5th Int. Conference Structural Integrity of Welded Structures (ISCS2007), Timisora, Romania, 20-21 Nov 2007
- Testing & risk assessment in the development of advanced materials and joints -
For all papers of this publication click: www.ndt.net/search/docs.php3?MainSource=56

The structural integrity of railway products welded constructions, a traffic safety condition

Mihaela Herman [1], Richard Herman [2]
Universitatea "Politehnica" din Timişoara, Facultatea de Mecanică
Phone: 40 0256 403723; Fax: 40 0256 403523;
e-mail: mihaela.herman@mec.upt.ro; richard.herman@mec.upt.ro

Abstract:
During the railway transportation process, it is necessary to achieve traffic safety, regarding the traffic organization and the railway product conduct.
The railway product, including the ensembles, sub ensembles and the railway vehicle guide marks, is submitted during exploitation to several stresses that affect in a different way and at different times their structural integrity.
The ensembles are realized, almost solely by welding. This is a process that involves as a preliminary the execution of some complex shaped and high precision assembling devices, in order to ensure the needed precision in the ensembles exploitation.
After the welding assembling, the railway products pass through some successive stages in which the welding and geometrical precision characteristic quality is checked.
Keywords: railway, transportation, structural integrity, shaped, welding assemblies

1. Introduction

Due to its geographical setting, Romania is a major bridge between the main railways that link the North and South, East and West of Europe. Thereby, the railway transportation modernization and development in our country is a must. Further more, the railway transportation offers many advantages over the other means of transportation:

- energy efficiency;
- traffic safety;
- environment protection;
- field usage;
- social involvement.

Having this is consideration, a great attention is paid to the wagons and wagon components testing and verification. This is done in accordance with the Romanian Railway Authority standards, so that they can be homologated and admitted in traffic.

2. Railway vehicles welded assembled components

2.1. General aspects regarding the railway vehicles

Railway vehicles in general, and wagons in particular have a large type and dimension variety *[4]*, given mainly by the transported object (fig.1). But, regardless of their destination – personnel or goods transport – the wagons have the following basic components: the wagon top box and the bogie unit assembly.

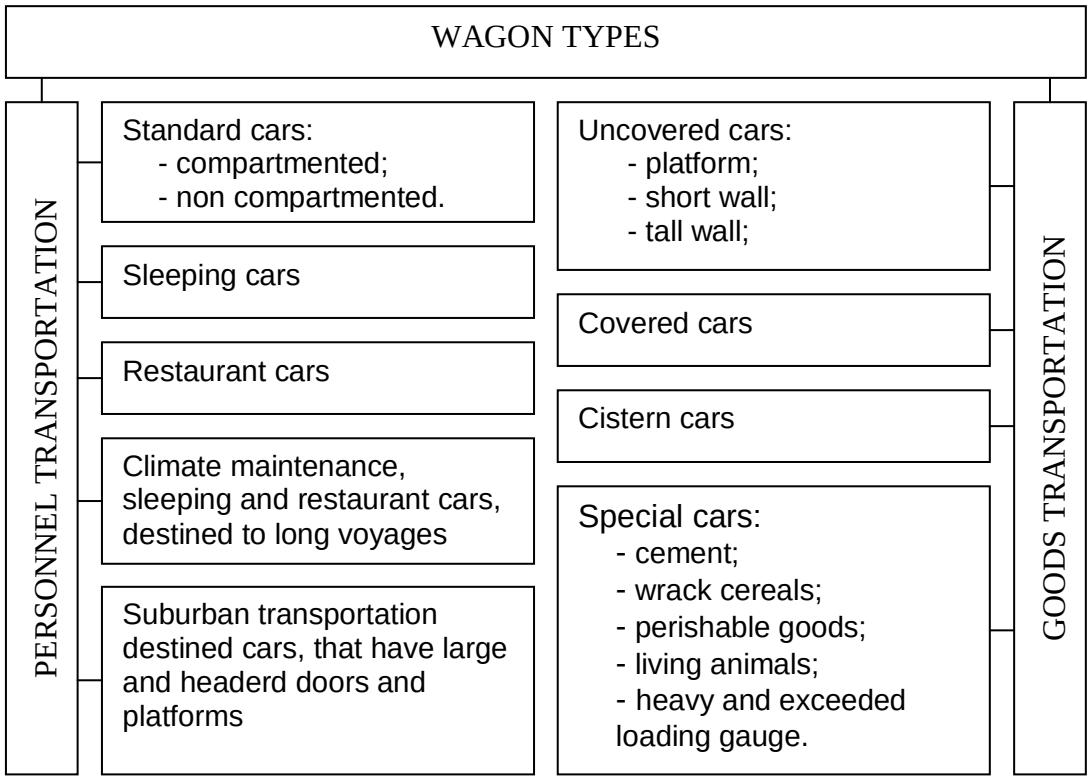

Figure1. Personnel and goods transportation wagon types

2.2. Welded subassemblies particularities

2.2.1 The wagon top box

The top box *[2]* has to ensure the safety of the transported object, the personnel comfort and the goods integrity. The wagon top boxes (fig.2) have to be manufactured of shock, vibration and weather resistant materials in order to give the necessary protection.

Figure 2. Personnel wagon top box

When talking about goods wagons (fig. 3), additional conditions are needed, that are determined by the transported goods particularities.

Figure 3. Goods wagon top box

The basic structures of both types of wagons – personnel and goods transportation – are manufactured in welded construction.

2.2.2 The bogie units

Bogies *[2]* are the wagon subassemblies that, with their components, ensure the top box support and rolling. The bogie frame is a welded structure (fig. 4).

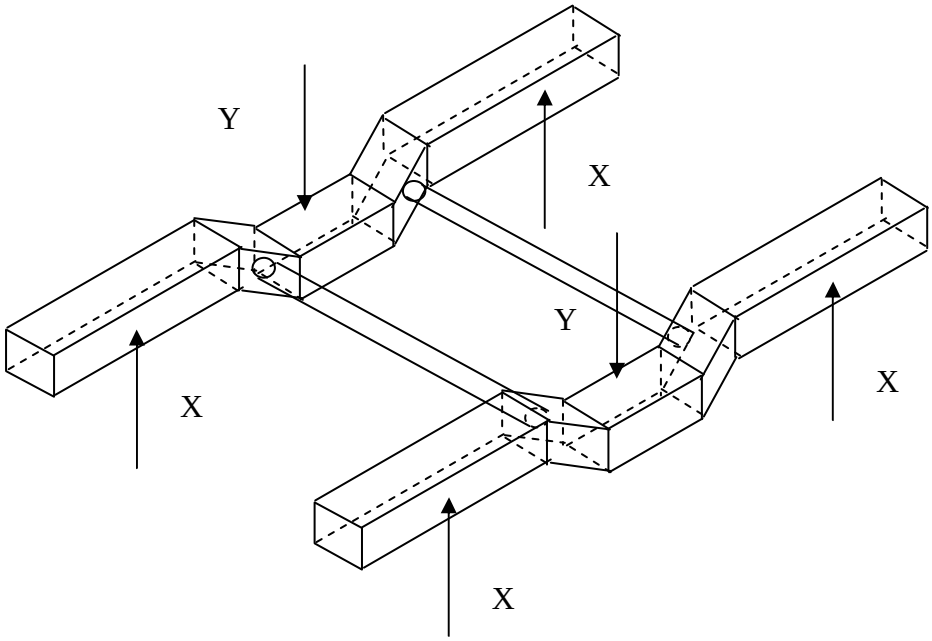

Figure 4. The one piece bogie scheme representation

The bogie frame consists of: two bent and welded metal sheet longerons, each of them being provided with a space for the secondary suspension mounting; two tubular transverses that sustain the longerons; one central metal sheet transverse, cut and welded; four rings that are welded on the inner chassis, two for each longeron, in order to allow the bogie lifting; four catchers in order to limit the carcass cross travel in curves; several welded attachments.

2.3. The bogie frame resistance assaying

After the welding operations are finished, the bogie frame has to pass a load resistance assaying. The bogie is propped in four points marked with X. Then, it is applied a 395 kN evenly distributed load on the two contact surfaces of the secondary suspension coils, marked with Y. The load is maintained for 3 minutes, while a hammer hits the welding surroundings; the welding is visually inspected in order to discover eventual cracks. When in doubt, the welding is examined through an eyeglass or by using penetrating liquids or other methods. If cracks are discovered, the welding is repaired in accordance with the repairing technology, is thermally retreated in order to release the tension in the bogie frame and the assaying is repeated.

After the assaying, the frame does not have to show any remaining deformations. The test is executed the following way:

- 100% for the first 10 bogie frames
- 1/10 bogie frames for the following ones.

3. Conclusions

In the multitude of tests (using penetrating liquids, penetrating radiations, ultrasounds, magnetic control and other special methods) that railway vehicles pass through, from the simplest subassemblies to the most complex assemblies, an important factor is welding quality checking. The assaying follows the juncture quality and the subassemblies conduct while the railway vehicle is working. After the tests, if all of the values are within the working parameters, The Romanian Railway Authority homologates the respective products.

References

1. Dehelean, D., Sudarea prin topire, Editura Sudura, Timişoara, 1997
2. Dungan, M. C., Tehnologia de fabricare, reparare şi încercare a vagoanelor - partea 2-a, Timişoara, 1996
3. Herman, Mihaela, Herman, R., Tehnologie generală, Editura Augusta, Timişoara, 2000
4. Herman, Mihaela, Sisteme şi mijloace de transport**,** Editura MIRTON, Timişoara, 2007
5. ***, Instrucţia pentru repararea cadrelor de boghiuri de la vagoanele de marfă şi călători, Nr 935 MTTc, DCF, CMMR, Bucureşti, 1988
6. ***, Instrucţia pentru verificarea şi repararea şasiurilor şi cutiilor vagoanelor de marfă şi călători, Nr 936 MTTc, DCF, CMMR, Bucureşti, 1988