RAIL - ROAD LEVEL CROSSINGS
SAFETY IMPROVEMENT IN CROATIA

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Belgrade, November 2019
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Introduction

- Level crossings (LC) are spots where roads (vehicle or pedestrian users) cross railway lines or industrial tracks, i.e. from the aspect of construction, a place of crossing of the carriageway and the running surface of the rail
- Level crossings represent critical point of safety for both road and rail users
- Basic classification of protecting the level crossings is divided between passive and active protection
• Passive protected level crossings - equipped with any sign of warning, devices or any other protection equipment that is constant and that does not change depending on any traffic situation

• In the Republic of Croatia level crossings passive protection is considered to be the use of road traffic signs “St. Andrews Cross” and “Stop” together with the regulated visibility triangle
• Active protected level crossing - any type of protection which changes its state according to the approaching train.

• In the Republic of Croatia most common automatic level crossings protection is use of flashing lights and sound traffic signs and use of half-barriers with the sound and flashing lights.

• Protection with full barriers that are controlled manually by dedicated gate keeper.
Level crossings in Croatia

- total length of railway lines in Croatia - 2.605 km,
  - 2.351 km single track lines
  - 254 km double track lines
  - 980 km of electrified lines (977 km with 25kV/50 Hz A.C. system and 3km with 3kV D.C. system)
- 1,520 level crossings
  - 62.76% protected with passive protection systems
  - 37.24% protected with active protection systems
LCs ON THE CROATIAN RAILWAYS
<table>
<thead>
<tr>
<th>Railway line</th>
<th>Rail road level crossings</th>
<th>Pedestrian level crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Passive</td>
<td>Active</td>
</tr>
<tr>
<td>International</td>
<td>213</td>
<td>329</td>
</tr>
<tr>
<td>Regional</td>
<td>282</td>
<td>152</td>
</tr>
<tr>
<td>Local</td>
<td>398</td>
<td>68</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>893</td>
<td>549</td>
</tr>
<tr>
<td></td>
<td>1442</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1513</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>LC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTIVE</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>PASIVE</td>
<td>47</td>
<td>29</td>
</tr>
<tr>
<td>PEDESTRIAN</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>71</td>
<td>41</td>
</tr>
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PERCENTAGE SHARE FOR LC TYPE
in total number of accidents

- ACTIVE: 62%
- PASIVE: 37%
- PEDESTRIAN: 1%
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<tbody>
<tr>
<td><strong>Killed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Active LC</td>
<td>9</td>
<td>1</td>
<td>10</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>48</td>
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<td>7</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>39</td>
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<tr>
<td>Pedestrian LC</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<tr>
<td><strong>Total</strong></td>
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<td>7</td>
<td>15</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>8</td>
<td>2</td>
<td>7</td>
<td>8</td>
<td>89</td>
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<tr>
<td><strong>Badly injured</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Active LC</td>
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<td>5</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>0</td>
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<td>1</td>
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<td>4</td>
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<tr>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
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<td><strong>Total</strong></td>
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<td>9</td>
<td>8</td>
<td>15</td>
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<td>11</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td><strong>Slightly injured</strong></td>
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</tr>
<tr>
<td>Active LC</td>
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<td>25</td>
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<td>8</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>92</td>
</tr>
<tr>
<td>Pedestrian LC</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>2</td>
<td>11</td>
<td>9</td>
<td>30</td>
<td>32</td>
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<td>11</td>
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<td>8</td>
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<td>154</td>
</tr>
<tr>
<td>Broken half-barriers</td>
<td>706</td>
<td>613</td>
<td>567</td>
<td>522</td>
<td>518</td>
<td>470</td>
<td>501</td>
<td>447</td>
<td>524</td>
<td>452</td>
<td>5320</td>
</tr>
</tbody>
</table>
Regarding 409 serious accidents & accidents on LC-s and pedestrian LC-s for 401 (98%) responsibility is on users of LC-s, for 4 (1%) infrastructure manager and for 4 (1%) railway undertakings
Legal base

- Law on safety and interoperability of railway system
  - Rule book on ways to secure traffic on rail-road level crossings and pedestrian level crossings
  - Rule book on conditions for determination of intersection of railway lines and other traffic lines
  - Rule book on technical conditions for traffic management and signal safety railway infrastructure subsystem
- Transport development strategy of The Republic of Croatia 2017-2030
- Program of resolving on rail-road level crossings and pedestrian level crossings for period 2018 - 2022
Criteria for LC-s: passive to active

- Sorting of railway lines
- Sorting of roads
- Railway traffic intensity
- Road traffic intensity
- Number of accidents
- Number of fatal and badly injured in accidents
- Permitted speed of trains on determined part of railway line
- Speed restriction on determined part of railway line due to a LC
- Train speed for which is determined safety triangle
- Number of lines / gauges on LC
- Type of LC (rail – road or rail – pedestrian)
Criteria for LC-s: determination for modernisation and reconstruction

• Replacement of obsolete equipment due to a impossibility to obtain spare parts for maintenance
• Number of incidents in past period caused by human factor which could result by accident
• Suspension of segregated spots on open rail line or station for equipment control
• Automatization of LC-s handled by staff which has limited working hours
• Reduction of staff due to a automatization of LC-s
• Planned changes of technological organisation
Work on LC-s in Croatia

- In period 2013 - 2018 resolving 67 LC-s (63,2 mil. Kn)
- In period 2019 - 2023 planned works and modernisation 164 LC-s (230 mil. Kn; 50 LC-s IBRD loan and 114 LC-s commercial bank loans)
- EU projects for railway lines modernisation
- Scope for resolving LC-s
  - Modernisation
  - Reduction
  - Denivelation
  - Permanent suspension
Potential challenges

- Challenges regarding reduction existing LC-s on acquiring approval from local entities
- Demands from local entities related with leaving LC-s on short distances
- Not clearly defined normative demands for various equipment
- Public procurement issues,
- Connectivity with electro network on isolated spots,
- Expropriation issues
- Financial resources.
Preventive activities

- Several stakeholders:
  - Ministry of Sea, Transport and Infrastructure
  - Ministry of Interior: National Program of Safety of Road Traffic
  - Infrastructure manager; HŽ – Infrastruktura d.o.o.: „Train is always faster”
  - Faculty of Transport Sciences: active suporting
NATIONAL ROAD TRAFFIC SAFETY PROGRAMME OF REPUBLIC OF CROATIA
2011 - 2020

Project
IMPLEMENTATION OF MEASURES TO INCREASE SAFETY OF THE MOST VULNERABLE ROAD USERS AT LEVEL CROSSINGS

Coordinator: University of Zagreb, Faculty of Transport and Traffic Sciences
Partner: HŽ Infrastruktura (Croatian Railways), preventive-educational action „Train is always faster”
http://www.fpz.unizg.hr/projekt-sigurnost-na-zcp/
200 respondents – 55% F i 45% M
the highest number of respondents belonged to the group of 26-60 years of age (61%)
84% of respondents use the LC Trnava every day
61% live within 500 m of the LC
73% of respondents do not know how much is the fine for illegal crossing
33% of respondents indicate that the reason for illegal crossing is because they are in a hurry
93% of respondents think that it is necessary to build an underpass (for pedestrians and for vehicles)

Reasons for legal and illegal crossing of the LC:
- 33% of respondents stated that they are in a hurry
- 13% of respondents think it is safe to pass because they do not see any train arriving
- 12% of respondents think that the barrier stays lowered for too long
- 9% say that they are tired of waiting
- 6% estimate that it is safe
- Only 29% of respondents cross the LC in a proper and legal way
RAILWAY STATIONS IN VINKOVCI AND SLAVONSKI BROD
SAFETY EDUCATION IN SCHOOLS
TRAVELING EXHIBITION – „Safety and design“
COMPETITION – WRITE A SAFETY STORY OR A POEM!

http://www.fpz.unizg.hr/projekt-sigurnost-na-zcp/index.php/novosti/
WRITE A SAFETY STORY OR A POEM! - AWARDS CEREMONY
SAFETY TIPS - video

https://www.youtube.com/channel/UC_8WyivQmWEX7NIHpadRi6A

**SAFETY TIPS**

- **SIGURNO S ANDRUOM NA PUTU DO ŠKOLE!**
- **PREPORUKE VOZAČIMA ZA SIGURAN PRELAZAK PREKO ŽELJEZNIČKO-CESTOVNOG PRIJELAZA**
- **SAFE WITH ANDREW ON THE WAY TO SCHOOL!**

**SAŽETAK AKTIVNOSTI - FPZ - Nacionalni program sigurnosti ...**

165 prikaza • prije 2 mjeseca

**ZNAK RAZMIŠLJAM SUDJELUJEM**

**SIGURNOST U PROMETU ZAPOČINJE SA MNOM POŠTUJEM PROMETNE PROPISE I ZNAKOVE!**
VIDEO – „Safe with Andrew on the way to School!”

https://www.youtube.com/watch?v=C2ZplhRYGko
10th edition of the INTERNATIONAL LEVEL CROSSING AWARENESS DAY
Launched conference
Zagreb, CROATIA

Save the DATE!


10 YEARS INTERNATIONAL LEVEL CROSSING AWARENESS DAY
Zagreb JUNE 7, 2018
ILCAD – 7 June 2018 – Zagreb, CROATIA – „Conference”
LC LOCATIONS IN ZAGREB URBAN AREA

Methodology for Collecting Data

<table>
<thead>
<tr>
<th>Day</th>
<th>Camera</th>
<th>Researcher</th>
<th>Video</th>
<th>Survey</th>
<th>Educational</th>
<th>Others</th>
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<tr>
<td>Monday</td>
<td>✓</td>
<td></td>
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<tr>
<td>Tuesday</td>
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<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Wednesday</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
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<tr>
<td>Thursday</td>
<td>✓</td>
<td></td>
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<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Friday</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Location</td>
<td>Queue:</td>
<td>Longest Average Waiting of Vehicles:</td>
<td>Largest Average Vehicle Delays:</td>
<td>Highest Emission of Harmful CO Gases:</td>
<td>Fuel Consumption:</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
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<td>--------------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>LC Trnava</td>
<td>240 m</td>
<td>19.8 s</td>
<td>26.06 s</td>
<td>932 PPM</td>
<td>13 L</td>
<td></td>
</tr>
<tr>
<td>LC Osječka - Trnava</td>
<td>143 m</td>
<td>69.7 s</td>
<td>80.44 s</td>
<td>1182 PPM</td>
<td>17 L</td>
<td></td>
</tr>
</tbody>
</table>
- „Train is always faster” – HŽ Infrastruktura d.o.o.
- Activ from year 2000
- In 2018, through workshops participated 3016 students from elementary schools in Croatia
- From 2012 till today 10,625 students in 98 schools
- In coordination with Ministry of Interior activities on LC-s in major cities
Project Implementation of Measures to Increase the Safety of the most Vulnerable Road Users at Level Crossings is carried out within the framework of the National Road Traffic Safety Program in the Republic of Croatia 2011-2020 by Croatian Ministry of the Interior. Faculty of Transport and Traffic Sciences of University of Zagreb is the project leader, and HŽ Infrastruktura with its preventive and educational program "The train is always faster" partner in the project.
Railway tracks are not a playground!

Video was created as part of Project Implementation of Measures to Increase the Safety of the most Vulnerable Road Users at Level Crossings is carried out within the framework of the National Road Traffic Safety Program in the Republic of Croatia 2011-2020 of Croatian Ministry of the Interior.

Video was made by team (high school students) from SKIG - Studija kreativnih ideja Gunja.

https://youtu.be/Mf_n8foy85w
Thank you for your attention!