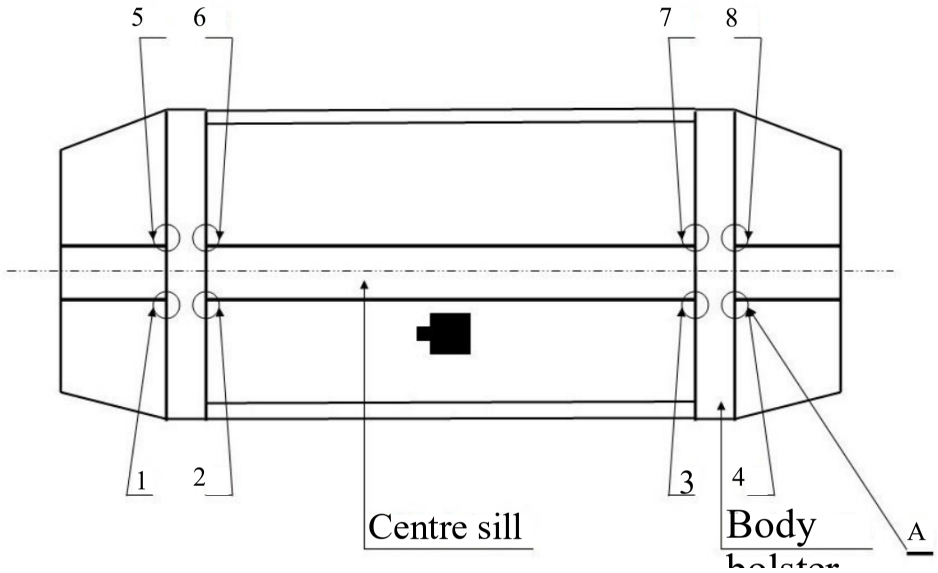
## LAYOUT DIAGRAM OF FRAME WELDED-JOINT TEST LOCATIONS FOR A HOPPER-DISPENSER WAGON

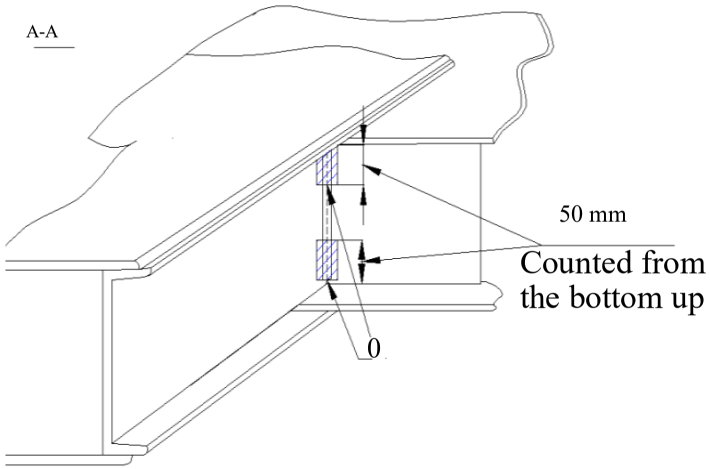
(external defects in the welded joints of the hopper-dispenser wagon frame)



## LAYOUT DIAGRAM OF TEST LOCATIONS FOR A HOPPER-DISPENSER WAGON

(internal defects in the welded joints of the hopper-dispenser wagon frame)



Annex 14

| (Company name) | **ULTRASONIC THICKNESS MEASUREMENT TEST REPORT** | **TESTS** |
|---|---|---|

| **Report No.** | **Date** | **Application No.** |
|---|---|---|

| **Client:** | **Purpose of the tests:** |
|---|---|

| **Measurement location:** | | **Test subject:** | **Drawing No.** |
|---|---|---|---|

| **Component No.** **T** | **Material:** |
|---|---|

| **Measurement standard, methodology:** | **Environmental conditions:** | |
|---|---|---|

| **Part being measured** | **Measurement point No.** | **Nominal thickness** | **Permissible thinning up to** | **Sketch of the object to be measured, showing the locations of the measurement points** Diagram No. |
|---|---|---|---|---|
| Centre sill | | | | |
| | | | | |
| | | | | |

| **Thickness Gauge** | **Serial No.** | **Calibration blocks** |
|---|---|---|

| **Transducer: No.** | **Frequency:** | **Serial No.** | **Couplant:** |
|---|---|---|---|

| **Evaluation criteria, standard:** | **Deviations from standards or the contract:** |
|---|---|

**ULTRASONIC THICKNESS MEASUREMENT RESULTS**

| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation | Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|---|---|---|---|---|
| Centre sill | 1 | 1 | | | Centre sill | 3 | 1 | | |
| | | 2 | | | | | 2 | | |
| | | 3 | | | | | 3 | | |
| | | 4 | | | | | 4 | | |
| | | 5 | | | | | 5 | | |
| | | 6 | | | | | 6 | | |
| | 2 | 1 | | | | 4 | 1 | | |
| | | 2 | | | | | 2 | | |
| | | 3 | | | | | 3 | | |
| | | 4 | | | | | 4 | | |
| | | 5 | | | | | 5 | | |
| | | 6 | | | | | 6 | | |

| **The tests were conducted by:** | **Person who approved the report:** |
|---|---|

| (Company name) | **VISUAL TESTING REPORT** | |
|---|---|---|

| **Report No.** | **Date:** | **Application No.** |
|---|---|---|
| **Client:** | **Purpose of the tests:** | |
| **Test site:** | **Test subject:** | **Diagram No.** |
| **Test component No.** | **Component dimensions according to diagram No.** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Data Sheet No.** - | |
| **Testing equipment:** | | |

**VISUAL TESTING RESULTS**

| **Test component assembly No. according to the diagram** | **Defects found** | **Assessment** | **Test component assembly No. according to the diagram** |
|---|---|---|---|
| No. | | | No. |
| | | | |
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| | | | |
| **Evaluation criteria, standard:** | **Deviations from standards:** | | |

| **The tests were conducted by:**<br>Cert. No.: | **Person who approved the report:**<br>**Cert. No.:** |
|---|---|

| (Company name) | ULTRASONIC TESTING REPORT | TESTS |
|---|---|---|

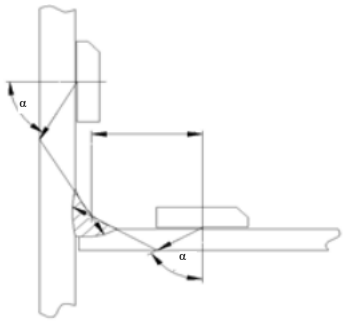
| | | |
|---|---|---|
| **Report No.:** | **Date**: | **Application No.:** |
| **Client:** | **Purpose of the tests:** | |
| **Test location:** | **Test subject:** | **Drawing No.:** |
| **Test component** No.: | **Part dimensions:** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Sheet No.:** | **Test level:** |
| **Flaw detector:** | **Product No.:** | **Couplant:** |

**Evaluation criteria, standard:** **Deviations from standards:**

**Transducers**

| | | | | |
|---|---|---|---|---|
| **1.** | Frequency | MHz | Angle | Product No. |
| **2.** | Frequency | MHz | Angle | Product No. |
| **3.** | Frequency | MHz | Angle | Product No. |
| **4.** | Frequency | MHz | Angle | Product No. |

| **Calibration and reference blocks:** | | | | **Time range** | **Scanning directions and areas** | | |
|---|---|---|---|---|---|---|---|
| **Sensitivity setting** | | | | | | **α, ◦** | **X,** |
| | **Reference level** | **Examination level** | **Recording level** | | | | |
| **1.** | | | | | | | |
| **2.** | | | | | | | |
| **3.** | | | | | | | |
| **4.** | | | | | | | |




**Evaluation criteria, standard:** **Deviations from standards:**

**ULTRASONIC TEST RESULTS**

| | | |
|---|---|---|
| **No defects were found** ☐ | **Permissible defects (see the other side of the page)** ☐ | **Unacceptable defects (see the other side of the page)** ☐ |

| | |
|---|---|
| **The tests were conducted by:** | **Person who approved the report:** |

**ULTRASONIC TESTING RESULTS REPORT**

| ULTRASONIC TEST RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Part No. | Defect No. | Defect height, mm | | Defect amplitude | Defect length, mm | Defect start, mm | Defect assessment | Note |
| | | from | to | | | | | |
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| | | | | | | | | |
| The tests were conducted by: | | | | | | | | |

**Annex 17**

## INITIAL TEST DATA REPORT

### Initial Test Data Report No.

Wagon No. _____ – determination of longitudinal _____ beam deflection
(centre sill, side beam)

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

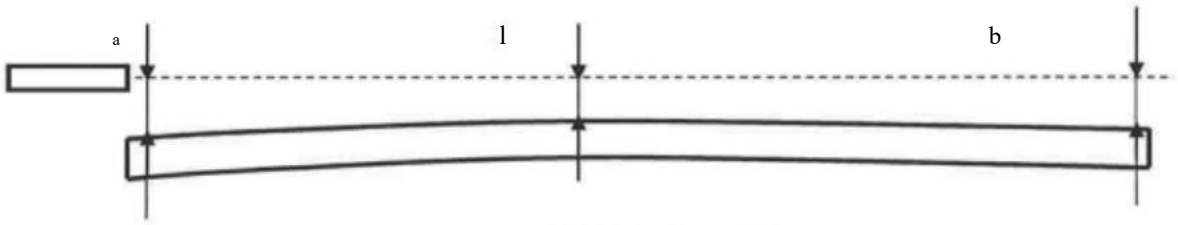
CLIENT _____

ORDER No. _____ TEST DATE_____

ENVIRONMENTAL CONDITIONS

Measuring instruments;

**Measurement diagram**




**Determining the level of a laser beam**

| **Distance to the laser beam, mm** | **Ruler readings** | | | | |
|---|---|---|---|---|---|
| | 1st reading | 2nd reading | 3rd reading | 4th reading | 5th reading |
| a | | | | | |
| b | | | | | |
| $l_{(ab)}=(a+b)/2$ | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | **Distance l, mm** | **Deflection $l_n$, mm** | Calculation of beam deflection (ln) |
|---|---|---|---|
| 1 | | | $I_n = l_{(ab)} - l_n$; *where* $l_{(ab)} < l_n$; |
| 2 | | | $I_n = l_n - l_{(ab)}$; *where* $l_{(ab)} > l_n$; |
| 3 | | | |
| | | | |

$I=£ I_n/n$ – longitudinal beam deflection, i.e. the arithmetic mean of the deflections;

Vertical/horizontal (delete as appropriate) deflection of the longitudinal beam of the wagon frame

Measurement uncertainty value (upon the client's request)

The deflection of the longitudinal beam of the wagon frame meets/does not meet (delete as appropriate) the requirements of the instructions

The tests were conducted by

_____ _____ _____

(signature) (First Name Last Name) (Date)

Annex 18

## INITIAL TEST DATA REPORT FOR ADJUSTABLE SUPPORTS

**Initial Test Data Report No.** _

Wagon No. _____ – determination of frame deviation from a plane (warping)

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

CLIENT _____

ORDER No. _____ TEST DATE _____

ENVIRONMENTAL CONDITIONS _____

Measuring instruments;

**Determination of the level of adjustable supports**

| Adjustable supports | Levelling staff readings | | | | | |
|---|---|---|---|---|---|---|
| | 1st reading | 2nd reading | | | | |
| a | | | | | | |
| b | | | | | | |
| | | | | | | |
| c | | | | | | |
| d | | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | Distance a, mm | Distance b, mm | Distance c, mm | Distance d, mm |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| | | | | |

**Measurement diagram**




**Calculation of a wagon frame's deviation from the plane (warping)**

$l = \sum_n/n$ – arithmetic mean of the wagon frame's deviation from a plane

$l_n = (a_n - b_n) - (d_n - c_n)$, kai $a_{,,} > b_{,,}$, $c_{,,} < d_{,,}$;

$l_n = (a_n - b_n) + (d_n - c_n)$, kai $a_{,,} > b_{,,}$, $c_{,,} > d_{,,}$;

Deviation of the wagon frame from the plane (warping) _____

Measurement uncertainty value (for the client _____

The deviation of the wagon frame from the plane (warping) complies with/does not comply with (delete as appropriate) the requirements of the instructions

The tests were conducted by:

_____ _____ _____

(signature) (First Name Last Name) (Date)

## ASSESSMENT OF THE TECHNICAL CONDITION OF FLAT WAGONS

The process of assessing the technical condition of flat wagons includes: inspection of their technical condition; measurement of frame thickness; non-destructive testing of welded joints; geometric testing of wagon frames (deviation from a plane (warping) and longitudinal beam deflection); calculation of the permissible thickness of the load-bearing structures of flat wagon frames, taking account of thinning of structural members; assessment of remaining service life; and processing of the inspection results.

During the inspection of the technical condition of flat wagons, parts and assemblies damaged during operation are identified.

The thicknesses of the frame's main load-bearing metal structures are measured to determine the actual metal thickness and compare it with the original thickness values (to determine the extent of corrosion during the service life).

Non-destructive testing is used to detect defects in the welded joints of flat wagon frames.

Geometric tests of flat wagon frames are performed to determine the deviation from the plane (warping) and the vertical (horizontal) deflection of the longitudinal beams.

The design strength of a flat wagon frame is determined by taking into account the thinning of the flat wagon's structural members, and its remaining service life is assessed.

The inspections establish the defect or limit-state criteria that prohibit further operation of flat wagons.

The unserviceable condition of flat wagons is indicated by defects that pose a threat to traffic safety, the safety of the cargo being transported, and the environment. Any defects identified during the inspection of the technical condition of flat wagons are recorded in a table (see Table 2).

If the inspection identifies any of the flat wagon frame defects listed in items 1.1, 1.2, 1.3, 1.4, 1.6, 1.7 and 1.9–1.13 of **Table 2**, the frames will not be restored or repaired.

**Table 2. Types of failures in the main components of a flat wagon**

| | |
|---|---|
| **1. Frame** | 1.1. Cracks in the centre sill in the area of the support brackets<br>1.2. Cracks in the joints between the centre sill and body bolsters<br>1.3. Cracks in the centre sill in the middle of the wagon<br>1.4. Corrosion reducing the thickness of centre sill sections by more than 30%<br>1.5. Damage to the body bolster<br>1.6. Corrosion reducing the thickness of body bolster sections by more than 30%<br>1.7. A broken, bent or dented end beam<br>1.8. Breaks and other damage to intermediate beams and braces<br>1.9. Corrosion reducing the thickness of longitudinal and transverse beam sections by more than 30%<br>1.10. Frame deviation from the plane (warping) of more than 70 mm per metre of width or 100 mm across the entire width of the frame<br>1.11. The vertical deflection of the longitudinal beams is greater than 200 mm<br>1.12. The horizontal deflection of the longitudinal beams is greater than 100 mm<br>1.13. The need to replace more than five intermediate crossbeams |

| | |
|---|---|
| **2. Side boards of the body** | 2.1. The board sheathing is deformed, broken or missing.<br>2.2. Damaged hinges and locks.<br>2.3. Broken or missing timber-stanchion clamps |
| **3. End boards of the body** | 3.1. The board sheathing is deformed, broken or missing.<br>3.2. Damaged hinges and locks. |
| **4. Wagon floor** | 4.1. The floorboards are broken or missing entirely<br>4.2. Torn or loose floor sheathing |
| **5. Brake system fasteners** | 5.1. A loose or broken brake cylinder mounting device<br>5.2. A mounting device for an air distributor that has come loose or broken<br>5.3. Loose or broken auxiliary reservoir mounting<br>5.4. Loose or broken automatic load-regulator mounting<br>5.5. Loose or broken fastening of the retaining and protective clamps<br>5.6. Broken or damaged handbrake linkage |
| **6. Steps and handrails** | 6.1. Broken, bent or damaged steps and handrails |
| **7. Equipment mounted on the end beam** | 7.1. Loose or broken release lever bracket<br>7.2. Loose or broken release lever holder<br>7.3. Worn or cracked support socket |

The investigation of a flat wagon begins with determining the wagon model and its characteristics, as well as the nature of the cargo being transported and its impact on the flat wagon's frame material under various transport conditions.

The technical condition of a wagon is assessed by visually inspecting its assemblies and components for cracks and damage to structural members. During the inspection, bolted and riveted joints are checked by tapping with a hammer to detect loose fastenings (with inspection dismantling if necessary).

Any defects found are recorded *on the Flat Wagon Technical Condition Inspection Card* (**Annex 20**), which specifies the flat wagon's details (wagon model, number, year of manufacture, scheduled repair date, intended use of the wagon). Sketches or photos of the defects may be attached, indicating their location and dimensions.

Cracks, fractures, bends, deflections, twists and ruptures in metal structures are identified visually, and the dimensions of the defects are then measured. Corrosion is detected by measuring the thickness of the components.

The thickness of the main load-bearing members of metal structures is measured regardless of whether defects in these members were identified during a visual inspection.

Defects identified through non-destructive testing are recorded in accordance with the procedures laid down in normative documents.

In accordance with the specified diagrams (**Annex 24**), the thickness of the flat wagon body and frame is measured, the welded joints of the frame are visually examined for external defects (**Annex 23**), and non-destructive ultrasonic and magnetic particle testing is carried out on welded joints (**Annex 25**).

Based on the body and frame thickness measurement results, *reports on ultrasonic thickness measurement tests of the flat wagon body and frame* are prepared (**Annex 21**); based on the visual testing results for welded joints, a *Visual Testing Report for Welded Joints* is prepared (**Annex 22**); and based on the

results of non-destructive ultrasonic testing of welded joints, an *Ultrasonic Testing Report* is prepared (**Annex 26**).

The deflection of the flat wagon frame's longitudinal beam and the frame's deviation from a plane (warping) are also determined, and *initial data reports for the geometric tests* are prepared (**Annexes 27 and 28**).

After processing and analysing the inspection data, in accordance with normative technical documents and taking into account the nature of the cargo being transported, a conclusion is reached regarding the flat wagon's fitness for service and the extension of its service life:

- not to extend the service life (to write off the dump wagon);
- the service life is extended following depot repair;
- the service life is extended following overhaul;

Following technical diagnostics in the laboratory, a Technical Decision is prepared for each flat wagon, specifying the scope of scheduled repair required and the extended service life of the wagon.

The work specified in the Technical Decision must be completed within 6 months.

**Technical Condition Inspection Card for Flat Wagon No. XXXXXXXX**

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Comments |
|---|---|---|---|---|---|
| | | Overhaul | Depot repair | | |
| | | | | According to the Freight Wagon Model Handbook | |

**Damage to the main load-bearing structural components of a flat wagon**

| **1. Frame** | | **4. Platform floor** | |
|---|---|---|---|
| 1.1. Cracks in the centre sill in the area of the support brackets | | 4.1. Broken or missing floorboards | |
| 1.2. Cracks in the joints between the centre sill and body bolsters | | 4.2. Torn or loose floor sheathing | |
| 1.3. Cracks in the centre sill in the middle of the wagon | | **5. Brake system fasteners** | |
| 1.4. Corrosion reducing the thickness of centre sill sections by more than 30% | | 5.1. Loose or broken brake cylinder mounting | |
| 1.5. Damaged body bolster | | 5.2. Loose or broken air distributor mounting | |
| 1.6. Corrosion reducing the thickness of body bolster sections by more than 30% | | 5.3. Loose or broken auxiliary reservoir mounting | |
| 1.7. A broken, bent or deformed end beam | | 5.4. Loose or broken automatic load-regulator mounting | |
| 1.8. Breaks and other damage to intermediate beams and braces | | 5.5. Loose or broken fastening of the retaining and protective clamps | |
| 1.9. Corrosion reducing the thickness of longitudinal and transverse beam sections by more than 30% | | 5.6. Broken or damaged handbrake linkage | |
| 1.10. Frame deviation from the plane (warping) of more than 70 mm per metre of width or 100 mm across the entire width of the frame | | **6. Steps and handrails** | |
| 1.11. The vertical deflection of the longitudinal beams is greater than 200 mm. | | 6.1. Broken, warped or damaged steps and handrails | |
| 1.12. The horizontal deflection of the longitudinal beams is greater than 100 mm. | | **7. Equipment mounted on the end beam** | |
| 1.13. The need to replace more than five intermediate crossbeams | | 7.1. Loose or broken release lever bracket | |
| **2. Side boards** | | 7.2. Loose or broken release lever holder | |
| 2.1. The board sheathing is deformed, broken or missing | | 7.3. Worn or cracked support socket | |
| 3.2. Damaged hinges and locks | | | |

| | | |
|---|---|---|
| 2.2. Damaged hinges and locks | | NOTES:<br>1. Underline the defect<br>2. Mark a defect with +<br>3. Mark a serviceable item with − |
| 2.3. Broken or missing timber-stanchion clamps | | |
| **3. End boards** | | 4. Mark a rectified defect with p |
| 3.1. The board sheathing is deformed, broken or missing | | |
| 3.2. Damaged hinges and locks | | |

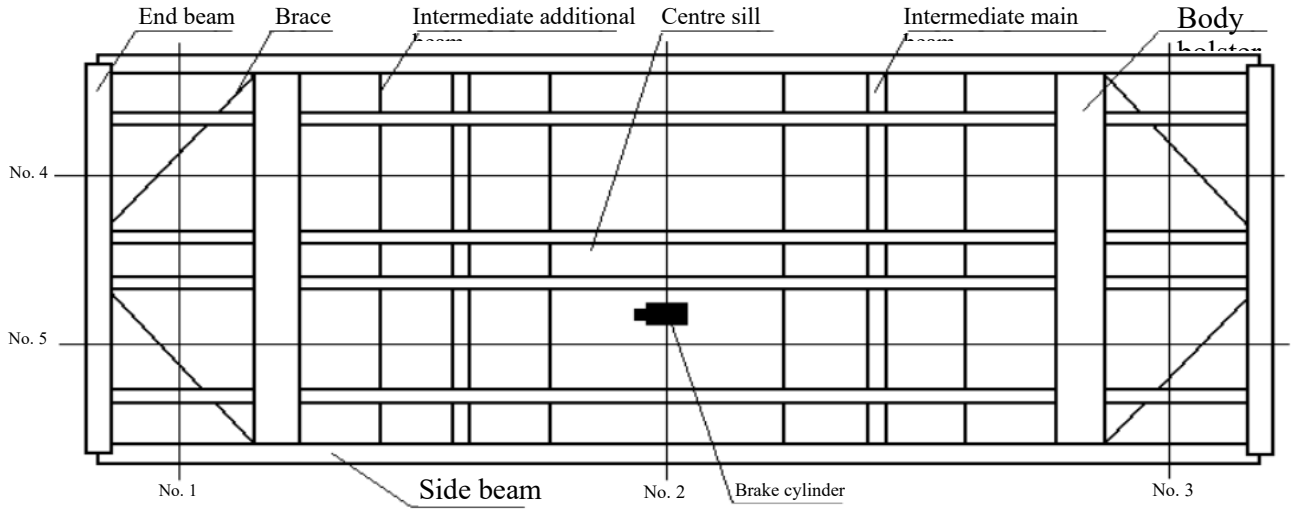
Type of repair ordered: _____

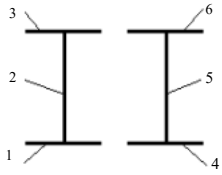
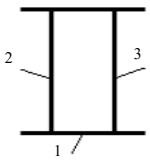
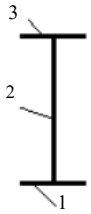
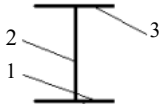
Specified service life: _____

_____ _____ _____ _____

(Place and date of inspection)

**Thickness measurement data for flat wagon No. XXXXXXXX**




| Name | Measurement location | Section No. | Measurement result, mm | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| Centre sill |  | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| Body bolster No. 1 |  | | 1 | | 2 | | 3 | |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| Body bolster No. 2 | | 4 | | | | | | |
| | | 5 | | | | | | |
| Side beam |  | | 1 | 2 | 3 | 1 | 2 | 3 |
| | | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| Intermediate main beam |  | 4 | | | | | | |
| | | 5 | | | | | | |

Signatures:

| (Company name) | **ULTRASONIC THICKNESS MEASUREMENT TEST REPORT** | **TESTS** |
|---|---|---|

| **Report No.** | **Date** | **Application No.** |
|---|---|---|

| **Client:** | **Purpose of the tests:** Diagnostics |
|---|---|

| **Measurement location:** | | **Test subject:** Frame of a flat wagon | **Diagram No.** |
|---|---|---|---|

| **Component No.** | **Material:** **Material** |
|---|---|

| **Measurement standard, methodology:** | **Environmental conditions** |
|---|---|

| **Part being measured** | **Measurement point No.** | **Nominal thickness** | **Permissible thinning up to** |
|---|---|---|---|
| Centre sill | 1, 3, 4, 6 | | |
| | 2, 5 | | |
| Body bolster | 1 | | |
| | 2, 3 | | |
| Side beam | 1, 3 | | |
| | 2 | | |
| Intermediate main beam | 1, 3 | | |
| | 2 | | |

**Sketch of the object to be measured, showing the locations of the measurement points**

Diagram No.

| **Thickness Gauge** | **Serial** | **Calibration blocks** No. |
|---|---|---|

| **Transducer:** | **Frequency:** | **Serial No.** | **Couplant:** |
|---|---|---|---|

| **Evaluation criteria, standard:** | **Deviations from standards or** |
|---|---|

**ULTRASONIC THICKNESS MEASUREMENT RESULTS**

| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|
| Centre sill | 1 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 2 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |

| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|
| Centre sill | 2 | 5 | | |
| | | 6 | | |
| | 3 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| Body bolster No. 1 | 4 | 1 | | |
| | | 2 | | |

| **The tests were conducted by:** | **Person who approved the report:** |
|---|---|

## ULTRASONIC THICKNESS MEASUREMENT RESULTS

| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation | Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|---|---|---|---|---|
| Body bolster No. 1 | 4 | 3 | | | | | | | |
| | 5 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| Body bolster No. 2 | 4 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 5 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| Side beam | 1 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 2 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 3 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| Intermediate main beam | 4 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 5 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1 | | | | | | | |
| | | 2 | | | | | | | |
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**The tests were conducted by:**

Annex 22

| (Company name) | **VISUAL TESTING REPORT** | |
|---|---|---|

| **Report No.** | **Date:** | **Application No.** |
|---|---|---|
| **Client:** | **Purpose of the tests:** | |
| **Test site:** | **Test subject:** | **Diagram No.** |
| **Test component No.** | **Component dimensions according to diagram No.** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Data Sheet No.** - | |
| **Testing equipment:** | | |

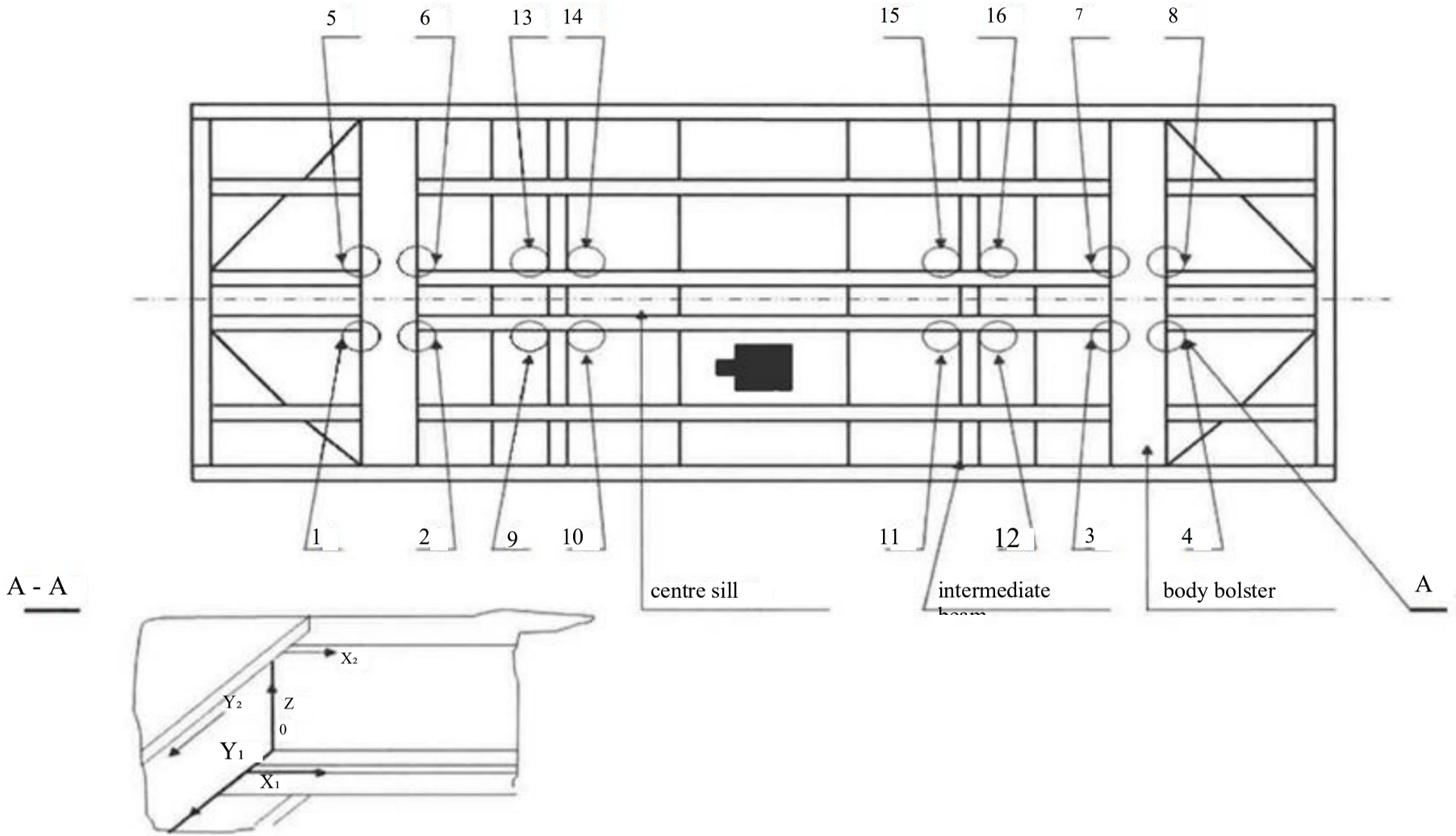
**VISUAL TESTING RESULTS**

| **Test component assembly No. according to the diagram** | **Defects found** | **Assessment** | **Test component assembly No. according to the diagram** |
|---|---|---|---|
| No. | | | No. |
| | | | |
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| **Evaluation criteria, standard:** | **Deviations from standards:** | | |

| **The tests were conducted by:**<br>Cert. No.: | **Person who approved the report:**<br>**Cert. No.:** |
|---|---|

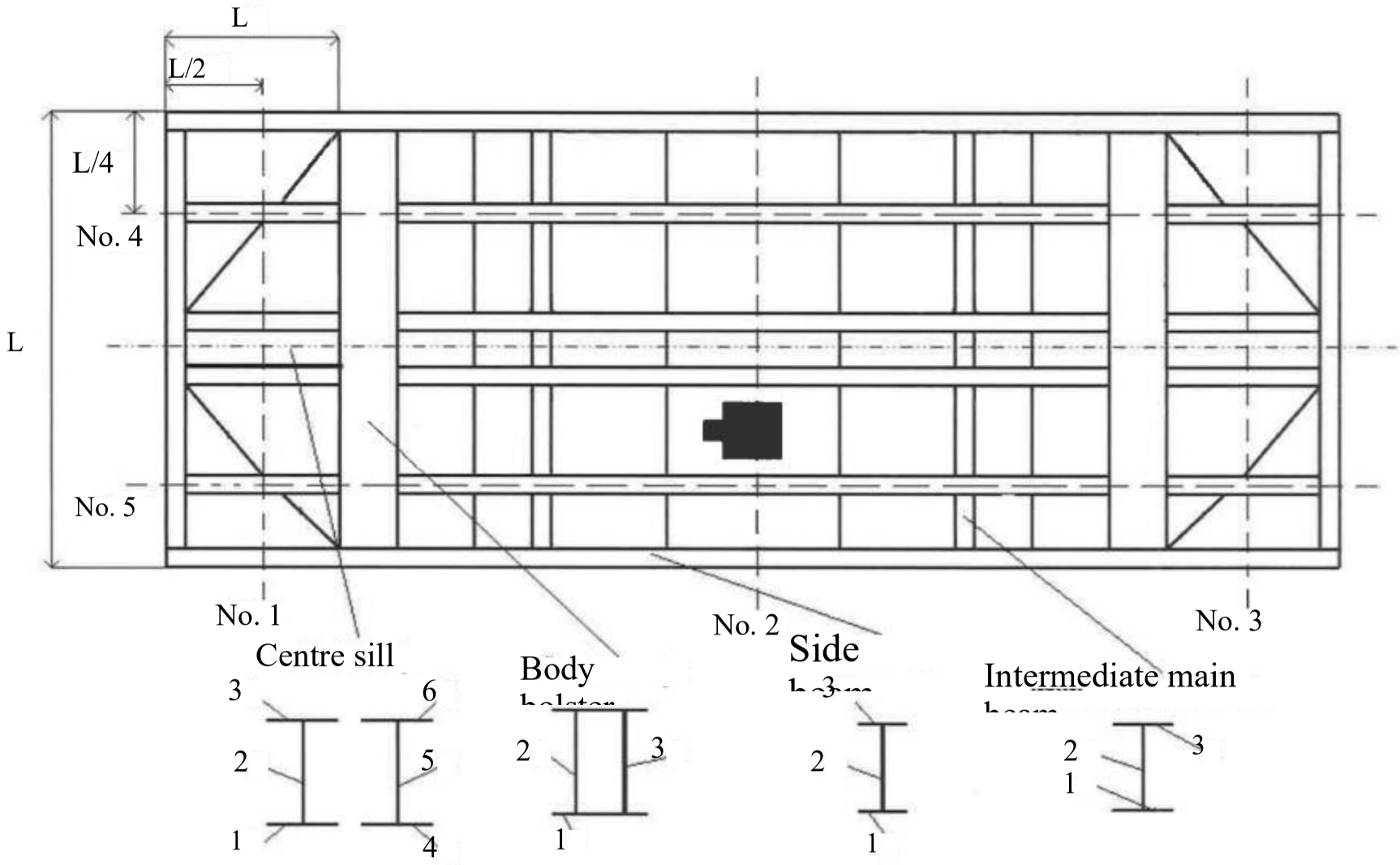
## DIAGRAM OF THE LAYOUT OF TEST POINTS FOR A FLAT WAGON FRAME

(External defects in the welded joints of a flat wagon frame)



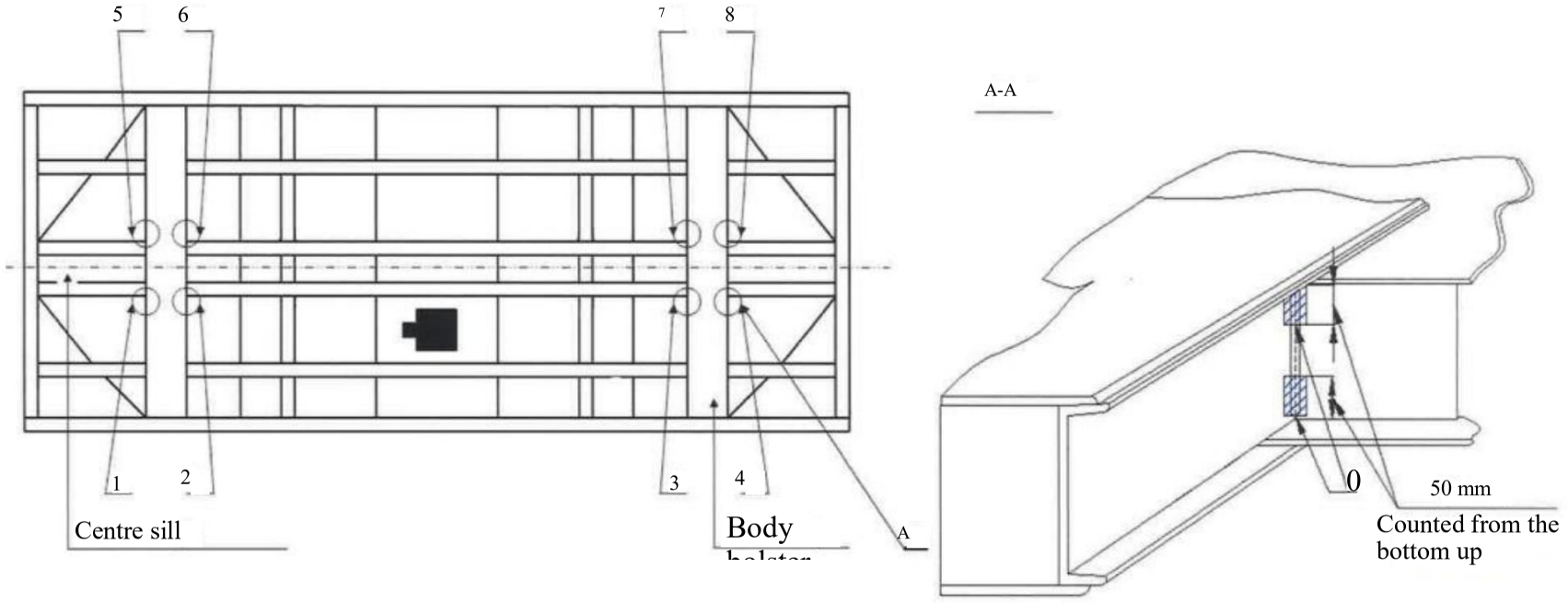
## DIAGRAM SHOWING THE LAYOUT OF TEST POINTS ON THE WALLS OF A FLAT WAGON FRAME

(thicknesses of the flat wagon frame walls)



## DIAGRAM SHOWING THE LAYOUT OF TEST POINTS ON THE WALLS OF A FLAT WAGON FRAME

(internal defects in the welded joints of a flat wagon frame)



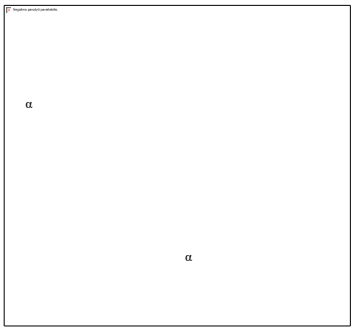
| (Company name) | **ULTRASONIC TESTING REPORT** | **TESTS** |
|---|---|---|

| | | |
|---|---|---|
| **Report No.:** | **Date**: | **Application No.:** |
| **Client:** | **Purpose of the tests:** | |
| **Test location:** | **Test subject:** | **Drawing No.:** |
| **Test component** No.: | **Part dimensions:** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Sheet No.:** | **Test level:** |
| **Flaw detector:** | **Product No.:** | **Couplant:** |

**Evaluation criteria, standard:** **Deviations from standards:**

**Transducers**

| | | | | | |
|---|---|---|---|---|---|
| **1.** | Frequency | MHz | Angle | Product No. | |
| **2.** | Frequency | MHz | Angle | Product No. | |
| **3.** | Frequency | MHz | Angle | Product No. | |
| **4.** | Frequency | MHz | Angle | Product No. | |

| **Calibration and reference blocks:** | | | | **Time range** | **Scanning directions and areas** | | |
|---|---|---|---|---|---|---|---|
| **Sensitivity setting** | | | | | | **α, °** | **X,** |
| | **Reference level** | **Examination level** | **Recording level** | |  | | |
| **1.** | | | | | | | |
| **2.** | | | | | | | |
| **3.** | | | | | | | |
| **4.** | | | | | | | |



| **Evaluation criteria, standard:** | **Deviations from standards:** |
|---|---|

**ULTRASONIC TEST RESULTS**

| | | |
|---|---|---|
| **No defects found** ☐ | **Permissible defects (see the other side of the page)** ☐ | **Unacceptable defects (see the other side of the page)** ☐ |

| | |
|---|---|
| **The tests were conducted by:** | **Person who approved the report:** |

**ULTRASONIC TESTING RESULTS REPORT**

| ULTRASONIC TEST RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Part No. | Defect No. | Defect height, mm | | Defect amplitude | Defect length, mm | Defect start, mm | Defect assessment | Note |
| | | from | to | | | | | |
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| The tests were conducted by: | | | | | | | | |

**Annex 27**

## INITIAL TEST DATA REPORT

Wagon No. _____ – determination of longitudinal _____ beam deflection
(centre sill, side beam)

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

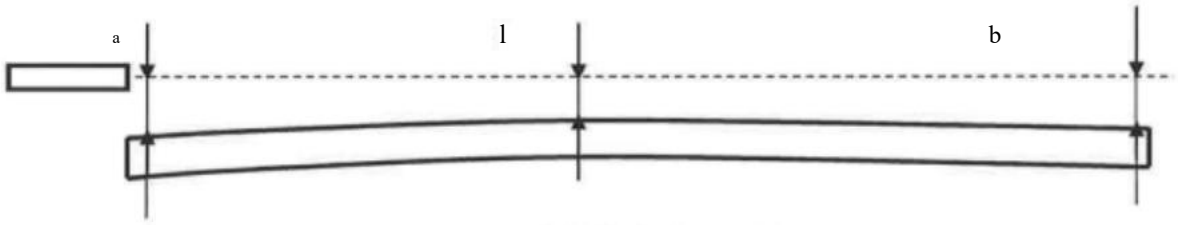
CLIENT _____

ORDER No. _____ TEST DATE_____

ENVIRONMENTAL CONDITIONS

Measuring instruments;

**Measurement diagram**




**Determining the level of a laser beam**

| **Distance to the laser beam, mm** | **Ruler readings** | | | | |
|---|---|---|---|---|---|
| | 1st reading | 2nd reading | 3rd reading | 4th reading | 5th reading |
| a | | | | | |
| b | | | | | |
| $l_{(ab)}=(a+b)/2$ | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | **Distance l, mm** | **Deflection $l_n$, mm** | Calculation of beam deflection (ln) |
|---|---|---|---|
| 1 | | | $I_n = l_{(ab)} - l_n$; *where* $l_{(ab)} < l_n$; |
| 2 | | | $I_n = l_n - l_{(ab)}$; *where* $l_{(ab)} > l_n$; |
| 3 | | | |
| | | | |

$I=£ I_n/n$ – longitudinal beam deflection, i.e. the arithmetic mean of the deflections;

Vertical/horizontal (delete as appropriate) deflection of the longitudinal beam of the wagon frame

Measurement uncertainty value (upon the client's request)

The deflection of the longitudinal beam of the wagon frame meets/does not meet (delete as appropriate) the requirements of the instructions

The tests were conducted by

_____ _____ _____

(signature) (First Name Last Name) (Date)

Annex 28

## INITIAL TEST DATA REPORT FOR ADJUSTABLE SUPPORTS

**Initial Test Data Report No.** _

Wagon No. _____ – determination of frame deviation from a plane (warping)

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

CLIENT _____

ORDER No. _____ TEST DATE _____

ENVIRONMENTAL CONDITIONS _____

Measuring instruments;

**Determination of the level of adjustable supports**

| Adjustable supports | Levelling staff readings | | | | | |
|---|---|---|---|---|---|---|
| | 1st reading | 2nd reading | | | | |
| a | | | | | | |
| b | | | | | | |
| | | | | | | |
| c | | | | | | |
| d | | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | Distance a, mm | Distance b, mm | Distance c, mm | Distance d, mm |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| | | | | |

**Measurement diagram**




**Calculation of a wagon frame's deviation from the plane (warping)**

$l = \sum_n/n$ – arithmetic mean of the wagon frame's deviation from a plane

$l_n = (a_n - b_n) - (d_n - c_n)$, kai $a_{,,} > b_{,,}$, $c_{,,} < d_{,,}$;

$l_n = (a_n - b_n) + (d_n - c_n)$, kai $a_{,,} > b_{,,}$, $c_{,,} > d_{,,}$;

Deviation of the wagon frame from the plane (warping) _____

Measurement uncertainty value (upon the client's request) _____

The deviation of the wagon frame from the plane (warping) complies with/does not comply with (delete as appropriate) the requirements of the instructions

The tests were conducted by:

_____ _____ _____

(signature) (First Name Last Name) (Date)

Annex 29

## PROCEDURE FOR ASSESSING THE TECHNICAL CONDITION OF DUMP WAGONS

The process of assessing the technical condition of dump wagons includes: an inspection of the technical condition of the dump wagon; measurement of the thickness of the main load-bearing structures of the body and frame; non-destructive testing of welded joints; calculation of the design strength of the body and frame load-bearing structures, taking into account the thinning of structural elements; assessment of the remaining service life; and processing of the inspection results.

The condition of dump wagons is inspected to identify damage to structural components and assemblies.

When measuring the main load-bearing structures of the body and frame, the actual metal thickness is determined and compared with the original thickness values (to determine the extent of corrosion over the service life).

The design strength of the body and frame of a dump wagon is determined by taking into account the thinning of structural members, and the remaining service life is assessed.

The inspections establish the defect or limit-state criteria that prohibit further operation of dump wagons.

A dump wagon is considered unfit for service if it has defects that pose a threat to traffic safety, fail to ensure the safety of the cargo being transported, and do not meet environmental protection requirements.

Any damage to the dump wagons identified during the technical condition inspection is recorded in a table (see Table 3).

If the inspection identifies any of the frame defects listed in items 1.1, 1.2, 1.3, 1.5, 1.7 and 1.11 of Table 3, the dump wagon frames are not restored or repaired.

If the wagon body has the defects listed in items 2.1, 2.2 and 2.3 of Table 3, requiring replacement of more than 50% of the lower rail, the dump wagon is not restored or repaired.

**Table 3. Types of failures in the main load-bearing structural components of dump wagons**

| Assembly name | Description of the defect or limit state |
|---|---|
| **1. Frame** | 1.1. Cracks in the centre sill in the area of the support brackets<br>1.2. Cracks in the joints between the centre sill and body bolsters<br>1.3. Cracks in the centre sill in the middle of the wagon<br>1.4. Bulging of the centre sill top plate in the middle and end sections.<br>1.5. Corrosion reducing the thickness of centre sill sections by more than 30%<br>1.6. Damaged body bolster<br>1.7. Corrosion reducing the thickness of the body bolster brackets by more than 30%<br>1.8. Corrosion reducing the thickness of the cylinder brackets by more than 30%<br>1.9. Broken or otherwise damaged cylinder brackets<br>1.10. A broken, bent or deformed end beam<br>1.11. Frame deviation from the plane (warping) of more than 70 mm per |
| **2. Upper frame of the body** | 2.1. Cracks, warping and corrosion in longitudinal beams<br>2.2. Cracks, warping and corrosion in the body bolsters<br>2.3. Cracks, warping and corrosion in cylinder beams<br>2.4. Cracks, fractures, bending and corrosion of the longitudinal channel-section, box-shaped members of the cylinder beams |

| | |
|---|---|
| | 2.5. Cracks, detachment and corrosion of the pivot supports<br>2.6. Cracks, detachment and corrosion of the cylinder supports<br>2.7. Cracks and detachment of the bottom plate |
| **3. Side board of the body** | 3.1. Cracks, breaks, detachments and corrosion in the upper rails<br>3.2. Cracks, breaks, detachments or corrosion in the inner or outer sheathing sheets |
| **4. End wall of the body** | 4.1. The wall has come away from the top frame<br>4.2. Cracks, breaks, detachments and corrosion in posts<br>4.3. Cracks, breaks, detachments or corrosion in the inner or outer sheathing |
| **5. Brake system fasteners** | 5.1. Loose or broken brake cylinder mounting bracket<br>5.2. A mounting device for an air distributor that has come loose or broken<br>5.3. Loose or broken auxiliary reservoir mounting<br>5.4. Loose or broken mounting of the automatic load regulator<br>5.5. A fastening device for brake lines and connecting tubes that has come loose or broken<br>5.6. Loose or broken support and protective clamps<br>5.7. Faulty handbrake linkage |
| **6. Handrails and steps** | 6.1. Broken, warped or damaged steps and handrails |
| **7. Equipment mounted on the end beam** | 7.1. Loose fastening, a fractured bracket or a deformed release lever<br>7.2. Loose or broken release lever holder<br>7.3. Worn or cracked support socket |

The inspection of a dump wagon begins with determining the wagon model and its specifications, as well as the nature of the cargo being transported and its impact on the materials of the dump wagon's frame and body under various transport conditions.

The technical condition of a wagon is assessed by visually inspecting its assemblies and components for cracks and damage to structural members. During the inspection, bolted and riveted joints are checked by tapping with a hammer to detect loose fastenings (with inspection dismantling if necessary).

Any defects found are recorded on *the Dump Wagon Technical Condition Inspection Form* (**Annex 30**), which specifies the dump wagon's details (wagon model, number, year of manufacture, scheduled repair date, purpose of the wagon). Sketches or photos of the defects may be attached, indicating their location and dimensions.

Cracks, fractures, bends, deflections, twists and ruptures in metal structures are identified visually, and the dimensions of the defects are then measured. Corrosion is detected by measuring the thickness of the components.

The thickness of the main load-bearing members of metal structures is measured regardless of whether defects in these members were identified during a visual inspection.

Defects identified through non-destructive testing are recorded in accordance with the procedures laid down in normative documents.

In accordance with the specified diagrams (**Annexes 31 and 32**), measurements of the thickness of the dump wagon body and frame are performed, the welded joints of the dump wagon frame are visually inspected

for external defects (**Annex 33**), and non-destructive ultrasonic and magnetic particle tests are performed on the welded joints (**Annex 34**).

Based on the body and frame thickness measurement results, *reports on ultrasonic thickness measurement tests of the dump wagon body and frame* are prepared (**Annex 35**); based on the visual testing results for welded joints, a *Visual Testing Report for Welded Joints* is prepared (**Annex 36**); and based on the results of non-destructive ultrasonic testing of welded joints, an *Ultrasonic Testing Report* is prepared (**Annex 37**).

The deflection of the dump wagon frame's longitudinal beam and the frame's deviation from a plane (warping) are also determined, and *initial data reports for the geometric tests* are prepared (**Annexes 38 and 39**).

After processing and analysing the test data, in accordance with normative technical documents and taking into account the nature of the cargo being transported, a conclusion is reached regarding the dump wagon's fitness for service and the extension of its service life:

- not to extend the service life (to write off the dump wagon);
- the service life is extended following depot repair;
- the service life is extended following overhaul;

Following technical diagnostics in the laboratory, a Technical Decision is prepared for each dump wagon, specifying the scope of scheduled repair required and the extended service life of the wagon.

The work specified in the Technical Decision must be completed within 6 months.

**Technical Condition Inspection Card for Dump Wagon No. XXXXXXXX with Four Unloading Cylinders**

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Comments |
|---|---|---|---|---|---|
| | | Overhaul | Depot repair | | |
| | | | | According to the Freight Wagon Model Handbook | |

**Damage to the main load-bearing structural components of a dump wagon with four unloading cylinders**

| | | | |
|---|---|---|---|
| **1. Frame** | | 3.2. Cracks, breaks, detachments or corrosion in the inner or outer sheathing sheets | |
| 1.1. Cracks in the centre sill in the area of the support brackets | | 3.3. Cracks, breaks, detachments and corrosion in the lower rail. | |
| 1.2. Cracks in the joints between the centre sill and body bolsters | | **4. End wall** | |
| | | 4.1. The wall has come away from the top frame | |
| 1.3. Cracks in the centre sill in the middle of the wagon | | 4.2. Cracks, breaks, detachments and corrosion in posts | |
| 1.4. Bulging of the centre sill top plate in the middle and end sections | | 4.3. Cracks, breaks, detachments or corrosion in the inner or outer sheathing sheets. | |
| 1.5. Corrosion reducing the thickness of centre sill sections by more than 30% | | **5. Brake system fasteners** | |
| | | 5.1 Loose or broken brake cylinder mounting. | |
| 1.6. Damage to the body bolsters | | 5.2. The mounting for the air distributor has come loose or broken. | |
| 1.7. Corrosion reducing the thickness of the body bolster brackets by more than 30% | | 5.3. Loose or broken auxiliary reservoir mounting. | |
| 1.8. Corrosion reducing the thickness of the cylinder brackets by more than 30% | | 5.4. Loose or broken automatic load-regulator mounting | |
| 1.9. Broken or otherwise damaged cylinder brackets | | 5.5. Loose or broken fastening of the main pipe and connecting tubes | |
| 1.10. A broken, bent or deformed end beam | | | |
| 1.11. Frame deviation from the plane (warping) of more than 70 mm per metre of width or 200 mm across the entire width of the frame | | 5.6. Loose or broken support and protective clamps. | |
| | | 5.7. Faulty handbrake linkage | |
| 1.12. Fractures and other damage to the cylinder supports | | **6. Stairs and handrails** | |

| | | | |
|---|---|---|---|
| **2. Top Frame** | | 6.1. Damaged, bent or broken stairs and handrails | |
| 2.1. Cracks, warping and corrosion in longitudinal beams | | **7. Equipment mounted on the end beam** | |
| 2.2. Cracks, warping and corrosion in the body bolsters | | 7.1. Loose fasteners, broken brackets or a deformed release lever. | |
| 2.3. Cracks, warping and corrosion in cylinder beams | | | |
| 2.4. Cracks, fractures, bending and corrosion of the longitudinal channel-section, box-shaped members of the cylinder beams | | 7.2. Loose or broken release lever holder | |
| | | 7.3. Worn or cracked support socket | |
| 2.5. Cracks, detachment and corrosion of the pivot supports | | NOTES:<br>1. Underline the defect<br>2. Mark a defect with +<br>3. Mark a serviceable item with −<br>4. Mark a rectified defect with p | |
| 2.6. Cracks, detachment and corrosion in cylinder supports | | | |
| 2.7. Cracks and detachment of the bottom plate | | | |
| **3. Side board** | | | |
| 3.1. Cracks, breaks, detachments and corrosion in the upper rail. | | | |

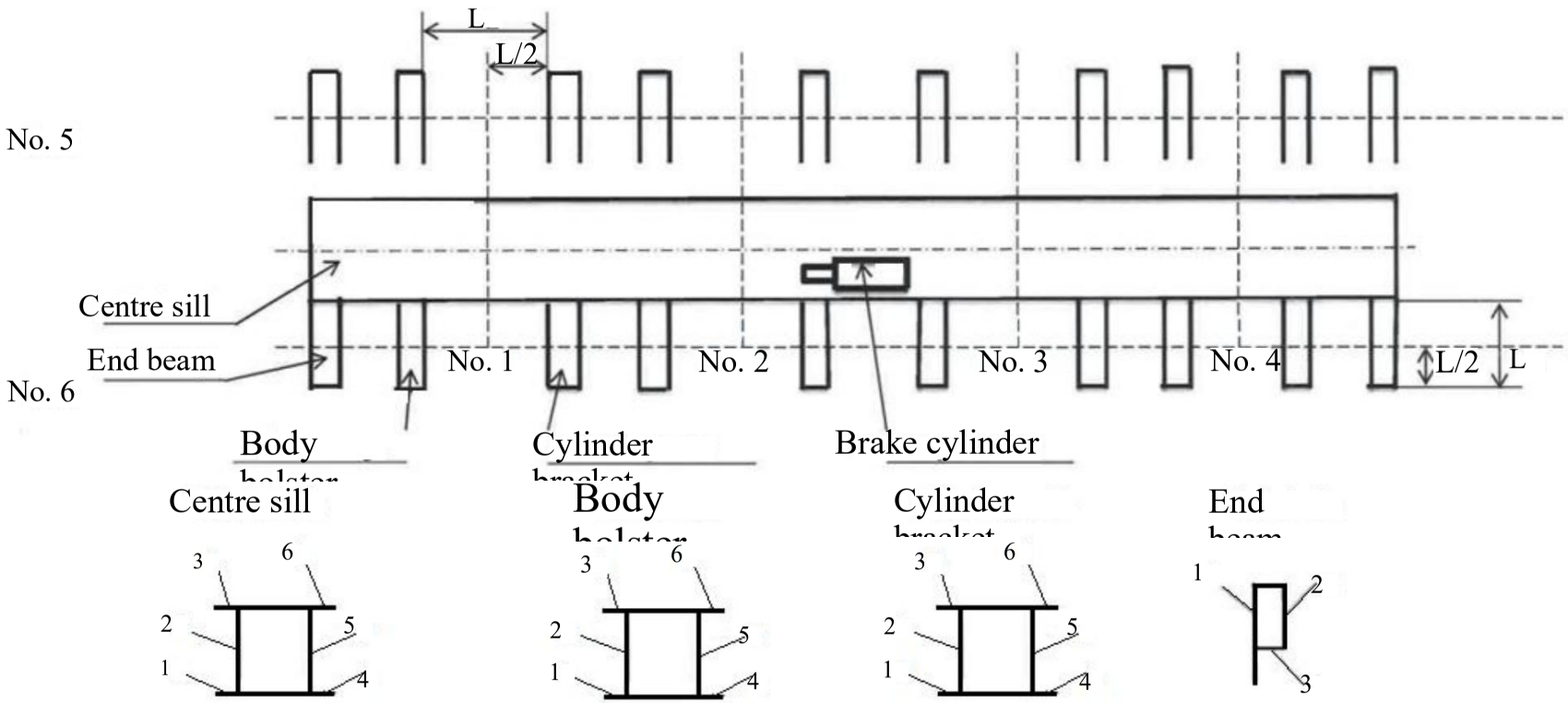
Type of repairs ordered:

Specified service life:

(day) (month) 20

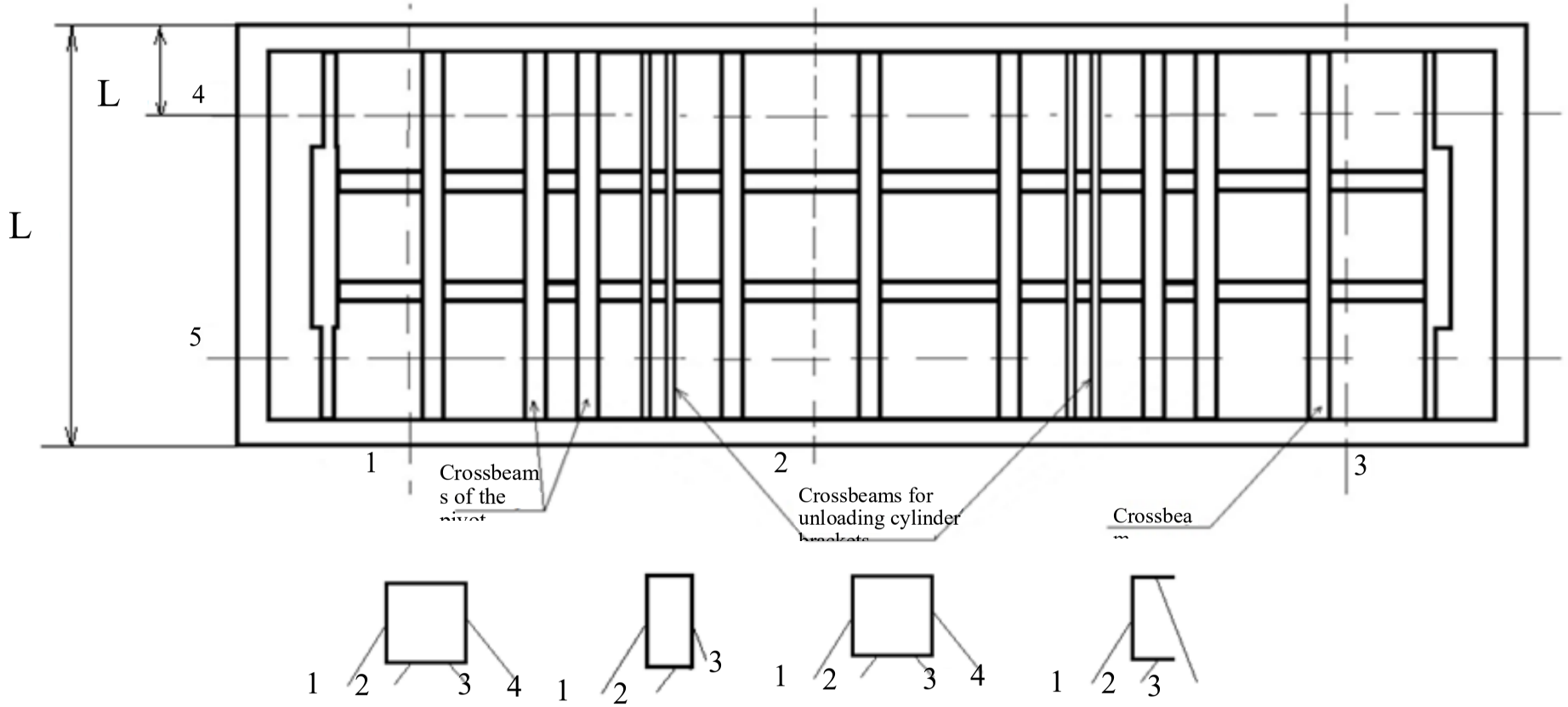
## LAYOUT DIAGRAM OF LOWER FRAME WALL TEST LOCATIONS FOR A DUMP WAGON

(thickness of the side walls of the lower frame of a dump wagon)



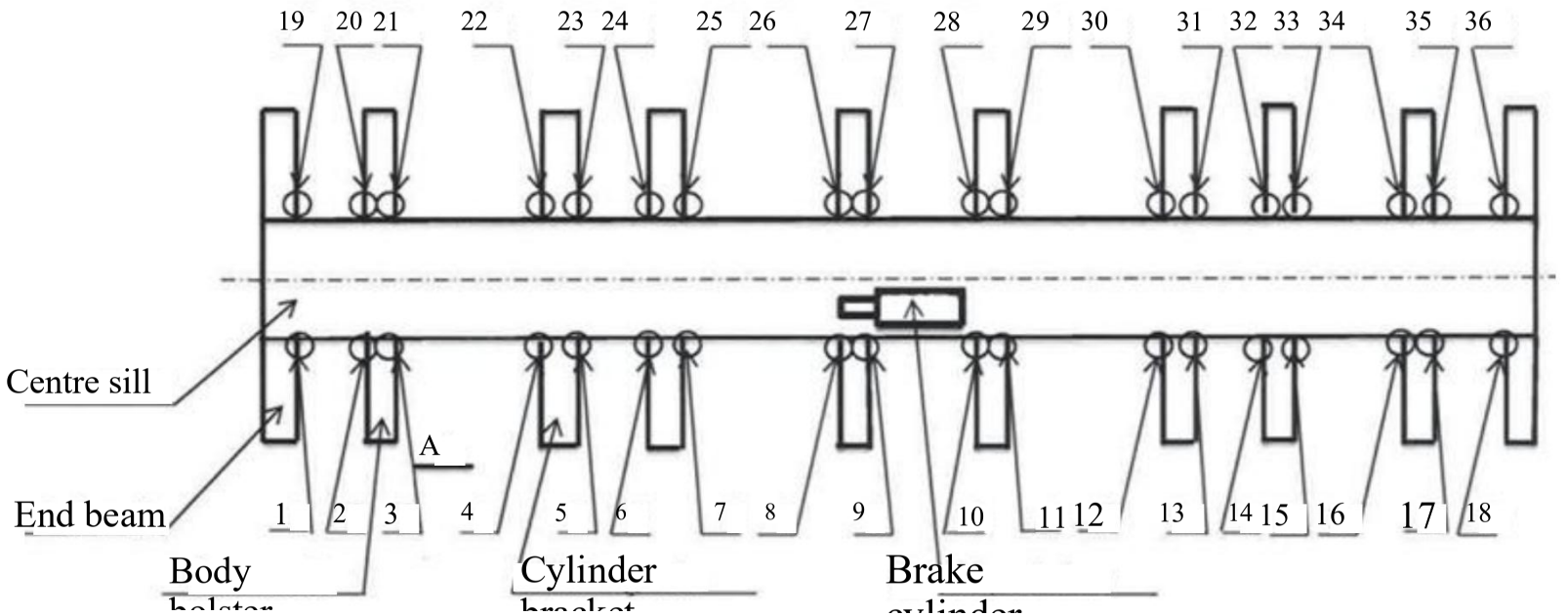
## LAYOUT DIAGRAM OF UPPER FRAME TEST LOCATIONS FOR A DUMP WAGON

(thickness of the side walls of the upper frame of a dump wagon)



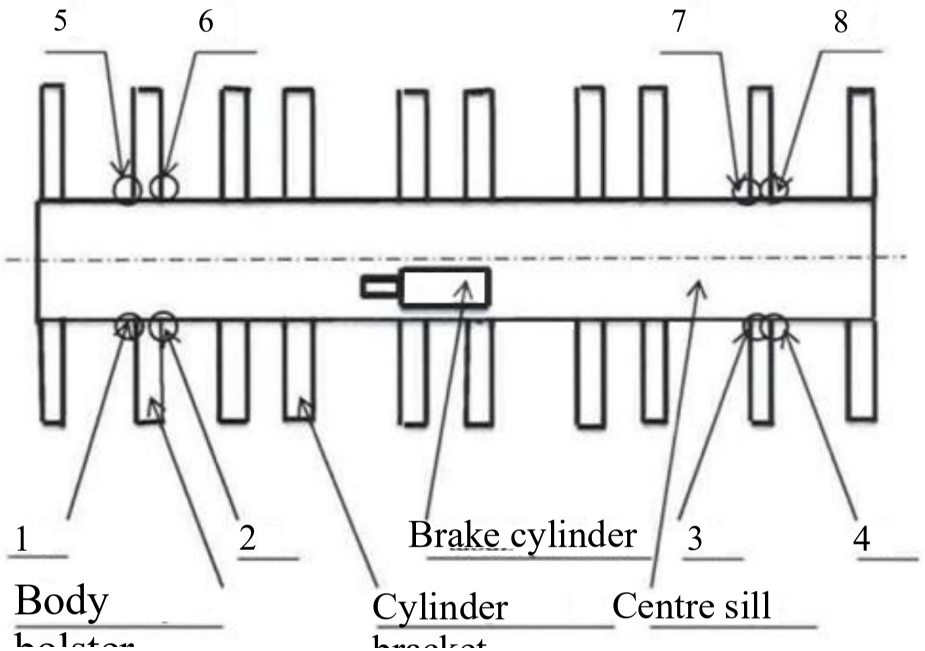
## LAYOUT DIAGRAM OF LOWER FRAME TEST LOCATIONS FOR A DUMP WAGON

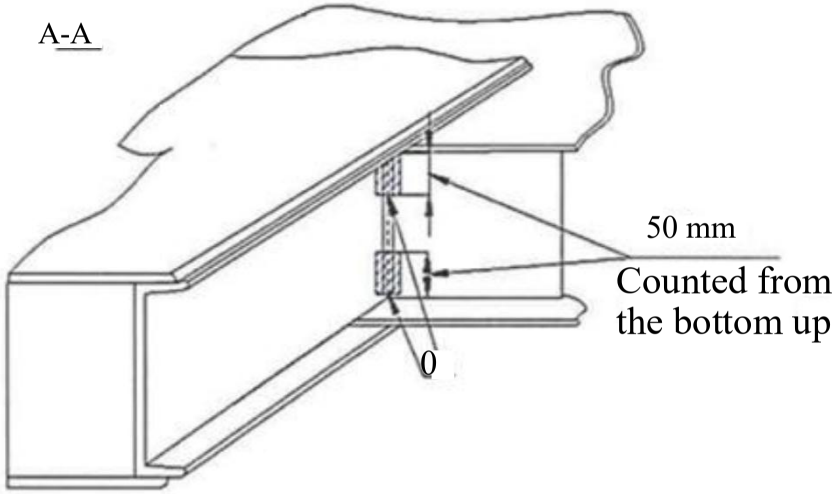
(external defects in the welded joints of the lower frame of a dump wagon)



## LAYOUT DIAGRAM OF FRAME WELDED-JOINT TEST LOCATIONS FOR A DUMP WAGON

(internal defects in the welded joints of a dump wagon frame)



| (Company name) | **ULTRASONIC THICKNESS MEASUREMENT TEST REPORT** | **TESTS** |
|---|---|---|

| **Report No.** | **Date:** | **Application No.** |
|---|---|---|

| **Client:** | **Purpose of the tests:** |
|---|---|

| **Measurement location:** : | | **Test subject:** Lower frame of a dump wagon | **Drawing No.** |
|---|---|---|---|

| **Component No.** | **Material:** |
|---|---|

| **Measurement standard, methodology:** | **Environmental conditions:** | |
|---|---|---|

| **Part being measured** | **Measurement point No.** | **Nominal thickness (mm)** | **Permissible thinning up to mm** | **Sketch of the object to be measured, showing the locations of the measurement points** |
|---|---|---|---|---|
| Centre sill | 1, 4 | | | Diagram No. |
| | 2, 5 | | | |
| | 3, 6 | | | |
| Body bolster | 1, 4 | | | |
| | 2, 5 | | | |
| | 3, 6 | | | |
| Cylinder bracket | 1, 4 | | | |
| | 2, 5 | | | |
| | 3, 6 | | | |
| End beam | 1 | | | |
| | 2 | | | |
| | 3 | | | |

| **Thickness gauge** | **Serial** No. | **Calibration blocks** No. |
|---|---|---|

| **Transducer:** | **Frequency:** | **Serial No.** | **Couplant:** |
|---|---|---|---|

| **Evaluation criteria, standard:** | **Deviations from standards or the contract:** |
|---|---|

**ULTRASONIC THICKNESS MEASUREMENT RESULTS**

| Measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation | Measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|---|---|---|---|---|
| Centre sill | 1 | 1 | | | Centre sill | 2 | 5 | | |
| | | 2 | | | | | 6 | | |
| | | 3 | | | | 3 | 1 | | |
| | | 4 | | | | | 2 | | |
| | | 5 | | | | | 3 | | |
| | | 6 | | | | | 4 | | |
| | 2 | 1 | | | | | 5 | | |
| | | 2 | | | | | 6 | | |
| | | 3 | | | | 4 | 1 | | |
| | | 4 | | | | | 2 | | |

| **The tests were conducted by:** | **Person who approved the report:** |
|---|---|

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## ULTRASONIC THICKNESS MEASUREMENT RESULTS

| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|
| Centre sill | 4 | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 1 Body bolster | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 2 Body bolster | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 1 Cylinder bracket | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 2 Cylinder bracket | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |

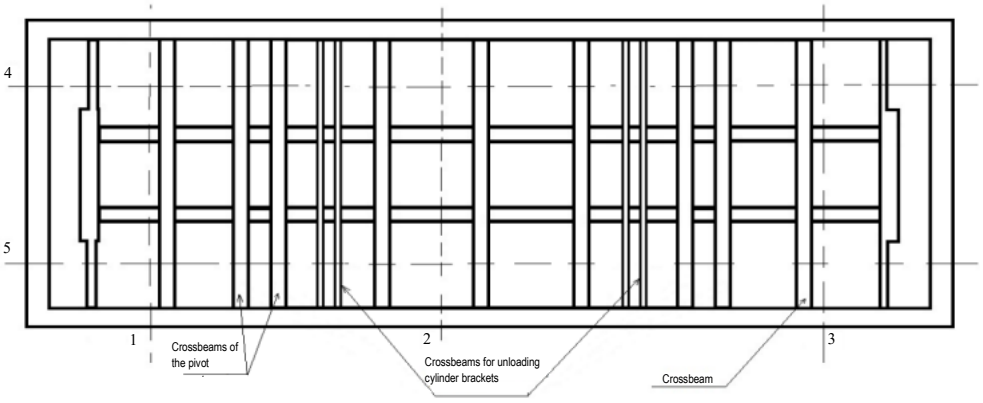
| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|
| 3 Cylinder bracket | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 4 Cylinder bracket | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 5 Cylinder bracket | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| 6 Cylinder bracket | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| | 6 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| | | 5 | | |
| | | 6 | | |
| End beam | 5 | 1 | | |
| | | 2 | | |
| | | 3 | | |
| | | 1 | | |

**The tests were conducted by:**

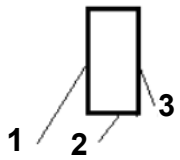
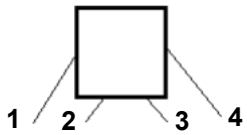
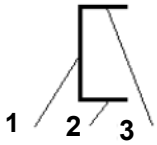
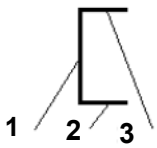
**ULTRASONIC THICKNESS MEASUREMENT RESULTS**

| Measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation | Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|---|---|---|---|---|
| End beam | 5 | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 6 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| **The tests were conducted by:** | | | | | | | | | |

**Measurement data for the thickness of the upper frame of dump wagon No. XXXXXXXX with four unloading cylinders**




C

| Name | Measurement location | Section No. | Measurement result, mm | | | | | |
|---|---|---|---|---|---|---|---|---|
| Side beam |  | | 1 | 2 | 3 | 1 | 2 | 3 |
| | | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| Crossbeams, 5 units. |  | | 1 | | 2 | | 3 | 4 |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| Outer end beam |  | | 1 | 2 | 3 | 1 | 2 | 3 |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| Inner end beam |  | | 1 | 2 | 3 | 1 | 2 | 3 |
| | | 4 | | | | | | |
| | | 5 | | | | | | |

Signatures:

Annex 36

| (Company name) | **VISUAL TESTING REPORT** | |
|---|---|---|

| **Report No.** | **Date:** | **Application No.** |
|---|---|---|
| **Client:** | **Purpose of the tests:** | |
| **Test site:** | **Test subject:** | **Diagram No.** |
| **Test component No.** | **Component dimensions according to diagram No.** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Data Sheet No.** - | |
| **Testing equipment:** | | |

**VISUAL TESTING RESULTS**

| **Test component assembly No. according to the diagram** | **Defects found** | **Assessment** | **Test component assembly No. according to the diagram** |
|---|---|---|---|
| No. | | | No. |
| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
| **Evaluation criteria, standard:** | **Deviations from standards:** | | |

| **The tests were conducted by:**<br>Cert. No.: | **Person who approved the report:**<br>**Cert. No.:** |
|---|---|

| (Company name) | **ULTRASONIC TESTING REPORT** | **TESTS** |
|---|---|---|

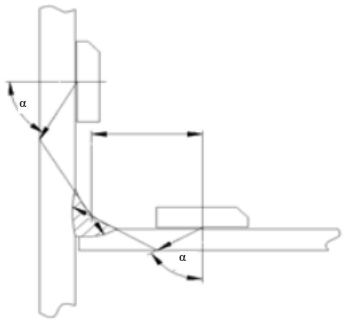
| | | |
|---|---|---|
| **Report No.:** | **Date**: | **Application No.:** |
| **Client:** | **Purpose of the tests:** | |
| **Test location:** | **Test subject:** | **Drawing No.:** |
| **Test component** No.: | **Part dimensions:** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Sheet No.:** | **Test level:** |
| **Flaw detector:** | **Product No.:** | **Couplant:** |

**Evaluation criteria, standard:** **Deviations from standards:**

**Transducers**

| | | | | |
|---|---|---|---|---|
| **1.** | Frequency | MHz | Angle | Product No. |
| **2.** | Frequency | MHz | Angle | Product No. |
| **3.** | Frequency | MHz | Angle | Product No. |
| **4.** | Frequency | MHz | Angle | Product No. |

| **Calibration and reference blocks:** | | | | **Time range** | **Scanning directions and areas** | | |
|---|---|---|---|---|---|---|---|
| **Sensitivity setting** | | | | | | **α, ◦** | **X,** |
| | **Reference level** | **Examination level** | **Recording level** | | | | |
| **1.** | | | | | | | |
| **2.** | | | | | | | |
| **3.** | | | | | | | |
| **4.** | | | | | | | |




| **Evaluation criteria, standard:** | **Deviations from standards:** |
|---|---|

**ULTRASONIC TEST RESULTS**

| | | |
|---|---|---|
| **No defects found** ☐ | **Permissible defects (see the other side of the page)** ☐ | **Unacceptable defects (see the other side of the page)** ☐ |

| | |
|---|---|
| **The tests were conducted by:** | **Person who approved the report:** |

## ULTRASONIC TESTING RESULTS REPORT

| ULTRASONIC TEST RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Part No. | Defect No. | Defect height, mm | | Defect amplitude | Defect length, mm | Defect start, mm | Defect assessment | Note |
| | | from | to | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| The tests were conducted by: | | | | | | | | |

**Annex 38**

# INITIAL TEST DATA REPORT

## Initial Test Data Report No.

Wagon No. _____ – determination of longitudinal _____ beam deflection
(centre sill, side beam)

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

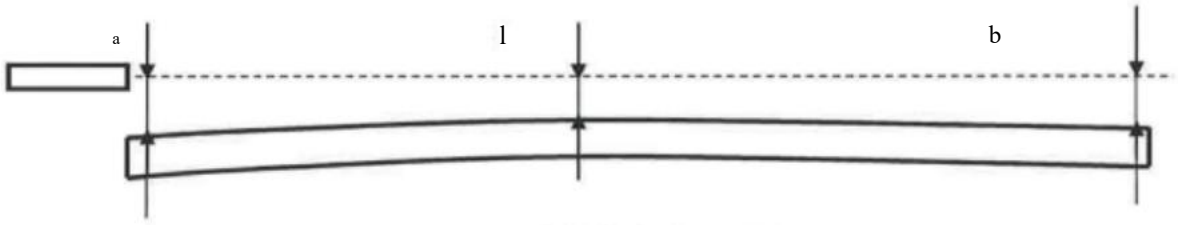
CLIENT _____

ORDER No. _____ TEST DATE_____

ENVIRONMENTAL CONDITIONS

Measuring instruments;

**Measurement diagram**




**Determining the level of a laser beam**

| **Distance to the laser beam, mm** | **Ruler readings** | | | | |
|---|---|---|---|---|---|
| | 1st reading | 2nd reading | 3rd reading | 4th reading | 5th reading |
| a | | | | | |
| b | | | | | |
| $l_{(ab)}=(a+b)/2$ | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | **Distance l, mm** | **Deflection $l_n$, mm** | Calculation of beam deflection (ln) |
|---|---|---|---|
| 1 | | | $I_n = l_{(ab)} - l_n$; *where* $l_{(ab)} < l_n$; |
| 2 | | | $I_n = l_n - l_{(ab)}$; *where* $l_{(ab)} > l_n$; |
| 3 | | | |
| | | | |

$I=£ I_n/n$ – longitudinal beam deflection, i.e. the arithmetic mean of the deflections;

Vertical/horizontal (delete as appropriate) deflection of the longitudinal beam of the wagon frame

Measurement uncertainty value (upon the client's request)

The deflection of the longitudinal beam of the wagon frame meets/does not meet (delete as appropriate) the requirements of the instructions

The tests were conducted by

_____ _____ _____

(signature) (First Name Last Name) (Date)

Annex 39

# INITIAL TEST DATA REPORT FOR ADJUSTABLE SUPPORTS

**Initial Test Data Report No.** _

Wagon No. _____ – determination of frame deviation from a plane (warping)

| Wagon model | Date of manufactur | Date of the last repair | | Type of cargo being | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

CLIENT _____

ORDER No. _____ TEST DATE _____

ENVIRONMENTAL CONDITIONS _____

Measuring instruments;

**Determination of the level of adjustable supports**

| Adjustable supports | Levelling staff readings | | | | | |
|---|---|---|---|---|---|---|
| | 1st reading | 2nd reading | | | | |
| a | | | | | | |
| b | | | | | | |
| | | | | | | |
| c | | | | | | |
| d | | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | Distance a, mm | Distance b, mm | Distance c, mm | Distance d, mm |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| | | | | |

**Measurement diagram**




**Calculation of a wagon frame's deviation from the plane (warping)**

$l = \sum_n/n$ – arithmetic mean of the wagon frame's deviation from a plane

$l_n = (a_n - b_n) - (d_n - c_n)$, kai $a_{,,} > b_{,,}$, $c_{,,} < d_{,,}$;

$l_n = (a_n - b_n) + (d_n - c_n)$, kai $a_{,,} > b_{,,}$, $c_{,,} > d_{,,}$;

Deviation of the wagon frame from the plane (warping) _____

Measurement uncertainty value (upon the client's request) _____

The deviation of the wagon frame from the plane (warping) complies with/does not comply with (delete as appropriate) the requirements of the instructions

The tests were conducted by:

_____ _____ _____

(signature) (First Name Last Name) (Date)

Annex 40

## PROCEDURE FOR ASSESSING THE TECHNICAL CONDITION OF REFRIGERATED SERVICE WAGONS

The process of assessing the technical condition of refrigerated wagons includes: inspection of the technical condition of the refrigerated service wagon; measurement of the thickness of the main load-bearing structures of the body and frame; non-destructive testing of welded joints; calculation of the strength of the body and frame load-bearing structures in accordance with the applicable standards, taking account of thinning of structural members; assessment of remaining service life; and processing of the inspection results.

The technical condition of refrigerated wagons is inspected to identify damage to structural components and assemblies.

When measuring the main load-bearing metal structures of the body and frame, the actual metal thickness is determined and compared with the initial thickness values (to determine the extent of corrosion during the service life).

Standard strength calculations for the body and frame of a refrigerated service wagon, taking into account the thinning of structural elements, are performed to assess the remaining service life.

The inspections establish the defect or limit-state criteria that prohibit further operation of a refrigerated service wagon.

A refrigerated service wagon is considered to be in an inoperable condition when it has defects that pose a threat to traffic safety, fail to ensure the safety of the cargo being transported, and do not meet environmental protection requirements.

Any damage to the refrigerated wagons identified during the technical inspection is recorded in a table (see Table 4). In addition, the technical condition of the running gear, automatic coupler and pivot assemblies is inspected.

If the inspection identifies any of the frame defects listed in items 1.1, 1.2, 1.3, 1.5, 1.7 and 1.11 of Table 4, the refrigerated wagon frames are not restored or repaired.

If the wagon body has the defects listed in items 2.1, 2.2 and 2.3 of Table 4, requiring replacement of more than 50% of the lower rail, the refrigerated service wagon is not restored or repaired.

**Table 4. Types of failures in the main load-bearing structural components of refrigerated service wagons**

| Assembly name | Description of the defect or limit state |
|---|---|

| | |
|---|---|
| **1. Lower frame of the body** | 1.1. Cracks and deflection of the centre sill: vertical deflection greater than 100 mm, horizontal deflection greater than 50 mm; corrosion of sill sections exceeding 30%<br>1.2. Cracks and deflection of the body bolster; corrosion exceeding 30%<br>1.3. Cracks, corrosion and detachment at the joints between the centre sill and body bolsters<br>1.4. Cracks in the upper and lower plates of the end beam in the impact support area; beam deflection greater than 50 mm<br>1.5. Corrosion of the side longitudinal beams exceeds 25%; deflection exceeds 50 mm<br>1.6. Cracks in the transverse main and secondary beams; corrosion exceeding 25%; deflection greater than 50 mm<br>1.7. Cracks and dents in the impact support area<br>1.8. Cracked front and rear support brackets; their rivets have come loose |
| | |
| **2. Side wall** | 2.1. Corrosion, dents and punctures on the metal sheathing<br>2.2. Through-corrosion of the metal sheathing over more than 25% of its area.<br>2.3. Corrosion of the metal sheathing at a height of 300–400 mm above the floor along a length exceeding 25%, and damage to welded joints. Indentations, punctures<br>2.4. Cracks and warping in the top rail<br>2.5. Cracks and deflection in more than 5 intermediate posts, dents and corrosion over more than 50% of the area<br>2.6. Cracks, corrosion and warping in door posts<br>2.7. Cracks, corrosion and dents in corner posts<br>2.8. Corrosion and dents on the cargo compartment doors; cracks in the door hinges<br>2.9. Corrosion and dents on the doors of the engine compartment; cracks in the door hinges<br>2.10. Cracks, corrosion and warping in the upper and lower door tracks<br>2.11. Breakage or warping of the door opening and closing mechanism |
| **3. End wall** | 3.1. More than 5 corner and intermediate posts with deflection exceeding 100 mm (each), dents and corrosion covering an area greater than 50%<br>3.2. Corrosion of the metal sheathing exceeding 35%, damage to welded joints, dents and punctures<br>3.3. Corrosion on the equipment removal door, dents and cracks in the door |
| **4. Wagon floor** | 4.1. The cross-sectional area of the floor beams has decreased by more than 25%; corrosion covers an area greater than 50%<br>4.2. Through-corrosion of the metal floor exceeding 35%, damage to welded joints, dents and punctures |

| | |
|---|---|
| **5. Wagon roof** | 5.1. Through-corrosion of the roof sheathing over more than 50% of its area, damage to welded joints, dents and punctures<br>5.2. More than 5 roof arches with a deflection of more than 100 mm (each), dents, and corrosion covering an area greater than 50%<br>5.3. Corrosion, dents and warping of deflectors<br>5.4. Corrosion, denting and warping of opening covers |

An inspection of the technical condition of a refrigerated service wagon begins with determining the model of the wagon and its technical specifications.

The inspection begins by identifying the model of the refrigerated service wagon and its characteristics, as well as the nature of the cargo being transported and its effect on the materials of the refrigerated service wagon's frame and body under various transport conditions.

The technical condition is assessed by visually inspecting the wagon's assemblies and components for cracks and damage to structural members and checking bolted and riveted joints by tapping with a hammer to detect loose fastenings (with inspection dismantling if necessary).

Any defects found are recorded on *the Technical Condition Inspection Card for Refrigerated Service Wagon* (**Annex 41**), which lists the details of the refrigerated service wagon (wagon model, number, year of manufacture, scheduled repair date, and intended use). Sketches or photos of the defects may be included, indicating their location and dimensions.

Cracks, fractures, bends, deflections, twists and ruptures in metal structures are identified visually, and the dimensions of the defects are then measured. Corrosion is detected by measuring the thickness of the components.

The thickness of the main load-bearing members of metal structures is measured regardless of whether defects in these members were identified during a visual inspection.

Defects identified through non-destructive testing are recorded in accordance with the procedures laid down in normative documents.

In accordance with the specified diagrams (**Annexes 43 and 44**), measurements of the thickness of the body and frame of the refrigerated service wagon are performed, the welded joints of the refrigerated service wagon frame are visually inspected for external defects (**Annex 45**), and non-destructive ultrasonic and magnetic particle tests are performed on the welded joints (**Annex 46**).

Based on the body and frame thickness measurement results, *reports on ultrasonic thickness measurement tests of the refrigerated service wagon body and frame* are prepared (**Annex 47**); based on the visual testing results for welded joints, a *Visual Testing Report for Welded Joints* is prepared (**Annex 48**); and based on the results of non-destructive ultrasonic testing of welded joints, an *Ultrasonic Testing Report* is prepared (**Annex 49**).

The deflection of the longitudinal beam of the refrigerated service wagon frame is also measured, and *the Initial Test Data Report* (**Annex 50**) is prepared.

After processing and analysing the test data, in accordance with normative technical documents and taking into account the nature of the cargo being transported, a conclusion is reached regarding the refrigerated wagon's fitness for service and the extension of its service life:

- not to extend the service life (to write off the refrigerated service wagon);
- the service life is extended following depot repair;
- the service life is extended following overhaul;

Following technical diagnostics in the laboratory, a Technical Decision is prepared for each refrigerated service wagon, specifying the scope of scheduled repair required and the extended service life of the wagon.

The works specified in the Technical Decision must be completed within 6 months.

**Technical Condition Inspection Card for Refrigerated Service Wagon No. XXXXXXXX**

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Comments |
|---|---|---|---|---|---|
| | | Overhaul | Depot repair | | |
| | | | | According to the Freight Wagon Model Handbook | |

**Damage to the main load-bearing components and other structural parts of refrigerated wagons**

| | | | |
|---|---|---|---|
| **1. Body frame** | | 2.10. Cracks, corrosion and warping in the upper and lower door tracks | |
| 1.1. Cracks and deflection of the centre sill: vertical deflection greater than 100 mm, horizontal deflection greater than 50 mm; corrosion of sill sections exceeding 30% | | | |
| 1.2. Cracks and deflection of the body bolster; corrosion exceeding 30% | | 2.11. Breakage or warping of the door opening and closing mechanism | |
| 1.3. Cracks, corrosion and detachment at the joints between the centre sill and body bolsters | | 2.12. The louvres in the machine room are warped, with more than 50% corrosion. | |
| 1.4. Cracks in the upper and lower plates of the end beam in the impact support area; beam deflection greater than 50 mm | | 2.13. Handrails and steps are bent and broken | |
| | | **3. End wall** | |
| 1.5. Corrosion of the side longitudinal beams exceeds 25%, and the deflection is greater than 50 mm | | 3.1. More than 5 corner and intermediate posts with deflection exceeding 100 mm (each), dents, and corrosion covering an area greater than 50% | |
| 1.6. Cracks in transverse main and secondary beams, corrosion exceeding 25%, deflection greater than 50 mm | | 3.2. Corrosion of metal sheathing exceeding 35%; damage to welded joints, dents and punctures | |
| 1.7. Cracks and dents in the impact support area | | 3.3. Corrosion on the equipment removal door, dents and cracks in the door hinges | |
| | | **4. Wagon floor** | |
| 1.8. Cracked front and rear support brackets; their rivets have come loose | | 4.1. The cross-sectional area of the floor beams has decreased by more than 25%, with corrosion affecting an area greater than 50% | |
| **2. Side wall** | | 4.2. Through-corrosion of the metal floor exceeding 35%, damage to welded joints, dents and punctures | |
| 2.1. Corrosion, dents and punctures in metal sheathing | | | |

| | | | |
|---|---|---|---|
| 2.2. Through-corrosion of the metal sheathing over more than 25% of its area | | **5. Wagon roof** | |
| 2.3. Corrosion of metal sheathing at a height of 300–400 mm above the floor over a length greater than 25%, damage to welded joints, dents and punctures | | 5.1. Through-corrosion of the roof sheathing over more than 50% of its area; damage to welded joints, dents and punctures | |
| 2.4. Cracks and warping in the top rail | | 5.2. More than 5 roof arches with a deflection of more than 100 mm (each), dents, and corrosion covering an area greater than 50% | |
| 2.5. Cracks and deflection in more than 5 intermediate posts, dents and corrosion over more than 50% of the area | | | |
| 2.6. Cracks, corrosion and warping in door posts | | 5.3. Corrosion, dents and warping of deflectors | |
| 2.7. Cracks, corrosion and dents in corner posts | | 5.4. Corrosion, denting and warping of opening covers | |
| 2.8. Corrosion and dents on the cargo compartment doors; cracks in the door hinges | | NOTES:<br>1. Underline the defect<br>2. Mark a defect with +<br>3. Mark a serviceable item with –<br>4. Mark a rectified defect with p | |
| 2.9. Corrosion and dents on the doors of the engine compartment; cracks in the door hinges | | | |

Type of repairs ordered:

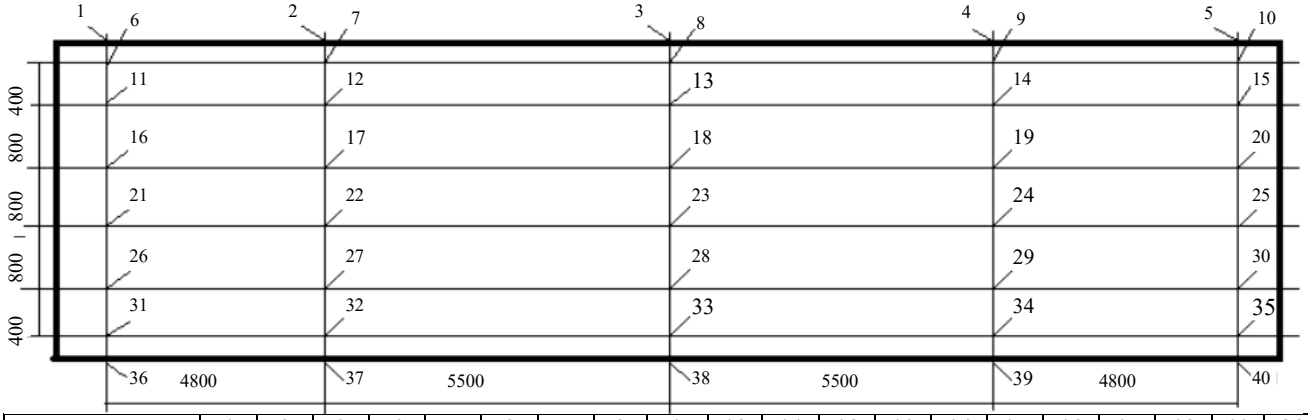
Specified service life:

(day) (month) 20

(Place and date of inspection)

# REFRIGERATED SERVICE WAGON NO. XXXXXXXX BODY PANEL THICKNESS MEASUREMENT DATA

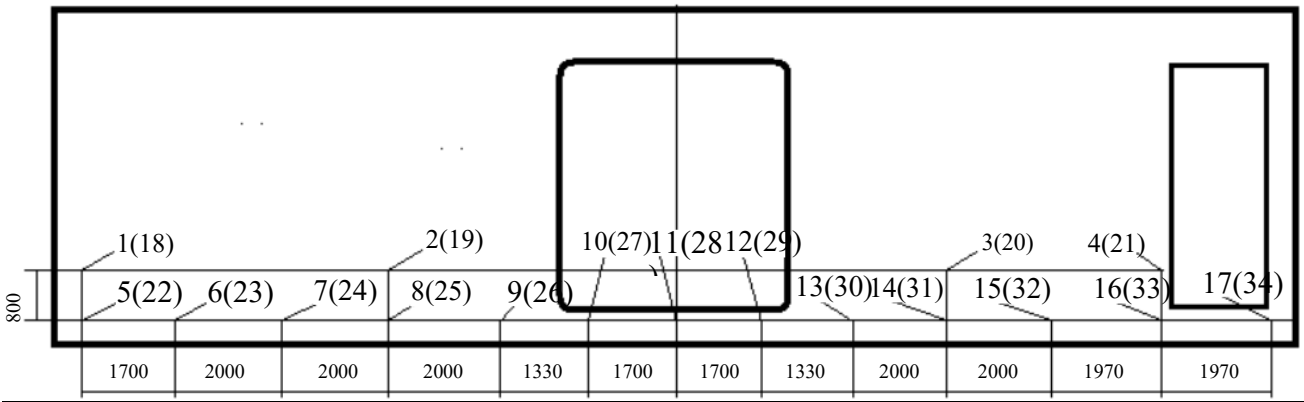
## Roof




| Point No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result | | | | | | | | | | | | | | | | | | | | |
| Point No. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| Result | | | | | | | | | | | | | | | | | | | | |

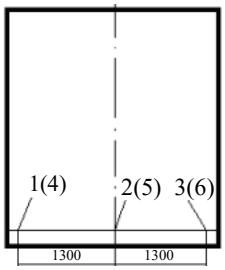
## Side wall

(the point marked in parentheses is on the opposite wall of the wagon)



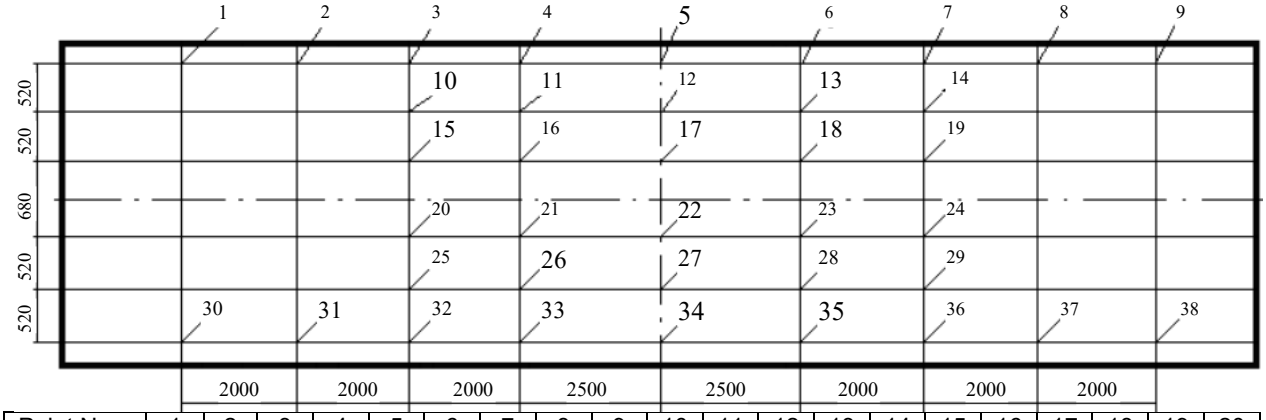

| Point No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result | | | | | | | | | | | | | | | | | | | | |
| Point No. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | | | | | | |
| Result | | | | | | | | | | | | | | | | | | | | |

## End walls



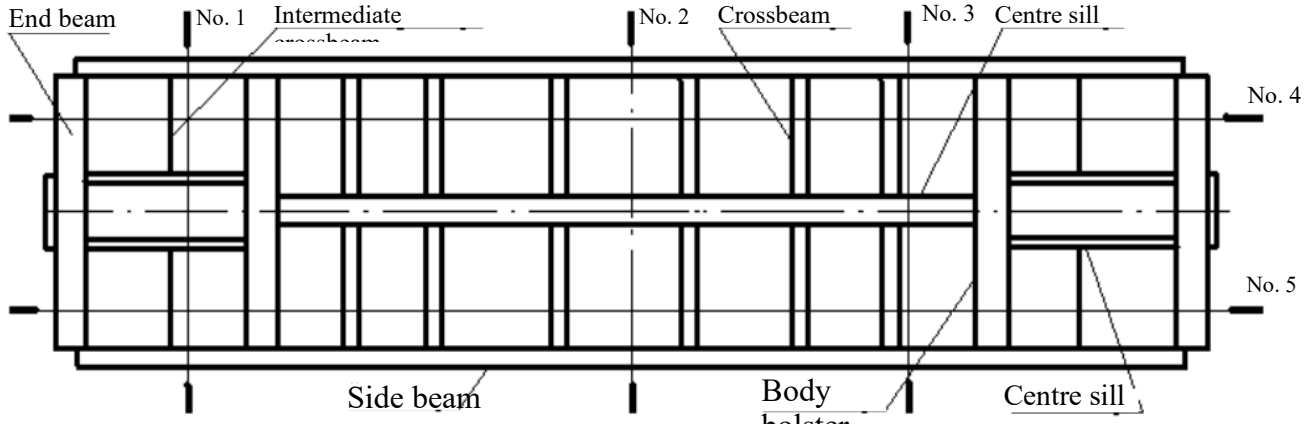

| Point No. | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result | | | | | | | | | | | | | | | | | | | |

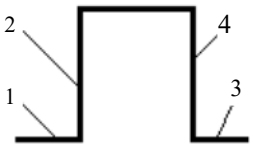
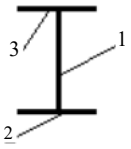
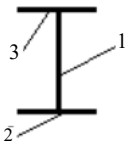
## Floors

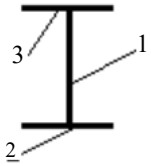
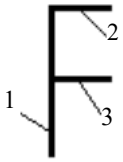



| Point No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result | | | | | | | | | | | | | | | | | | | | |
| Point No. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | | |
| Result | | | | | | | | | | | | | | | | | | | | |

## REFRIGERATED SERVICE WAGON NO. XXXXXXXX FRAME THICKNESS MEASUREMENT DATA




| Assembly name | Sketch | Measurement results | | | | | |
|---|---|---|---|---|---|---|---|
| | | Section No. / Point No. | 1 | 2 | 3 | 4 | 5 |
| Section of the centre sill up to the body bolster |  | 1 | | | | | |
| | | 2 | | | | | |
| | | 3 | | | | | |
| | | 4 | | | | | |
| | | 1* | | | | | |
| | | 2* | | | | | |
| | | 3* | | | | | |
| | | 4* | | | | | |
| Middle section of the centre sill |  | 1 | | | | | |
| | | 2 | | | | | |
| | | 3 | | | | | |
| Body bolster |  | 1 | | | | | |
| | | 2 | | | | | |
| | | 3 | | | | | |
| | | 1* | | | | | |
| | | 2* | | | | | |
| | | 3* | | | | | |

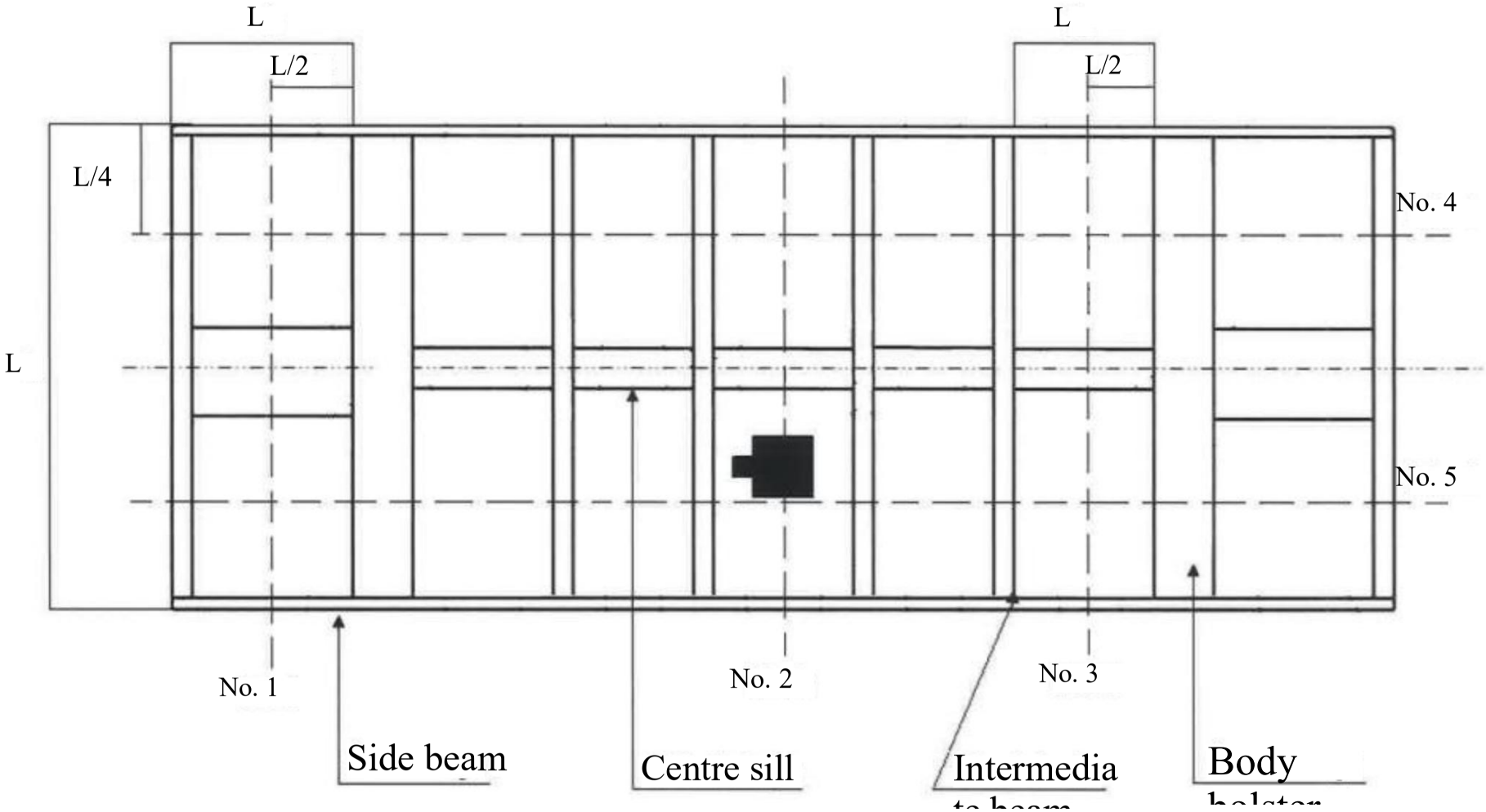
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frame side beam |  | 1 | | | | | |
| | | 2 | | | | | |
| | | 1* | | | | | |
| | | 2* | | | | | |
| Crossbeam |  | 1 | | | | | |
| | | 2 | | | | | |
| | | 3 | | | | | |
| | | 1 | | | | | |
| | | 2 | | | | | |
| | | 3 | | | | | |
| End beam |  | 1 | | | | | |
| | | 2 | | | | | |
| | | 3 | | | | | |
| | | 1* | | | | | |
| | | 2* | | | | | |
| | | 3* | | | | | |

(*) – The measurements shown were taken on the second beam or in another part of the wagon

Signatures:

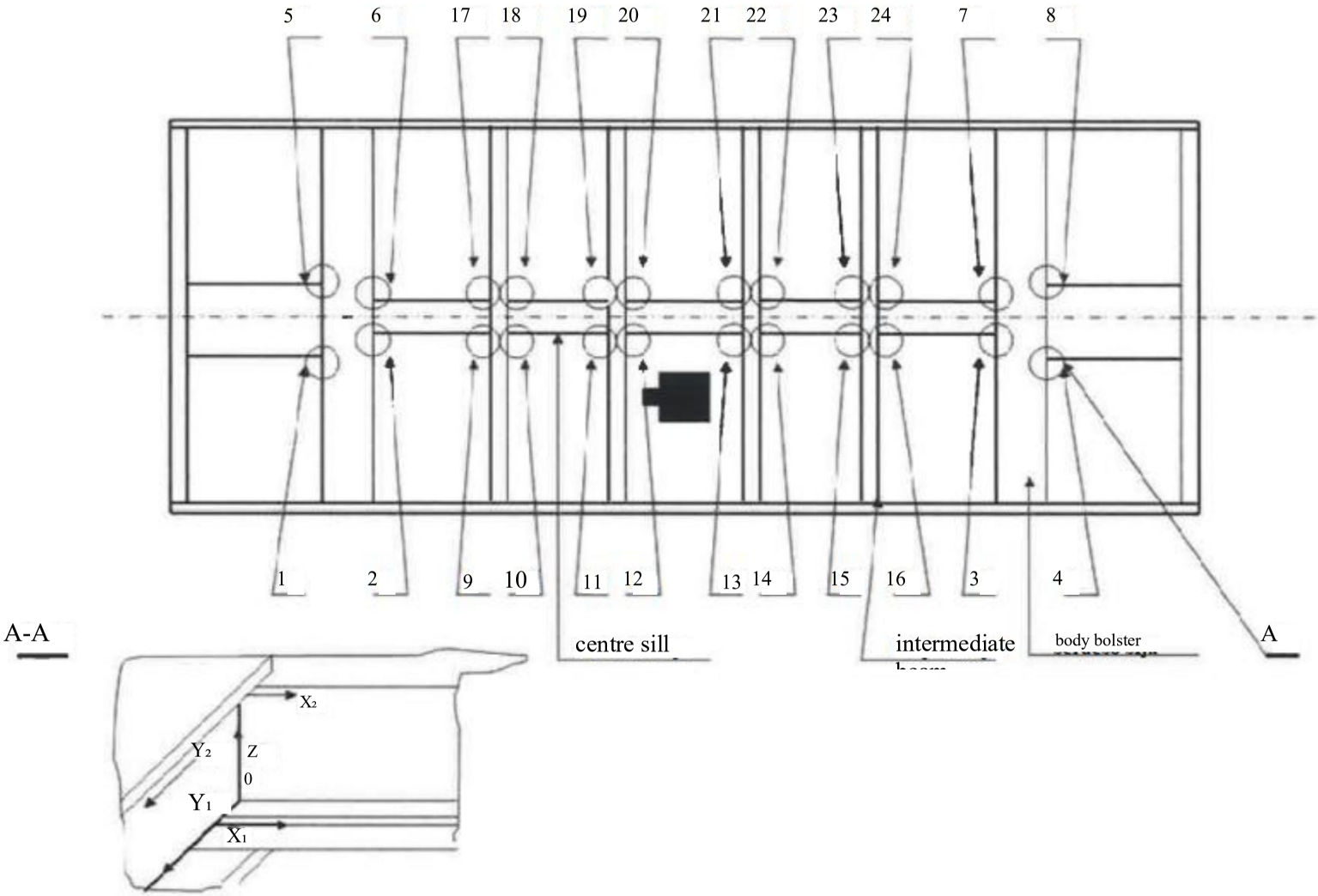
**DIAGRAM SHOWING THE LAYOUT OF TEST POINTS ON THE FRAME WALLS OF A REFRIGERATED SERVICE WAGON**

(thickness of the walls of a refrigerated wagon frame)



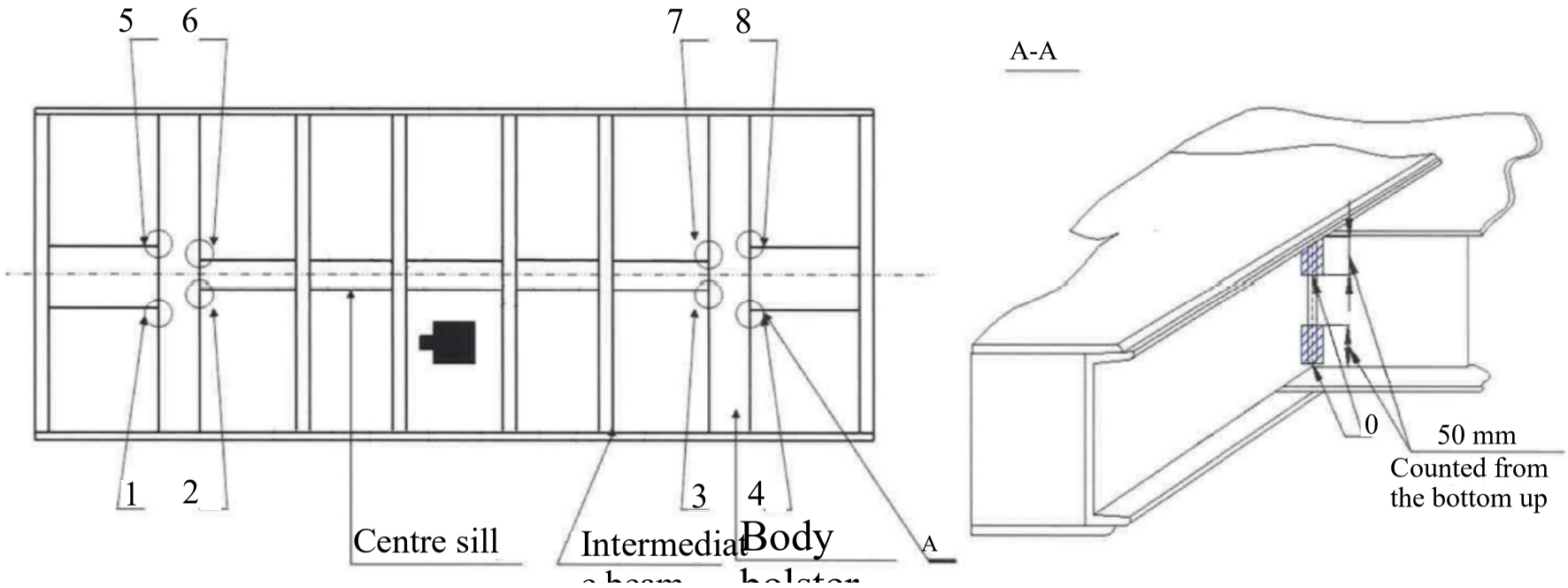
## LAYOUT DIAGRAM OF WELDED-JOINT TEST LOCATIONS FOR A REFRIGERATED SERVICE WAGON

(external defects in the welded joints of a refrigerated wagon)



**LAYOUT DIAGRAM OF TEST POINTS FOR WELDED JOINTS ON THE FRAME OF A REFRIGERATED SERVICE WAGON**

(internal defects in the welded joints of a refrigerated wagon frame)



| (Company name) | ULTRASONIC THICKNESS MEASUREMENT TEST REPORT | TESTS |
|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Report No.:** | **Date**: | | | **Application No.:** | |
| **Client:** | | | **Purpose of the tests:** Diagnostics | | |
| **Test location:** | **Test subject:** | | | **Drawing No.: 24** | |
| **Measured component** No.: | | | **Material:** | | |
| **Measurement standards, methodology:** | | | **Environmental conditions:** | | |
| **4.** | Frequency | MHz | Angle | Product No. | |
| **Calibration and reference blocks:** | Frequency | MHz | Angle | Product No. | |
| **Sensitivity setting** | Frequency | MHz | Angle | Product No. | |
| | Frequency | MHz | Angle | Product No. | |

| **Part being measured** | **Measurement point No.** | **Nominal thickness** | **Permissible thinning up to** | Sketch of the object to be measured, showing the locations of the measurement points **Diagram No.** | | | |
|---|---|---|---|---|---|---|---|
| Section of the centre sill up to the body bolster | 1,3,1 *,3* | | | Crossbeam to which the fuel storage tanks are attached | 1 | | |
| | 2,4,2*,4* | | | | 2 | | |
| Middle section of the centre sill | 1 | | | | 3 | | |
| | 2 | | | Intermediate crossbeam | 1 | | |
| | 3 | | | | 2 | | |
| Body bolster | 1,1* | | | | 3 | | |
| | 2,2* | | | End beam | 1.1* | | |
| | 3,3* | | | | 2.2* | | |
| | 1,1*, 2,2* | | | | 3,3* | | |

| | | | |
|---|---|---|---|
| **Thickness gauge:** | **Product** No.: | **Calibration blocks:** No.: | |
| **Transducer** | **Frequency: MHz** | **Product No.:** | **Couplant** |
| **The tests were conducted by:** | | **Deviations from standards or the contract:** | |

**ULTRASONIC THICKNESS MEASUREMENT TEST REPORT**

| Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation | Part being measured | Section No. | Measurement point No. | Measurement results, mm | Evaluation |
|---|---|---|---|---|---|---|---|---|---|
| Section of the centre sill up to the body bolster | 1 | 1 | | | | 3 | 2 | | |
| | | 2 | | | | | 3 | | |
| | | 3 | | | Body bolster | 4 | 1 | | |
| | | 4 | | | | | 2 | | |
| | | 1* | | | | | 3 | | |
| | | 2* | | | | | 1* | | |
| | | 2* | | | | | 2* | | |
| | | 4* | | | | | 3* | | |
| Middle section of the centre sill | 2 | 1 | | | | 5 | 1 | | |
| | | 2 | | | | | 2 | | |
| | | 3 | | | | | 3 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 | 1 | | | | | 1* | | |
| **The tests were conducted by:** | | | | | **Person who approved the report:** | | | | |

**ULTRASONIC THICKNESS MEASUREMENT RESULTS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Body bolster | 5 | 2* | | | | | | | |
| | | 3* | | | | | | | |
| Frame side beam Body bolster | 1 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 1* | | | | | | | |
| | | 2* | | | | | | | |
| | 2 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 1* | | | | | | | |
| | | 2* | | | | | | | |
| | 3 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 1* | | | | | | | |
| | | 2* | | | | | | | |
| Intermediate crossbeam to which the fuel tanks are attached | 4 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 5 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| Intermediate crossbeam | 4 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | 5 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| End beam | 4 | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 1* | | | | | | | |
| | | 2* | | | | | | | |
| | | 3* | | | | | | | |
| | 5 | 1 | | | | | | | |
| | | 2 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| End beam | | 3 | | | | | | | |
| | | 1* | | | | | | | |
| | | 2* | | | | | | | |
| | | 3* | | | | | | | |
| **The tests were conducted by:** | | | | | | | | | |

| (Company name) | **VISUAL TESTING REPORT** | |
|---|---|---|

| **Report No.** | **Date:** | **Application No.** |
|---|---|---|
| **Client:** | **Purpose of the tests:** | |
| **Test site:** | **Test subject:** | **Diagram No.** |
| **Test component No.** | **Component dimensions according to diagram No.** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Data Sheet No.** - | |
| **Testing equipment:** | | |

**VISUAL TESTING RESULTS**

| **Test component assembly No. according to the diagram** | **Defects found** | **Assessment** | **Test component assembly No. according to the diagram** |
|---|---|---|---|
| No. | | | No. |
| | | | |
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| **Evaluation criteria, standard:** | **Deviations from standards:** | | |

| **The tests were conducted by:**<br>Cert. No.: | **Person who approved the report:**<br>**Cert. No.:** |
|---|---|

| (Company name) | ULTRASONIC TESTING REPORT | TESTS |
|---|---|---|

| | | |
|---|---|---|
| **Report No.:** | **Date**: | **Application No.:** |
| **Client:** | **Purpose of the tests:** | |
| **Test location:** | **Test subject:** | **Drawing No.:** |
| **Test component** No.: | **Part dimensions:** | **Material:** |
| **Surface condition:** | **Scope of testing:** | **Type of welded joint:** |
| **Welding process and heat treatment data:** | **Environmental conditions:** | |
| **Testing standard, methodology:** | **Technical Sheet No.:** | **Test level:** |
| **Flaw detector:** | **Product No.:** | **Couplant:** |

**Evaluation criteria, standard:** **Deviations from standards:**

**Transducers**

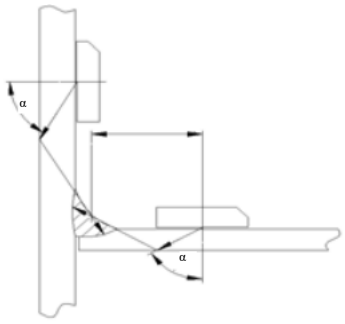
| | | | | |
|---|---|---|---|---|
| **1.** | Frequency | MHz | Angle | Product No. |
| **2.** | Frequency | MHz | Angle | Product No. |
| **3.** | Frequency | MHz | Angle | Product No. |
| **4.** | Frequency | MHz | Angle | Product No. |

**Calibration and reference blocks:**

**Sensitivity setting**

**Time range**

**Scanning directions and areas**




| | **Reference level** | **Examination level** | **Recording level** | | **α, ◦** | **X,** |
|---|---|---|---|---|---|---|
| **1.** | | | | | | |
| **2.** | | | | | | |
| **3.** | | | | | | |
| **4.** | | | | | | |

**Evaluation criteria, standard:** **Deviations from standards:**

**ULTRASONIC TEST RESULTS**

| | | |
|---|---|---|
| **No defects found** ☐ | **Permissible defects (see the other side of the page)** ☐ | **Unacceptable defects (see the other side of the page)** ☐ |

| | |
|---|---|
| **The tests were conducted by:** | **Person who approved the report:** |

**ULTRASONIC TESTING RESULTS REPORT**

| ULTRASONIC TEST RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Part No. | Defect No. | Defect height, mm | | Defect amplitude | Defect length, mm | Defect start, mm | Defect assessment | Note |
| | | from | to | | | | | |
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| The tests were conducted by: | | | | | | | | |

**Annex 50**

## INITIAL TEST DATA REPORT

### Initial Test Data Report No.

Wagon No. _____ – determination of longitudinal _____ beam deflection
(centre sill, side beam)

| Wagon model | Date of manufacture | Date of the last repair | | Type of cargo being transported | Note |
|---|---|---|---|---|---|
| | | overhaul | depot repair | | |
| | | | | | |

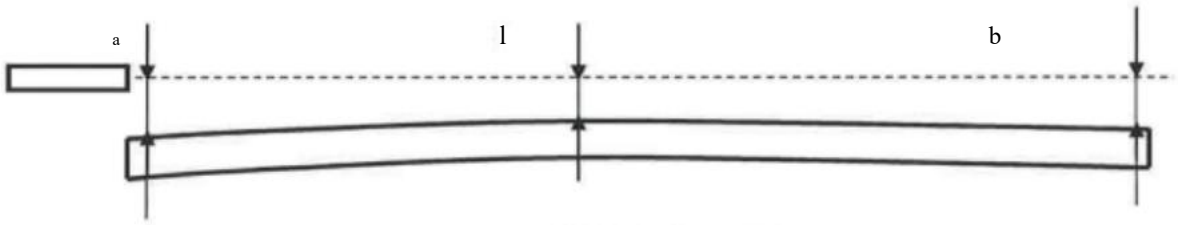
CLIENT _____

ORDER No. _____ TEST DATE_____

ENVIRONMENTAL CONDITIONS

Measuring instruments;

**Measurement diagram**




**Determining the level of a laser beam**

| **Distance to the laser beam, mm** | **Ruler readings** | | | | |
|---|---|---|---|---|---|
| | 1st reading | 2nd reading | 3rd reading | 4th reading | 5th reading |
| a | | | | | |
| b | | | | | |
| $l_{(ab)}=(a+b)/2$ | | | | | |

**Measuring the distance from the laser beam to the longitudinal beam of the wagon**

| Item No. | **Distance l, mm** | **Deflection $l_n$, mm** | Calculation of beam deflection (ln) |
|---|---|---|---|
| 1 | | | $I_n = l_{(ab)} - l_n$; where $l_{(ab)} < l_n$; |
| 2 | | | $I_n = l_n - l_{(ab)}$; where $l_{(ab)} > l_n$; |
| 3 | | | |
| | | | |

$I=£ I_n/n$ – longitudinal beam deflection, i.e. the arithmetic mean of the deflections;

Vertical/horizontal (delete as appropriate) deflection of the longitudinal beam of the wagon frame

Measurement uncertainty value (upon the client's request)

The deflection of the longitudinal beam of the wagon frame meets/does not meet (delete as appropriate) the requirements of the instructions

The tests were conducted by

_____ _____ _____

(signature) (First Name Last Name) (Date)

**Annex 51**

List of Companies Authorised to Perform Scheduled Repairs on Freight Wagons

| Company name | Company address | Company code |
|---|---|---|
| SIA L-Ekspresis | Kalna iela 68a, Rīga, LV-1003, Latvia | 897 |
| Radviliškis Freight Wagon Depot | Puškino g. 1, Radviliškis, LT-82124, Lithuania | 833 |
| SIA LDZ ritošā sastāva serviss | Turgeņeva iela 21, Rīga, LV-1050, Latvia | 900 |
| AS Valga Depoo | Voru 5, Valga, EE-68205, Estonia | 792 |
| OÜ Operail Repairs – Tapa Depood | Metalli 3, Tallinn, EE-15073, Estonia | 794 |

**Annex 52**

List of Companies Authorised to Perform Technical Diagnostics on Freight Wagons

| Company name | Company address | Company code |
|---|---|---|
| SIA Baltijas Testesanas Centrs | Gustava Zemgala iela 83, Rīga, LV-1039 | 8210 |
| AB LTG CARGO Rolling Stock Maintenance | Puškino g. 1, Radviliškis, LT-82124 | 8227 |
| SIA LDZ ritošā sastāva serviss | 49 Varšavas iela, Daugavpils, LV-5404, Latvia | 8216 |
| OÜ Operail Repairs – Tapa Depood | Metalli 3, Tallinn, EE-15073, Estonia | 8236 |