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Speed limits in the tram traffic in Wroclaw

Abstract: The article summarizes and classifies types of speed limits in tram traffic. Examples from the area of the tram network in Wrocław were presented. The reasons for the restrictions applied in other cities in Poland were analysed.

Keywords: Tram; Speed limits

Introduction

The maximum allowable speed for trams is 50 km/h. In some cities, this value is increased on selected sections up to 70 km/h (Krakow Rapid Tram, Poznań Rapid Tram). Despite a common policy for all cities aimed at prioritizing public transport [1], the highest average traffic speed was determined for Poznań, reaching only 20.8 km/h – Table **1** [14].

Tab. 1. Average Traffic Speed of Trams [14]

Average communication speed		
No.	City	Communication speed [km/h]
1.	Poznań	20,8
2.	Bydgoszcz	20,5
3.	Szczecin	20,3
4.	Olsztyn	19,8
5.	Warszawa	18,9
6.	Grudziądz	18,8
6.	Kraków	18,8
8.	Górnośląski Okręg Przemysłowy	18,6
9.	Wrocław	17,8
10.	Gdańsk	17,1
11.	Elbląg	17,0
12.	Łódź	15,6

The calculated value for Wrocław is merely 17.8 km/h. However, it is worth noting a number of speed restrictions that have a direct impact on the aforementioned result. Within the area of Wrocław, the following reasons for speed limitations can be identified:

- Restrictions arising from traffic regulations,
- Operational restrictions,
- Safety-related restrictions.

The subsequent part of the article provides an analysis of the aforementioned defined restrictions.

Restrictions Arising from Traffic Regulations Among the restrictions arising from traffic regulations [18], we can include the application of prohibition signs and informational signs [16]:

- B-33 “Speed Limit”

- B-43 "speed restricted zone":

- D-40 "residential zone":

Restrictions of this type are applied in Wrocław, among others, in the following places:

1. Grunwaldzki Bridge, the applicable marking obliges the tram driver to travel at a speed of 40 km/h along the length of the bridge – Fig. **1**.

1. Grunwaldzki Bridge, view from Grunwaldzki Square

2. Szewska Street, the current marking obliges the tram driver to travel at a speed of 30 km/h on the section from Kazimierza Wielkiego Street to Ofiar Oświęcimskich Street - Fig. **2**.

2. Szewska Street, view from Kazimierz Wielki Street

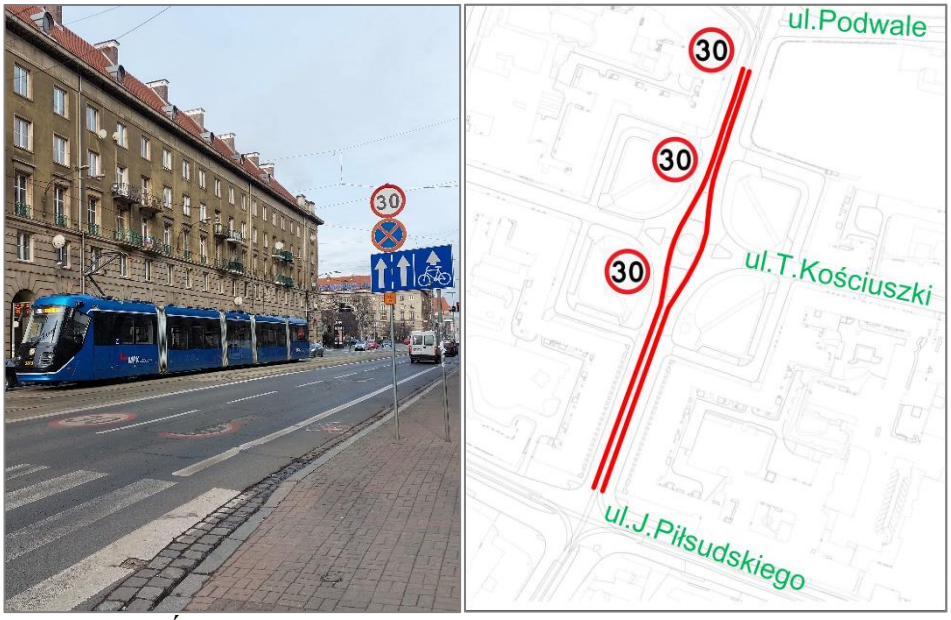
3. Szewska Street, the current marking obliges the tram driver to travel at a speed of 20 km/h on the section from Ofiar Oświęcimskich Street to Grodzka Street - Fig. **3**.

3. Szewska Street, view from Ofiar Oświęcimskich Street

4. Świdnicka Street, the current marking obliges the tram driver to travel at a speed of 30 km/h on the section from ul. Podwale to pl. Teatralny - Fig. **4**.

4. Świdnicka Street, view from Podwale Street

5. Świdnicka Street, the current marking obliges the tram driver to travel at a speed of 30 km/h on the section from Podwale Street to Kosciuszki Square, and from Kosciuszki Square to J. Piłsudskiego Street (repeat) - Fig. **5**.



5. Świdnicka Street, view from J. Piłsudskiego Street

Operational Restrictions

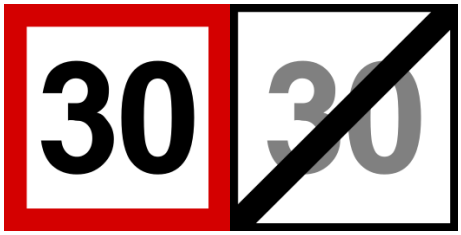
Restrictions resulting from the operational properties specified by the manufacturer are usually not marked in the field. Guidelines are defined in the instructions [13] provided by manufacturers along with the supplied switches and expansion devices. Such restrictions, as a permanent regulation, are included in the currently applicable **Wrocław Driver Instructions** [12]. These instructions require tram drivers to operate at speeds not exceeding:

- **15 km/h** on approach switches for straight routes (for locked turnouts) and on departure switches,
- **10 km/h** on approach switches for turning routes.

Wrocław's tram tracks are divided into two regions – **Region A** and **Region B**. Within the area of Wrocław, there are **493 tram turnouts** – **253 turnouts** in Region A and **240 turnouts** in Region B (as of January 23, 2023), not including turnouts in tram depots. Due to the number of switches in Wrocław, the speed restrictions resulting from manufacturers' specifications had to be permanently incorporated into the carrier's internal regulations.

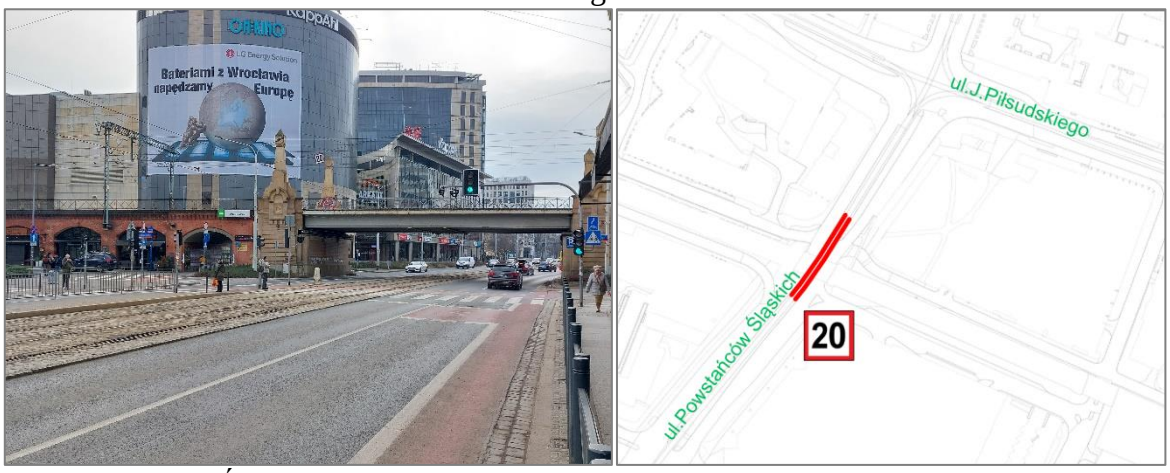
Safety-related Restrictions

In the **Regulation of the Ministers of Infrastructure and Internal Affairs and Administration** dated July 31, 2002, regarding road signs and signals, additional signs for tram operators were included. These signs are located on the right side of the track, either suspended above the track connected to the overhead line network or on poles in the between-track area. Speed restrictions are implemented in the form of **sign BT-1** and its subordinate sign (**sign BT-2**):



The safety-related speed limits that apply can be distinguished as follows:

1. Speed restrictions under viaducts resulting from the need to adapt the current collector arm to the lowered traction network - Fig. **6 - 7**.



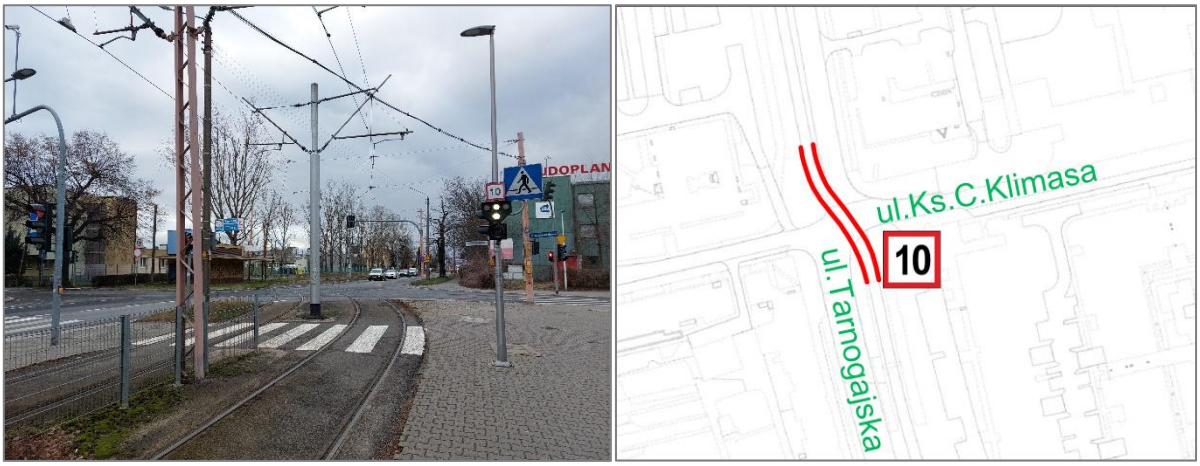
6. Powstańców Śląskich Street, view from J. Piłsudskiego Street. Speed limit of 20 km/h in force on the length of the passage under the viaduct

7. Grabiszyńska Street, view from Bzowa Street. Speed limit of 10 km/h applicable along the length of the viaduct

Apparently, speed limits (10 km/h) are also located in the area of the viaducts over Trzebnicka Street and W. Reymonta Stree.

2. Speed restrictions resulting from the need to fit into a counter-arc (two arcs of opposite direction following each other) - Fig. **8 - 9**.

8. Grabiszyńska Street, view from the Cmentarz Loop. Speed limit of 10 km/h in force on the length of the counter-arc.



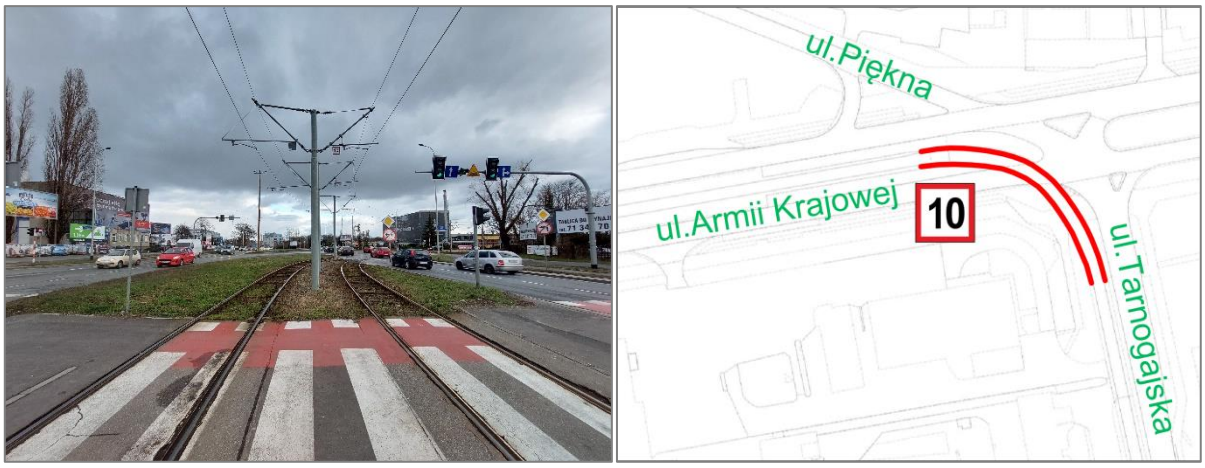
9. Tarnogajska Street, intersection with Klimasa Street. Speed limit of 10 km/h in force on the length of the counter-arc

3. Speed limit of 10 km/h at the intersection of tram tracks with railway tracks. In Wrocław there are only two such cases, i.e. on Krakowska Street and on Żmigrodzka Street – in both cases an intersection with a railway siding.

4. Speed limit resulting from track condition, e.g. cracks, rail wear, missing sleepers, etc - Fig. **10 - 12**.

10. Wróblewskiego Street next to the Centennial Hall. Speed limit of 20 km/h applicable on the length of the holding track

11. Mickiewicza Street, view from Wystawowa Street. The speed limit is 20 km/h from Wystawowa Street to Paderewskiego Street. Due to its condition, the track is out of service and is used only for emergency runs or detours. Additionally, the speed limit is 10 km/h at the intersection with Kopernika Street.

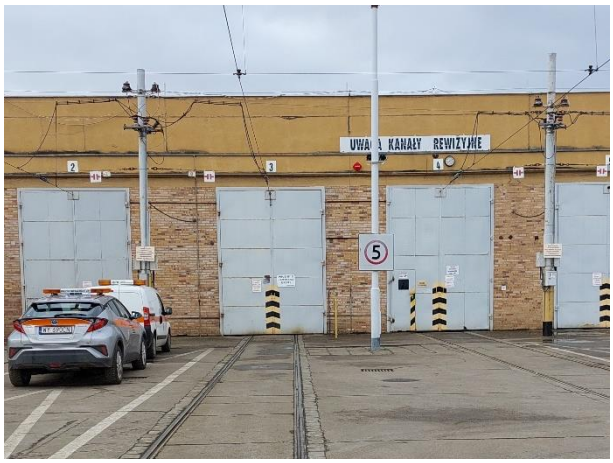


12. Armii Krajowej Street, view from Piękna Street. Speed limit of 10 km/h in force on the length of the arc

5. The restriction was introduced due to numerous reports from residents regarding the noise nuisance generated by the passing tram Fig. **13**.

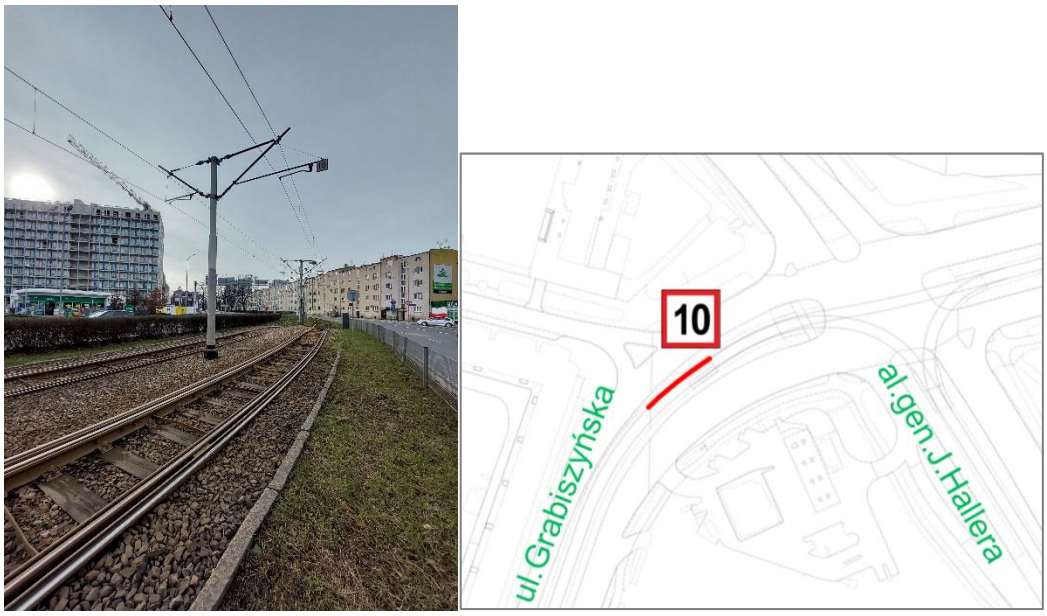
13. Al.gen.J.Hallera, view from Grabiszyńska Street. Speed limit of 30 km/h applicable on the length of the horizontal curve

6. Speed limit of 5 km/h for passing through inspection (inspection) pits and halls. The limit results from the regulation [15], additionally included in the Instructions for Tram Drivers [12] - Fig. **14**.



14. The Borek Tram Depot area at Powstańców Śląskich Street. The 5km/h speed limit for safety reasons has been repeated in the form of permanent markings

7. Speed limit due to lack of track geometry.



15. Grabiszyńska Street, view from the FAT side. The 10 km/h limit introduced due to the lack of geometry of the exit switch applies only on the track towards Fiołkowa Street

8. Speed limit resulting from works. Such restrictions are temporary and are introduced in the form of an internal announcement.

16. Powstańców Śląskich Street, intersection with Wielka Street, view from the roundabout. Speed limit of 20 km/h introduced as part of the project entitled "Plumbing of traction poles on Powstańców Śląskich Street in Wrocław" on 9.11.2022-23.01.2023.

It is worth noting that such restrictions are superior and have higher importance than road markings.

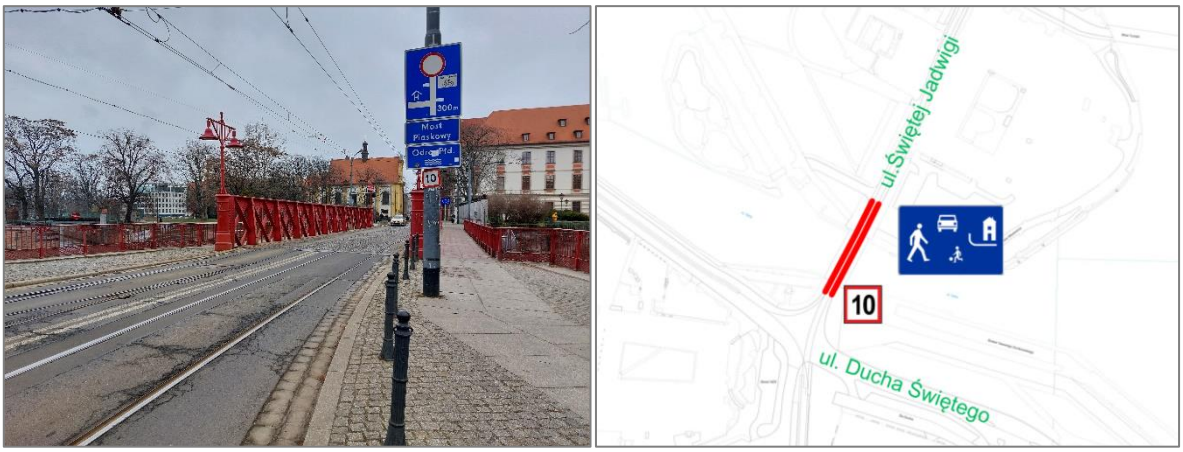
Fig. **17** shows an example of such marking along Podwale Street. From Świdnicka Street to Sądowa Street, the speed limit is 40 km/h (sign B-33).

17. Podwale Street, view from Świdnicka Street

However, due to the condition of the tracks, additional markings have been introduced on the same section, obliging the tram driver to travel at a speed of 20 km/h (sign BT-1) - Fig. **18**.

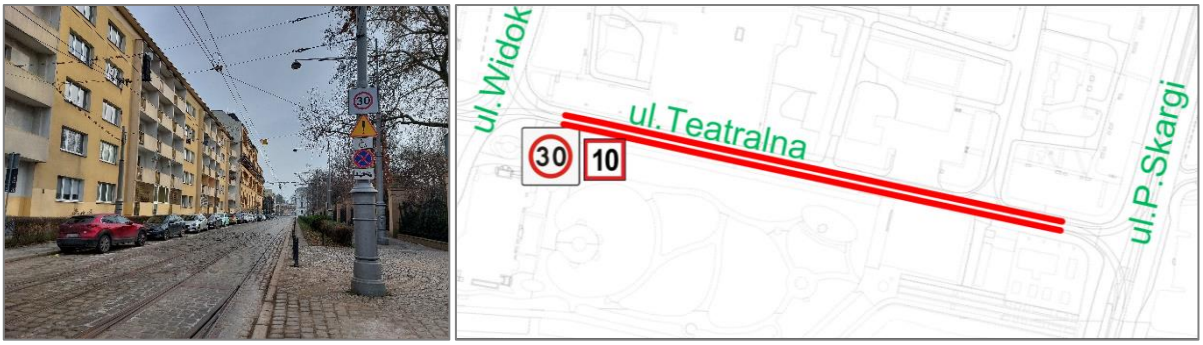
18. Podwale Street, view from Świdnicka Street

Another example of such a restriction applies at the entrance to Piasek Island. On Świętej Jadwigi Street and Młyńskich Street from Piaskowy Bridge to H.Sienkiewicza Street, a speed limit of 20 km/h applies (sign D-40). Due to the condition of the bridge, a superior speed limit of 10 km/h applies along Piaskowy Bridge (sign BT-1) - Fig. **19**.



19. St. Jadwiga Street/Sand Bridge, view from Holy Spirit Street

A similar restriction resulting from the condition of the tracks was introduced along Teatralna Street. The applicable marking obliges the tram driver to travel at a speed of 10 km/h (sign BT-1), despite the applicable limit of 30 km/h (sign B-43) on the section from Widok Street to Piotra Skargi Street - Fig. **20**.



20. Teatralna Street, view from Widok Street

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track area. Speed restrictions are implemented in the form of **sign BT-1** and its subordinate sign (**sign BT-2**).

Reasons for Applied Restrictions in Other Cities in Poland

Similarly to Wrocław, other cities in Poland also implement speed restrictions by tram track managers. The following examples come from Szczecin, Poznań, Kraków, Ruda Śląska, and Warsaw.

The most frequently mentioned reason is track defects such as cracking [1, 6], loosened plates under the track [7], or generally poor track conditions [3, 4, 5, 8, 9]. Speed restrictions were also justified by an environmental decision in Poznań [11] and noise and vibrations emitted by passing trams in Kraków [2]. In the case of a bridge in Warsaw, a speed limit of 45 km/h was indicated due to installed expansion joints and the manufacturer's instructions [10].

Summary

This study analyzes the speed restrictions in tram traffic applied in Wrocław, which have a direct impact on the average traffic speed. The author of the article conducted a classification of speed restrictions by dividing them into those arising from traffic regulations, operational restrictions, and safety-related restrictions. The article utilizes examples of speed restrictions applied in Wrocław. Additionally, a brief analysis of speed restrictions applied in tram traffic in other cities across Poland was conducted. It was found that speed restrictions classified by the author as resulting from safety concerns, occurring due to poor pavement conditions, rail cracking, and troublesome noise, were noted both in Wrocław and nationwide. These restrictions are often sudden and are implemented until the cause ceases.

At the beginning of the article, a comparison of average tram traffic speeds in selected Polish cities was presented. In the author's opinion, a proper assessment of tram transport quality should consider, in addition to the average traffic speed, an analysis of the causes of lost time, such as sections with speed restrictions arising from traffic regulations, the number of switches and expansion devices on the studied route, and sections with speed restrictions resulting from the need to maintain safety, which are not isolated incidents but constitute a permanent element of the urban tram network, as demonstrated in the above article.

Source materials

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