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# Analysis of the Technical Condition of Weighted Wagons of Type 640-Vpv Operated on Railways of the Republic Of Uzbekistan

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**KEYWORDS:** freight wagon, six-axle gondola wagon,railway, weight checking wagon, automatic coupler, speed.

**ABSTRACT:** In the article, necessary to design and build new and modern weighing wagons to replace the outdated ones, but this will take some time. Thus, before the construction of new wagons, as well as for the optimal use of existing wagons, it is necessary to extend their service life. Extension of the service life of weighing wagons involves determining the current technical condition and residual resources of these wagons.For this purpose, a survey and analysis of the main bearing elements and structural parameters of the bodies of the weighing wagons was carried out.

## I.INTRODUCTION

The wide range of measures carried out by the leadership of Uzbekistan to further increase the export and transit potential of the republic will require the intensification of the use of all types of transport, including rail [1-3]. To increase the volume and efficiency of freight rail transportation in the absence of reserves for increasing the carrying and carrying capacity of heavily loaded sections, as well as with limited lengths of receiving-departure tracks at stations, the most promising is the introduction of rolling stock with increased axle loads [4-8]. At the same time, scales are used to weigh rolling stock in the country's railway network, which require periodic checks [9-10].

Mechanized inspection of all types of wagon scales, which require periodic inspections, is provided by weighing wagons [11-12]. Weighing wagon - carries out mechanized checking of various types of wagon scales, thereby ensuring the accuracy and accuracy of the readings of weighing instruments [13].

On the railways of the Republic of Uzbekistan there are more than ten weight-checking wagons of the 640-VPV type, produced in 1965-1966 [14]. Such a wagon is a self-propelled unit equipped with exemplary equipment and mechanisms for checking wagon weights with maximum loads of 150 t and 200 t [10, 15].

Currently, it is necessary to design and build new and modern weighing wagons to replace the outdated ones, but this will take some time. Thus, before the construction of new wagons, as well as for the optimal use of existing wagons, it is necessary to extend their service life [16-17]. Extension of the service life of weighing wagons involves determining the current technical condition and residual resources of these wagons.

For this purpose, a survey and analysis of the main bearing elements and structural parameters of the bodies of the weighing wagons was carried out. Technical characteristics of the weighing wagon are shown in the table 1.

The weighing wagon of 640-VPV type (Fig. 1) is designed on the basis of a six-axle gondola wagon with a carrying capacity of 93-95 tons, equipped with standard shock-traction devices and a brake system, which allows it to be included in the train at set speeds up to 120 km / h [10, 14, 15].

The all-metal body of the weighing wagon is a welded structure consisting of a roof, two side walls and two end walls. Inside the wagon body, on a beam welded to the roof, there is an electric hoist boom with a gripper for two self-propelled weighing bogies and M1 weights of 2000 kg each [18].

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Technical characteristics of the weighing wagon
Table 1

| № | Technical characteristics | Value |
|---|---|---|
| 1 | Total weight of model weights and weighing trolleys, t | 80 |
| 2 | Number of exemplary weights of the 4th grade, pcs. | 38 |
| 3 | Mass of an exemplary weight of the 4th category, kg | 2000±0,2 |
| 4 | Number of weight verification trolleys, pcs. | 2 |
| 5 | Weight of the weighing trolley, kg | 2000±0,2 |
| 6 | Maximum load on the weighing trolley, t | 40 |
| 7 | The base of the weighing trolley, mm | 980 |
| 8 | Travel speed of the weighing wagon from its own drive, m / min | 23 |
| 9 | Boom extension speed of telpher, m / min | 30 |
| 10 | Speed of movement of the weighing trolley, m / min | 24 |
| 11 | The most possible removal of the weighing trolley from the wagon, m | 30 |
| 12 | Weight of a wagon with exemplary equipment, t | 127 |
| 13 | Wagon width, mm | 3220 |
| 14 | Carriage base, mm | 10440 |
| 15 | Wagon length along the coupling axes of the automatic coupler, mm | 16400 |
| 16 | Design speed, km / h | 120 |

On one of the end walls of the wagon there is a window and a hatch covered with shutters for servicing the diesel engine. The other end opening is closed across the entire width by double doors designed for unloading and loading weights and trolleys.

An entrance door and a staircase are installed on the side wall of the body. The floor of the weighing wagon is made of boards 60 mm thick, on which 36 (38) exemplary weights of the 4th grade are laid.

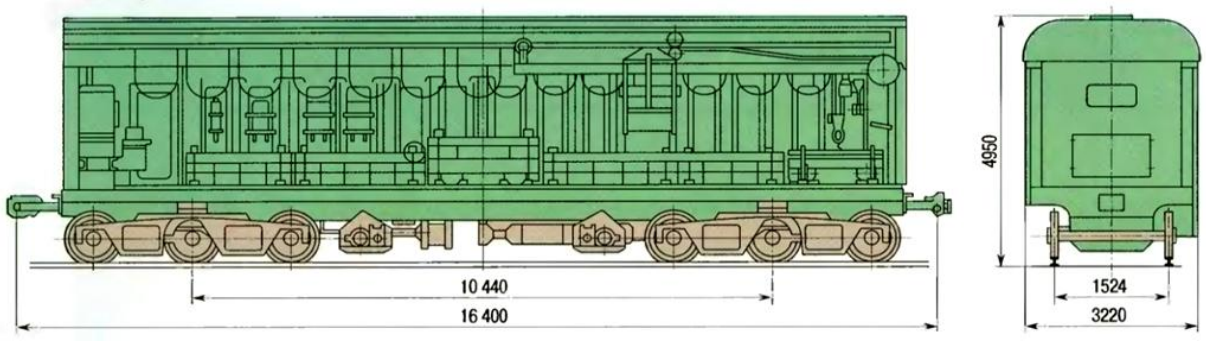


Figure: 1. Weight-checking wagon of 640-VPV type

The weighing wagon is equipped with two weighing trolleys. In the middle part of the wagon there is one weighing trolley, on which two more model weights weighing 2000 kg are laid. On the right side of the body, near the end doors, a second weighing trolley is installed. Outside the wagon, under the center beam, two movement mechanisms are installed - right and left.

To determine the technical condition, from the weight-checking wagons available on the territory of the Republic of Uzbekistan, 5 wagons were selected that were on the RZhU Bukhara, RZHU Kokand, RZHU Karshi and RZHU Termez.

At the first stage of the analysis of the state of the metal structure of the weighing wagons, a number of faults were identified that affect their service life. Examination of the body revealed that the side wall sheathing sheets have traces of corrosion under the paint (Fig. 2). There are faults in the welded joints of the uprights to the crossbeam and the sidewall sheathing to the uprights.

During the inspection inside the weighing wagon, it was revealed that the wooden floor requires 100% replacement, the monorail is subject to repair. It is necessary to restore the support part of the monorail. Due to wear, it is necessary to replace the rollers of the bogie hoist inside the wagon. The bottom sheet of the pivot girder of the model

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640-VPV-267 weighing wagon has a weld crack. The metal linings of the model 640-VPV-285 weighing wagon in the area of connection of the cross beams with the center beam are destroyed under the action of corrosion. At the time of inspection, the thickness of the metal plate is 30% of the nominal.

At the second stage of the analysis of the place of measurements of the dimensions of the elements of the metal structure of the body of the weighing wagon, the diagrams of which are shown in Fig. 3-6, were cleaned to a metallic luster to measure wear thickness with a depth gauge (Fig. 7). The measurement results were recorded in tables for each of the five wagons.

Figure: 2. Weighing wagon, type 640-VPV

## II. METHODS

Based on the results of measurements of wear thicknesses, the value of the averaged $h_{cp}$ wear thickness with allowance for tolerance «$\delta$=0,2 *mm*» for stripping, which is determined by the formula

$$h_{cp} = \frac{1}{n}\sum_{i}^{n} h^i - 0{,}2\,,$$

where$n$ – is number of measurements.

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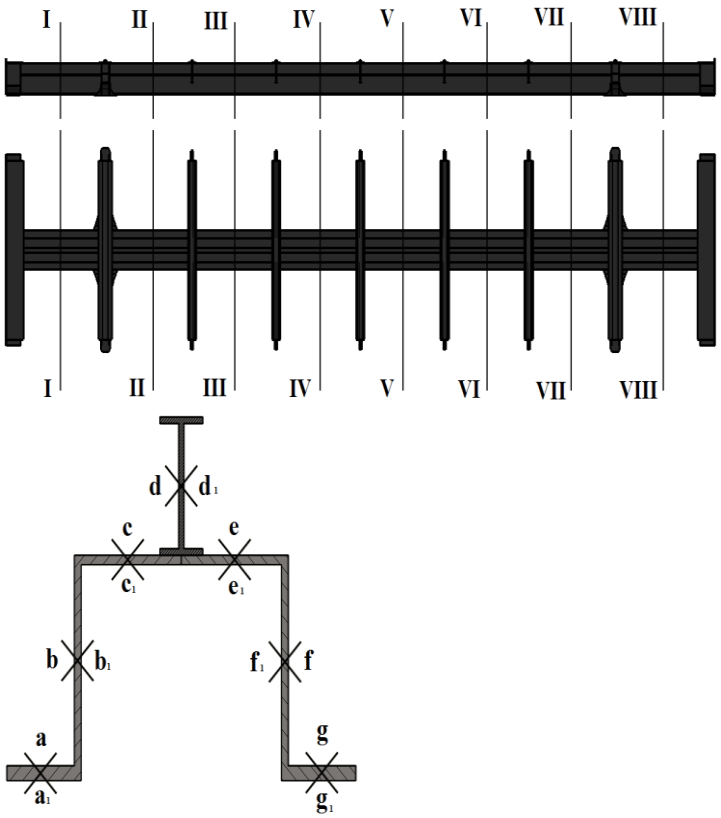


Figure: 3. Scheme for measuring the thickness of wear of sheets on the center beam of the frame of the weighing wagon

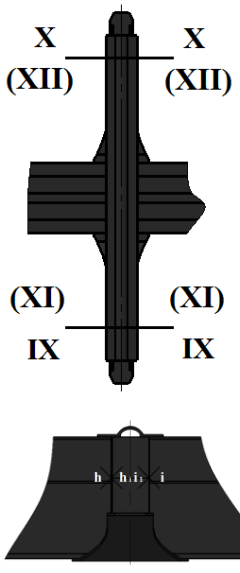


Figure: 4. Scheme for measuring the thickness of sheet wear on the pivot beam of the weighing wagon frame

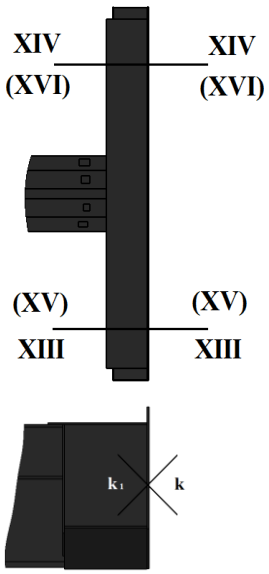


Figure: 5. Scheme for measuring the thickness of sheet wear on the end beam of the weighing wagon frame

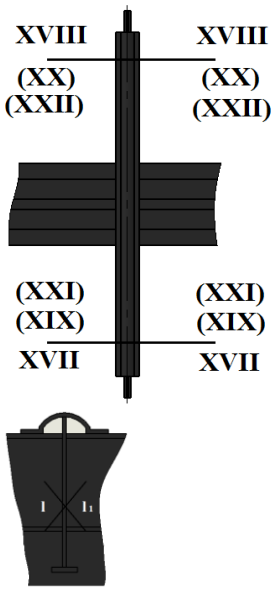


Figure: 6. Scheme of thickness measurements of sheet wear on the longitudinal beam of the weighing frame

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Figure: 7. Measurement of the frame elements of the weighing wagon

From the data obtained from five examined weighing wagons, the average value of sheet wear was determined for the elements of metal structures of the weighing wagon using the formula:

$$h_{cp} = \frac{1}{n}\sum_{i}^{n} h^{i}$$

## III. RESULTS

The results of the average values of the wear values for the beams of the weighing wagon are presented in Table 2.

Results of the average values of wear values for the elements of the weighing wagon

Table 2

| Model | Spine beam | Pivot beam | End beam | Longitudinal beam |
|---|---|---|---|---|
| 640-VPV-271 | 0,77 | 0,43 | 0,94 | 0,79 |
| 640- VPV-267 | 0,74 | 0,46 | 0,86 | 0,83 |
| 640- VPV-263 | 0,77 | 0,44 | 0,92 | 0,74 |
| 640- VPV-277 | 0,67 | 0,47 | 0,93 | 0,76 |
| 640- VPV-285 | 0,77 | 0,43 | 0,92 | 0,75 |
| $h^{i}_{cp}$ | 0,74 | 0,45 | 0,91 | 0,77 |

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## IV. CONCLUSION

The results obtained for the average values of wear thicknesses for the elements of the weighing wagon were used in the strength calculations of the metal structure of the weighing wagon.

Thus, the result of the study was the determination of the wear values of the metal structure of the weighing wagon, as well as the identification of malfunctions of these wagons. When carrying out strength calculations of the metal structure of the weighing wagon, the wall thickness was taken taking into account its decrease by the value of the average wear value. The results showed that this design meets all the established requirements [9, 19].

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